



## Paper FS-09-2013

### Addressing Fraudulent Payment Activity with Advanced Decision Management Analytics

CONCLUSIONS PAPER

Featuring:

Rex Pruitt, Senior Manager, Advanced Analytics and Big Data, Capgemini

## Table of Contents

<b>Introduction</b>	<b>1</b>
<b>Challenges to Implementing Decision Management Analytics</b>	<b>2</b>
Establish an Analytics Team Structure with Clear Accountability and Committed Resources	2
Ramp Up to Tackle Big Data and Software Proficiency Issues	3
Establish a Trusted, Analysis-Ready Data Foundation	4
Be Able to Measure and Prove the Results	4
Be Persistent	5
<b>Fraud Detection and Prevention in Action – Five Case Studies</b>	<b>5</b>
Case Study 1 – Validation of Third-Party NSF Models	5
Case Study 2 – Determining Check Float Criteria Based on Consumer Behavior Models	6
Case Study 3 – Fraud Loss Mitigation Modeling	6
Case Study 4 – Collections Call Routing Based on Propensity to Pay	8
Case Study 5 – Forecasting Detailed Profitability Components	9
<b>Closing Thoughts</b>	<b>10</b>
<b>About the Author</b>	<b>11</b>
<b>For More Information</b>	<b>11</b>

## Introduction

*We all face decisions in our daily lives. Some are relatively easy, some very tough. Some may have financial ramifications, and some may even lead us to face our own mortality.*

*I was faced with that very situation. About six months ago I had symptoms – in business we call them “pain points” – that I didn’t address. That bad decision could have cost me my life.*

*Ignoring the symptoms led to a heart attack. Good decisions led to rapid diagnosis and treatment – including placement of a stent.*

*I’m in great health now, but there’s a lesson in this: Listen to the symptoms and pain points, address them effectively, and you’ll be able to overcome them. Ignore them at your peril.*

If you work in the financial services industry – or you have ever turned on the news – you know about pain points, especially in the unforgiving economic and regulatory climate we’ve seen since 2008. Organizations in all industries have been tasked to do more with less, under leaner market conditions and with stricter regulatory oversight. It’s the proverbial perfect storm, one that requires organizations to make better and faster decisions with unprecedented volumes of data.

Enter decision management analytics.

Simply put, *decision management analytics* is using predictive analytics to make key strategic and operational decisions at the executive and/or operational management levels. It’s about trying to forecast an outcome using a variety of statistical techniques such as modeling, machine learning and data mining to analyze current and historical facts to make predictions about future events.

I have focused my career on applying decision management analytics for improving performance and reducing fraud and risk in financial services organizations. I spent seven years at Premier Bankcard, and before that held a similar role at the Mutual of Omaha insurance company. My experiences working with these companies and others cemented my belief in the power of analytics – as well as the very understandable reasons analytics are not more entrenched in the industry. Getting it done can be tough, but the results are worth it.

For example, consider a credit card company that serves customers with less-than-perfect credit. If the company issues too many cards to those who aren’t ready to reclaim creditworthiness, it faces losses and challenges from regulators. If it focuses exclusively on people who have nearly finished their climb into the prime market, it won’t earn money from renewal revenue, because customers will soon graduate to prime card issuers.

In an informal poll during a recent Association of Certified Fraud Examiners (ACFE) webinar, when asked to pick only one pain point category where decision management analytics could help, 73 percent of the audience pointed to fraud detection. Of course, the results are skewed because it was an audience of fraud specialists, but nonetheless, fraud is an area where analytics has delivered impressive results.

Decision management analytics can find that sweet spot of card product applicants – customers who will renew and aren't likely to become delinquent. Analytics can then be applied to help mitigate fraud losses. For one company, these analytics-driven initiatives and others led to millions of dollars in new revenue and/or expense reduction.

## Challenges to Implementing Decision Management Analytics

In spite of the rapid payback seen from decision management analytics, implementing these strategies can be a challenge. From a tidal wave of big data to a lack of proficiency with sophisticated software, some projects just seem to stall out and never get up and running.

In an informal poll conducted during an ACFE webinar, 70 percent of the audience indicated that their organizations “only moderately” rely on analytics to make decisions; another 17 percent said “not at all.” There is a ready opportunity to move those “moderately” analytics-driven organizations to the next level. I have seen several approaches to ease that evolution.

A common pain point is the inability to get operational areas to support the concept. Sometimes the issue is an individual's pride or ego. People can be overly protective of their particular silos in the organization. If the owner of an operational area isn't on board, it can be difficult to implement an analytics solution.

Other obvious issues are lack of financing, fear of change and concern for the downstream impact on business operations. These are understandable issues. I allowed pride, fear and financial concerns to get in the way of addressing my cardiac pain points, but that almost cost me my life. When we're talking about a significant cost to the business – the risk and lost opportunities associated with suboptimal decisions – we need to overcome these roadblocks.

When we're talking about a significant cost to the business – the risk and lost opportunities associated with suboptimal decisions – we need to overcome the roadblocks to implementing advanced decision management analytics.

## Establish an Analytics Team Structure with Clear Accountability and Committed Resources

The first step is to establish an analytics team structure that supports implementation plans, with clear lines of accountability and committed resources. Figure 1 shows how an organization can mobilize a team for its fraud identification processes:

- The MIS Data/Info **Core** Team provides management information systems (MIS) support for all operational areas of the company, such as marketing, customer service and collections. The analytic tasks to support these functions occur in a centralized location, and the information is fed out to internal customers.
- The MIS Data/Info **Extended Development** Team enlists representatives from IT/MIS or technically oriented business analysts to do model management, database administration and other functions that make the analytics work.
- The MIS Data/Info **Extended Support** Team focuses on prioritization, technical assistance and training, while being completely integrated into the core team structure.



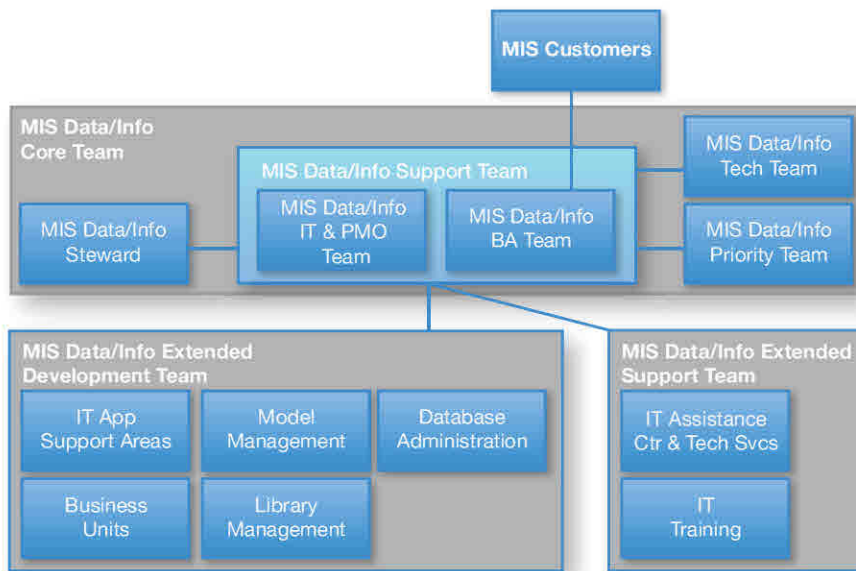


Figure 1: A cohesive team structure to support decision management analytics.

Once this team structure is in place, it can be quite effective and efficient in implementing the analytics solutions that are identified to address business needs. By supporting diverse operational areas from a centralized analytics function, an organization can implement best practices that improve data consistency and integrity, as well as communications and efficiency across functions, such as customer segmentation and fraud mitigation.

### Ramp Up to Tackle Big Data and Software Proficiency Issues

Big data is a big buzzword these days. The concept of big data is not an absolute measure of data volume – it's not x number of terabytes, transactions per second or number of data rows. Big data is relative to the size of your company and the capacity of its systems infrastructure. It refers to the point where the volume, velocity and variety of data push the limits of conventional hardware/software configurations and your organization's ability to analyze the data to answer business questions at the speed of decision.

If your IT infrastructure is a single PC, then big data will be the maximum that PC can collect, store and process. For an organization such as Premier, big data is somewhere on the order of 30 terabytes. For a much larger financial institution or the federal government, big data could be hundreds or thousands of terabytes, approaching petabytes. To put it in context, one terabyte contains 2,000 hours of CD-quality music; 10 terabytes could store the entire US Library of Congress print collection. Exabytes, zettabytes and yottabytes are on the horizon.

**“Big data” refers to the point where the volume, velocity and variety of data push the limits of conventional hardware/software configurations and your organization’s ability to analyze the data to answer business questions at the speed of decision. The technologies that extract real business value from big data – all of it – are here today.**

Some of the software products out there to mitigate fraud are very sophisticated, and they overlay on very large amounts of data, with good reason. When you're able to consider all the evidence – all the available and relevant data – then the predictions are much more reliable. Sampling will almost always inject some level of bias in the results. There's always the risk of over-sampling, under-sampling or biased sampling. There are various statistical methods for defining a sample set, but the bottom line is, if you use all the data, you take the bias out – unless you've got bad data, but that's another story.

It is now possible to analyze all available data (not just a subset of it) to get more accurate answers for hard-to-solve problems, uncover new growth opportunities and manage unknown risks – all while using IT resources very effectively. Big data technologies – such as grid computing, in-database analytics and in-memory analytics – can deliver answers to complex questions with very large data sets in minutes and hours, compared to days or weeks before. However, for many organizations, trying to scale up to big data often exposes infrastructure limitations and software proficiency issues.

### **Establish a Trusted, Analysis-Ready Data Foundation**

I worked with a company that built a best-in-class data warehouse – touted at the time as having one of the largest data warehouses in the country and showcased in a Microsoft case study article. I'm sure there are much bigger data warehouses out there now, just because of the sheer size of other organizations. But the value for this organization was being able to take its data and transform it into an environment that is much easier and more responsive to its project action efforts.

A lot of this was built out because the volume of big data became a recognized pain point. The correlated “heart attack” was a Federal Reserve warning. During safety and soundness audits, management was told to do a better job responding to Fed requests and surfacing the information faster and better. The team took that heads-up to heart. So the prescription was this new data warehouse, which resolved the issue and delivered good response times for clean and accurate reports.

### **Be Able to Measure and Prove the Results**

“If you can't measure it, don't do it.” I've heard that said throughout my career. That mantra supersedes “If you build it, they will come.” The latter mentality often ends up in failure, because there's always a need to show accountability, with clear lines of measurement and well-defined expectations. No matter how big or how small the solution, success really boils down to the ability to measure the results and prove the business benefit and return on investment.

For example, one organization had a pain point in using a tool that helps forecast fraud loss and some delinquency and charge-off parameters related to fraud. The legacy process for this forecasting was laborious, requiring multiple extracts to get at the needed insight. In fact, 80 percent of the effort was spent on data preparation and formatting for forecasting, and only 20 percent was left for analyzing the output. With the new data warehouse and decision management analytics, we were able to re-engineer the process and flip those proportions. Now only 20 percent of total time is spent on the front-end data management tasks and 80 percent on value-added business analysis.

## Be Persistent

Nudging a titanic organization to embrace decision management analytics is a matter of persistence and patience. The politics and logistics of the process are like putting your foot on the gas and always being ready to put your foot on the brake as well. Implementation is usually incremental in phases, with adoption earned rather than a given at each step. I don't think a 100 percent forced conversion is possible unless the organization was founded on analytics to begin with. The process is more about cherry-picking small projects that could return rapid and visible successes, and then building incrementally on that. When you share the successes of those analytics projects, it becomes more and more difficult for others to ignore or question the benefit.

In one organization, it helped that the CEO had read Tom Davenport's book *Competing on Analytics*, which sets forth what an organization needs to do to be a player in our field. That book played a key role in the organization embracing analytics. This CEO will not make a decision on anything without asking, "What do the analytics say about that?"

Don't give up when you encounter problems. You might meet resistance in an operational area, and the inclination is to give up, but that's not necessary. If the solution requires better technology, start the RFP process to get the proper technology in place. If staff members don't have the requisite skills to make the software work properly, get the right people in the right place, or improve the training of the ones you've got. It's difficult to talk about, but it's reality. Overcoming roadblocks and objections to decision management analytics can require heavy persistence. It's worth it, as the case studies will show.

The process is more about cherry-picking small projects that could return rapid and visible successes, and then building incrementally on that. When you share the successes of those analytics projects, it becomes more and more difficult for others to ignore or question the benefit.

## Fraud Detection and Prevention in Action – Five Case Studies

### Case Study 1 – Validation of Third-Party NSF Models

I worked with an organization that uses a third-party solution to help reduce the problem of failed check payments due to non-sufficient funds (NSF). Three years before the analytics project, approximately 1.2 percent of total payments by check were NSF. Although it's difficult to prove, one can view NSF cases as a form of fraud, because we know a certain percentage of bad check incidents are intentional.



With the new data warehouse and certain techniques in the decision management analytics process, it was possible to implement models that helped:

- Test and fine-tune parameters for the third-party models.
- Identify truly fraudulent payments and automatically eliminate them from the decision process.

In three years, this effort led to a 50 percent reduction in NSF payments – to about 0.6 percent of total payments by check.

## Case Study 2 – Determining Check Float Criteria Based on Consumer Behavior Models

Optimizing check float criteria is another piece to the decision management continuum that can significantly reduce bottom-line costs. Whether you call it outright fraud or not, people will write bad checks in the hopes of circumventing the check floating process.

To understand which checks to honor immediately and which to float, some financial services institutions use a purchased, third-party model. Transaction records go through a decision management process where a behavioral scoring technique is applied and score values are generated to help determine whether to float a check and for what period of time. Predictive analytics determine the best parameters for that process.

For the company involved with this particular project, an estimated 8 percent of check payments were floated, and of those, the decision management process caught about 66 percent of the bad payments coming through the system. Considering the size of the customer base, the dollar value this represented was enormous.

This organization is proactive in ensuring that its vendor scoring remains accurate and productive. Once you identify a target – such as detecting fraud, making payment float decisions or detecting an NSF – you can run a correlation analysis such as a chi-square statistic to see which scoring model most accurately predicts the actual outcome. In short, even though the company is purchasing these third-party scores, it uses internal models to challenge those scores and continually fine-tune the process and analytics.

**An estimated 8 percent of check payments were floated, and of those, the decision management process caught about 66 percent of the bad payments coming through the system.**

## Case Study 3 – Fraud Loss Mitigation Modeling

Decision management analytics can be very valuable for finding patterns and attributes that indicate a higher propensity for fraud. For example, scoring models use attributes from the credit card application to make a judgment about whether a payment should be routed down a different validation path and be subjected to additional research before it is approved or denied altogether.



By implementing this capability into systemic processes for decision management analytics – along with the score cuts and flags that are established as a result – financial services organizations can significantly reduce fraudulent activity. We proved that with a successful analytics project in 2012. Even though fraud occurred in only 5 percent of new accounts and only 0.123 percent of the active customer base, that rate is down 50 percent from previous levels. In both the “before” and “after” views, fraud was minimal as a percentage of total accounts/assets. But when you consider that the company has more than 2.5 million active accounts at any given time and brings on about 75,000 new accounts a month, the dollar amounts are enough to warrant attention.

Even though fraud occurred in only 5 percent of new accounts and only 0.123 percent of the active customer base in 2012, that rate is down 50 percent from previous levels.

In 2003, the company purchased SAS® Enterprise Miner™, which quickly delivered \$1 million in annual savings for fraud detection alone. When the original request for purchase was submitted, we reduced the anticipated savings by half, because we wanted to be conservative, but the project far exceeded our original projections with these fraud detection tools and scores that were built internally.

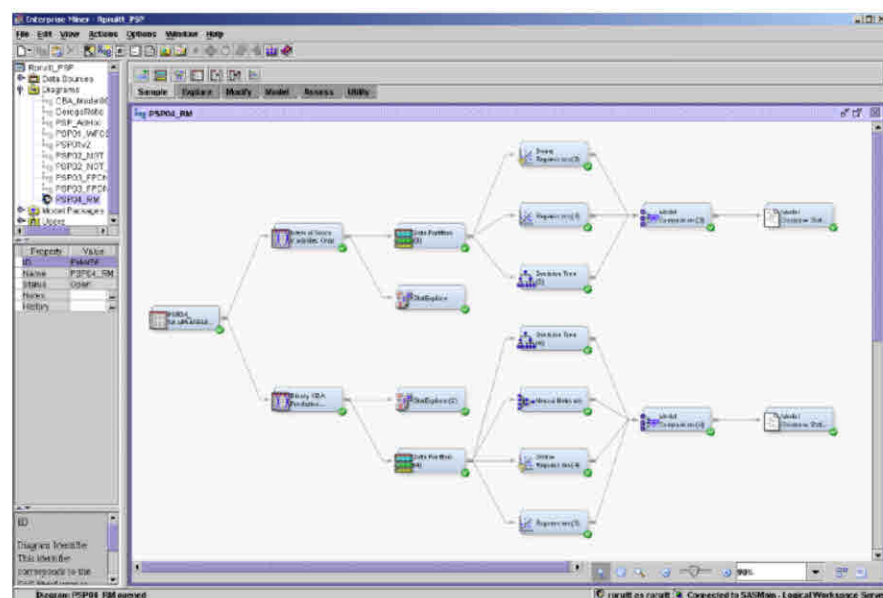


Figure 2: An analyst's view of a SAS Enterprise Miner scoring model.

Figure 2 shows an example of what a scoring model looks like to business analysts. The graphical user interface overlays on SAS technology. An analyst simply selects a data set from a drop-down menu on the left, and does a study through this scoring algorithm, which then generates an output at the end, showing analysts the path that the attributes on this algorithm would identify.

In a fraud detection scenario, for example, the process starts with a feed of the variables and attributes that describe an applicant. The process then goes down this modeling path and delivers a score for the applicant based on how the model was trained from experience. This score can then be pushed out to operational systems to determine the appropriate treatment. This interface and Gantt-type view enables business users with only a moderate analytical background to apply sophisticated decision management analytics to daily processes.

#### Case Study 4 – Collections Call Routing Based on Propensity to Pay

In the collections area, propensity to pay has several implications. There will be customers who may have had the best of intentions when they started the relationship, but unfortunately, they don't always follow through. Scoring models help to optimize call center resources and manage potential fraud by providing decisions as to the proper treatment for a customer. For example, if an account is delinquent, should the customer be given additional time or forgiveness for certain fees?

Through a propensity-to-pay model, financial institutions can also spot fraudulent behavior, because it can more clearly identify those who had no intent to pay in the first place. These are customers who were approved on the front end, welcomed into the portfolio, but their behavior indicates that they had no intention of paying, and they're probably going to roll right on out the door.

How much time and effort should be spent trying to collect from those individuals? Probably none. And therefore companies save call center time and resources by making better decisions about who has the highest propensity to make a payment, and then focus energy and efforts on those who came to the relationship with the right motive in mind – trying to improve their credit and solve a life issue.

Regulators respect SAS as an analytical tool. We justified our investment in SAS by targeting an application fraud mitigation model. It was estimated that SAS would help us reduce fraud significantly enough to have a \$1 million annual impact. We achieved that result and more.

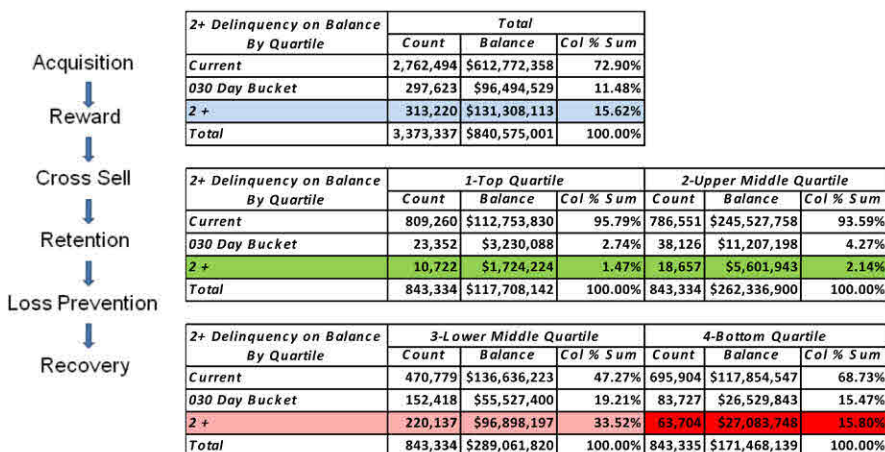


Figure 3: A typical scoring model for loss prevention and recovery.

Figure 3 shows how a segmentation exercise might be applied for loss prevention and recovery. This particular view is from 2008, when the company's portfolio was larger. (The portfolio was reduced in size as a result of the federal Credit Card Accountability Responsibility and Disclosure Act of 2009.)

The left column shows buckets of the customer life cycle – acquisition, reward, cross-sell, retention, loss prevention and recovery. Companies can make a lot of hay by focusing on the first four areas – keeping customers longer, increasing wallet share – but the last two areas are where a lot of the fraudulent activity is taking place. So understanding these customers separately is a good segmentation exercise.

When customers are segmented by delinquency in this manner, some obvious conclusions come to light. The “Top Quartile” and “Upper Middle Quartile” don't keep business leaders awake at night. The “Bottom Quartile” accounts are probably too far gone, perhaps calling for some emergency treatment. You'd want to focus on the biggest problem area where intervention can make a difference – the “Lower Middle Quartile.” The company can get the biggest bang for the buck by focusing its loss prevention and mitigation efforts right here. This is one example of how segmentation can help in a decision management analytics process.

### Case Study 5 – Forecasting Detailed Profitability Components

When analytical techniques are applied for vintage financial forecasting, you can predict such details as delinquency, closure, and charge-off accounts, resulting in more effective product and pricing decisions.

Forecasting payments and loss can also be considered a way of forecasting fraud. On the front end, there are the new customers who default on their first payment. Regardless of tenure with the company, the impact on the forecast profitability of accounts is a direct byproduct of delinquency and charge-off loss.

It requires extensive human capital and technology to forecast these things. Especially since the Card Act of 2009 squeezed profit margins, credit card issuers have had to be extremely accurate and pay much closer attention to these details in forecasting new product and pricing strategies and understanding the profitability of accounts.



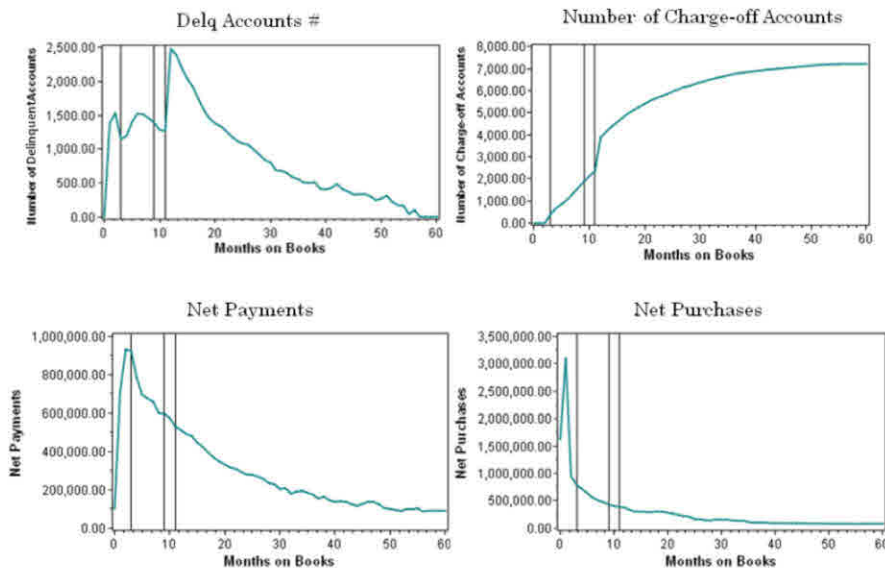


Figure 4: Forecasting graphs for delinquency, charge-offs, net payments and net purchases.

Figure 4 shows an analyst's view on this forecasting process. In this case, actual baseline history has been loaded, and the system forecasts out a line. Armed with this information, an analyst can then more accurately predict future scenarios, say in five years, for delinquent accounts, charge-off accounts, net payments and net purchases.

There are other fraud-related components that feed into this. The top two charts (the number of delinquent accounts and charge-off accounts) are directly related to fraud. The other two – net payments and net purchases – are correlated to fraudulent behavior. So these are all key components to understand in order to maintain the fortitude of the company and remain in a positive-return-on-asset environment.

## Closing Thoughts

When faced with decisions surrounding the issue of fraudulent payment activity, companies must not hesitate to implement an effective treatment plan. In my heart situation, some good decisions happened – later in the game than they should have, but at least they happened. The doctors performed good decision management analytics in their own way, and I'm alive today because of it.

We need to do that in business as well. We need solid decision management analytics, so we can be proficient in identifying and addressing pain points related to fraudulent activities. To achieve that proficiency, we have to be able to:

- Establish implementation plans with clear lines of accountability and committed resources.
- Quickly respond to what the analytics tells us to do, and make adjustments with persistence.
- Measure the results to justify the investments and develop a culture of data-driven decision making.

Decision management analytics is key to overcoming the challenges of the Card Act of 2009. For example, one company has reduced fraud by 50 percent, nearly eliminated the first payment default accounts and substantially reduced delinquency and charge-off rates.

The results are worth it. Decision management analytics was key to overcoming the challenges of the Card Act of 2009. For example, one company has reduced fraud by 50 percent from the time the forecasting model was implemented, nearly eliminated the first payment default accounts and substantially reduced delinquency and charge-off rates.

These results were all real, not just projections. Adding up incremental successes over time made it much easier to get support for reinvestment. So don't be shy about embracing the analytics, because there's so much case evidence out there that companies become very successful through decision management analytics. If your organization is still at the "moderate" level in this capability, do all it takes to get to the next level. Fraud detection is one area where you are virtually assured of hitting the bottom line. If you don't have the right resources in place, look around, because there are a lot of people who want to be a part of this.

## About the Author

### Rex Pruitt

Senior Manager, Capgemini

As a senior manager at Capgemini – a global leader in consulting, technology, outsourcing and local professional services – Pruitt works with North American and global financial service firms to deliver consulting and platform/software solutions for advanced analytics and big data. He is very active in SAS users group leadership, serving on special interest, regional, local and internal boards of directors.

For seven years before that, Pruitt was manager of MIS Profitability and Risk for Premier Bankcard, the 11th-largest issuer of Visa and MasterCard credit cards in the US. Pruitt was responsible for marketing analytics support, portfolio data mining, predictive modeling, and staff and project management.

Before joining Premier Bankcard, Pruitt worked in a very similar role at the Mutual of Omaha insurance company, where he was instrumental in CRM initiatives and other key decision management analytics projects.

Pruitt holds a BS in marketing management from Bellevue University in Nebraska. His passion is studying corporate data and turning it into a revenue source.

## For More Information

View Rex Pruitt's presentation on this topic in a webinar co-hosted by the Association of Certified Fraud Examiners (ACFE) and SAS: [sas.com/reg/web/corp/2206545](https://sas.com/reg/web/corp/2206545)

Read about SAS Security Intelligence online: [sas.com/software/security-intelligence/](https://sas.com/software/security-intelligence/)

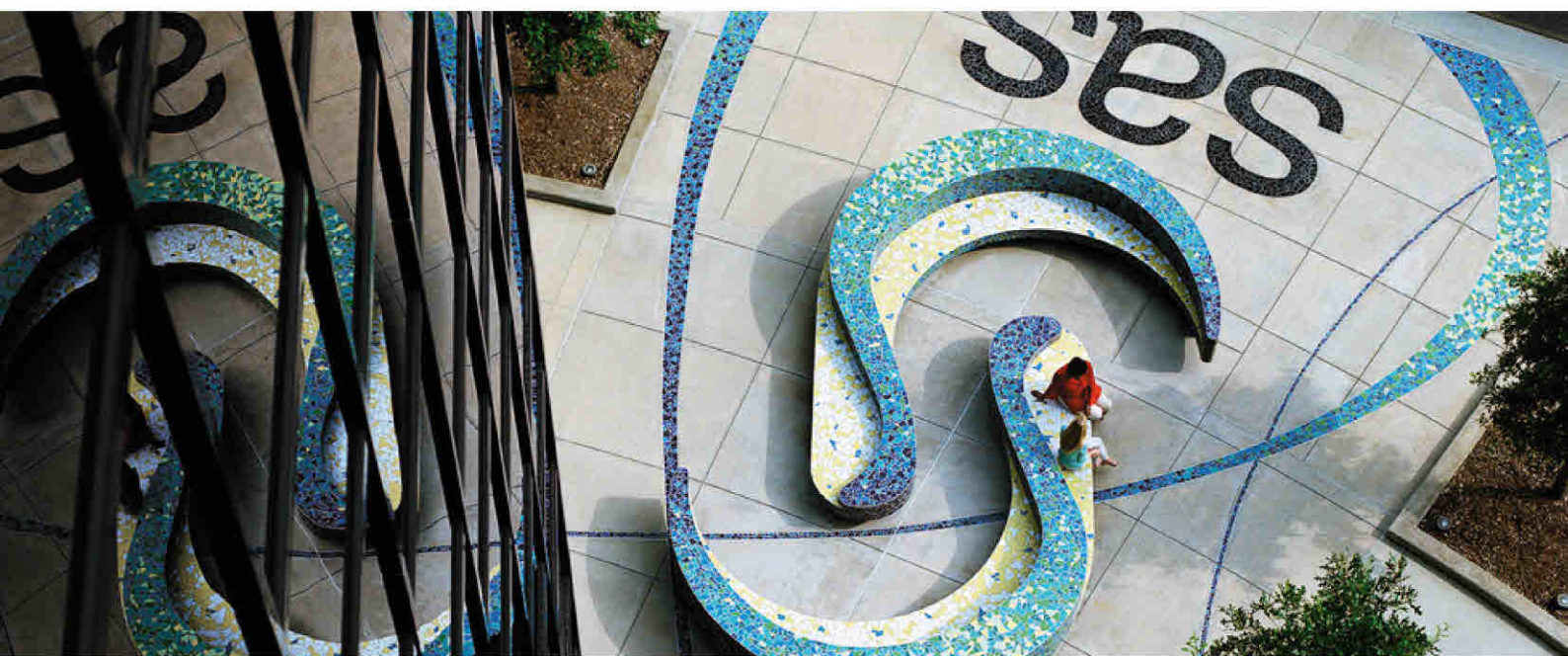
Read SAS special report *Meet the Next-Generation Solutions for Fraud, Compliance and Security*: [sas.com/reg/gen/corp/2165487](https://sas.com/reg/gen/corp/2165487)



## About SAS

The SAS® Security Intelligence analytics platform helps protect against losses resulting from fraud and improper payments, regulatory fines, compliance breaches and threats to national security and public safety. SAS Security Intelligence generates highly accurate results through superior modeling and industry-specific analytic solutions.

SAS is the leader in business analytics software and services, and the largest independent vendor in the business intelligence market. Through innovative solutions, SAS helps customers at more than 55,000 sites improve performance and deliver value by making better decisions faster. Since 1976, SAS has been giving customers around the world THE POWER TO KNOW®. For more information on SAS® Business Analytics software and services, visit [sas.com](http://sas.com).



SAS Institute Inc. World Headquarters +1 919 677 8000

To contact your local SAS office, please visit: [sas.com/offices](http://sas.com/offices)

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.  
Copyright © 2013, SAS Institute Inc. All rights reserved. 106347\_S101942\_0413