

SAS® IS WATCHING YOU: DEVELOPING A REFUND FRAUD DETECTION SYSTEM WITH THE SAS® SYSTEM

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Background

REI (Recreational Equipment Inc.) is a nationwide retailer of recreational equipment and clothing, with 21 retail stores and an international mail order operation. We sell \$200 million a year in high-quality, high-ticket merchandise, and our reputation is built on our commitment to customer service. Part of this commitment is an extremely liberal returns policy; if the customer is dissatisfied with merchandise purchased at REI, we give a cash refund regardless of the state of the merchandise or the lack of a receipt.

The Problem

Anytime a store hands over money so easily, refund fraud artists move in. Loss prevention experts estimate retail returns fraud to be roughly five percent of total returns, which adds up to three quarters of a million dollars a year to this company alone. Returns fraud is less risky for the thief than outright shoplifting, since you don't need to leave the store with the merchandise to get a refund. You just pick up an item off the floor, put it in a bag, and carry it to Customer Service. Some people defuse suspicion by saying they just got the wrong size and want to exchange the item that they have actually stolen.

Another problem unique to REI is the result of our being a cooperative. Although anyone can shop at an REI store, we pay annual dividends to our members based on their net purchases of regular-priced merchandise. Dividends have been running roughly 10% for the last 10 or more years. So if you bought a \$60 pair of ski goggles, and gave the cashier your membership number, you'd get about \$6 back at the end of the year.

I was suspicious that, in addition to the fraud artists, some members were returning merchandise without acknowledging their membership. Since the membership number attaches the return to the customer, this dishonesty keeps the member's dividend artificially high. For instance, if you returned that \$60 pair of goggles and told the cashier you weren't a member, you'd still get the \$6 dividend. Six dollars isn't a big deal, but multiply that problem by two million members, and it can really add up.

The Approach

I came up with a plan to detect both types of returns fraud by piggy-backing onto an existing Customer Information database designed by Systems Development. I turned in my Request for Service with a great cost-benefit analysis of less than one year. My project was estimated at several staff-years by MIS and scheduled for detail design in the year 1996. Not only that, but without proof that there was a problem with returns fraud, I was unable to get the MIS Steering Committee to buy off on the project.

My only alternative was to create the system myself. Even though I considered myself a reasonable SAS programmer, I wasn't sure how or where to begin. Since the files involved have millions of records, it took some experimentation and lots of condition code 12s to figure out an effective way to do the analyses. Although I wanted to use permanent SAS datasets, they took too much space. I found that temporary work

datasets were the only feasible answer, and so combined multiple data steps, sorts, summary, means, freqs, prints and charts all into one jobstream.

I convinced a couple of local stores to key non-member returns data into a CICS entry screen initially intended for use by our Mail Order division. This screen gives each customer with a return a unique ID number and retains their address, phone, etc. The stores entered the data daily and, when combined with our member sales data, it provided an audit trail for all returns.

At month-end, the fun started. Returns transactions were separated from sales and sorted by customer number. Since our Mail Order division can track their own customer sales and returns pretty well, I excluded Mail Order, foreign, and commercial accounts in this first step. I wanted to use Proc Summary to analyze each customer's returns, but at two million members the dataset was too big. So I passed the data through a counting loop to pull off only those customers with excessive number and dollars in returns.

This file, containing the customer number, number of returns and returns dollars, was held for use later in the jobstream. A second, exterior file was created to store just the customer numbers. Then we matched those customer numbers to the names and addresses on the Customer Information File. The matched observations were then recombined with the customers' returns summary. A final sort put the customer data into the store where his last return took place.

The final report was furnished to the retail stores for follow-up with the customer. Since there was a chance that the customer was just an impulsive buyer/returner, the store sent a letter that approached the topic from a customer service angle. We told the customer that we were concerned that they were not receiving appropriate service from our sales staff, since they were returning much of what they purchased. We asked them to stop by the Customer Service Counter during their next visit to the store so we could assign an especially knowledgeable salesperson to help them. A legitimate customer is pleased to know that we care about his satisfaction with our goods. A customer who is not stealing, but is abusing the returns policy, knows that we are aware of him. The thief just knows that it is time to move on.

To find the non-members who really are members, we match-merged non-member names and addresses to the appropriate field on our customer information file, and observations with a match were merged again with actual returns information by customer number. This process was then repeated using the phone number as the match-merge key. Surprisingly, many people will use a false name but list their own phone number. This step also eliminated non-matches due to inconsistencies in the data entry of customer data, such as 'street' being spelled out versus abbreviated, or Don versus Donald.

We forwarded returns information for anyone who really was a member to our Dividend Department for posting against the member's account.

A final round of statistics was produced by using proc's freq, means, and chart to obtain:

- The proportion of cash and charge returns
- Number of returns by location
- Min/max, mean and sum of returns dollars by location
- Vertical bar chart of returns by location for each day

Another jobstream simply sorted and printed all returns information by customer number for long-term retention.

The Results

In the first six months of operation at two test stores, this program identified \$40,261 in non-member returns that actually belonged to members. We were able to update the dividends-payable file which translated to \$4,026 in pure profit. (It would take over \$200,000 in additional sales to create as much profit.) An additional 57 customers were spotlighted as potential fraud artists, enabling the stores to be on the lookout for these people.

As a result of this test, the program was approved by Senior Management for use by all stores. Most stores are currently in the process of obtaining security for the appropriate files and may have actually begun entry by now. A conservative extrapolation puts REI's annual savings at \$50,000.

The Future

Like any other programmer, I have a list of enhancements I want to make to the system. For example, I would like the customer's returns detail to print on the report under his summary line. If the customer has returned items at multiple stores, I would like to send the customer information to each of the stores, and asterisk the store that should send the customer service letter.

I also want to send the stores these reports via Viewcom, our remote display system, so they can be printed locally.

I am planning to run a similar job quarterly that will help identify people who make only one large return each month and so slip through the monthly net.

It would be great to feed the customer numbers of these suspicious returns to our POS System so that when the cashiers key the number in we could produce a message back on their display screens to call the Manager or security.

The stores would like some sort of online function to be able to look up a person's returns activity on the spot.

Other Applications

In preparing for this presentation, I worried that there would be few techniques or ideas you could use besides knowing where NOT to commit returns fraud. The system is very straightforward, and uses no technical wizardry. But there are a couple of items you might be able to employ in other situations.

When you are participating in the development of a new system, ask the programmer to create a sequential file for you containing all the variables in the system for you to play with. Allowing the user to prototype any reports with SAS is a great time-saver for MIS. You can save costly rewrites and much confusion if you know exactly what you want and what works best. The end user is the only one who can do that. One of the best things about having this fraud system in SAS is that I could spend hours playing with the

reports until I got them just right. Even after the first month or two's reports, I solicited feedback from the stores who ultimately received those reports, and did some more rewriting.

Secondly, we are introducing an array to feed back to SAS the keys of data we need more information on. Originally, I used SAS to come up with the customer numbers and then I looked them up and did print screens online. After that got too boring, I added a step in the jobstream where I made a long list of ifs and plugged in those customer numbers manually. If customer number equals x or customer number equals y or customer number equals z then input the rest of the data. But the array will save me from having to do this step. It took awhile to understand it and it isn't working perfectly yet. Unfortunately, the documentation on arrays isn't quite as clear as I need, but the work is worthwhile.

Conclusion

In conclusion, I used SAS® software to build this application solely out of desperation. During the initial coding I really felt that somehow the system would be much better if MIS was writing it instead of me. I found, however, that the SAS® system was the perfect vehicle for this type of application; flexible enough to permit ad hoc explorations and 'what ifs', and able to respond to changing needs. It also allowed the person who really understands the application to retain the driver's seat. I know a lot more about fraud than the programmers. And I trust that the work I'm doing to prevent returns fraud losses will be a long-term benefit to REI. By reducing losses we can afford to provide better service and satisfy the ultimate end-user: the customer.

I want to acknowledge the assistance of another in-house SAS® programmer, Anita Kortbawi, for her assistance in understanding and using the array.

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Programming details for this system are available from the author:

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REI Returns Fraud Detection Program

