Predictive Threat and Risk Management: Meeting the Challenges of a Smarter Planet

IBM

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Introduction

A smarter planet creates new possibilities, as well as new complexities and risks. Thanks to recent technological advancements, including mobile devices, cloud computing and social media, we have created an interconnected, instrumented and intelligent world in which there is virtually infinite access to information. While this has opened the door to new and exciting possibilities, it also provides an opening for new threats and vulnerabilities. From external factors such as national security and the economy—to internal factors such as insider fraud, financial risk and information management—organizations face a multitude of threats every day. These threats are increasing in number and severity, and can cost organizations millions, even billions, in losses. For example:

- The International Monetary Fund estimates the cost of cleaning up the world's financial crisis to be $11.9 trillion[1]… and the real extent has not even been fully calculated.
- Sony's 2011 PlayStation network outage could cost anywhere from $20 million for several weeks of lost revenue, to as much as $24 billion for the long-term consequences of losing control of customer data.[2]
- Health insurance fraud costs $260 billion annually,[3] with $60 billion attributed to the US Medicare program alone.[4]

It is therefore not surprising that threat and risk mitigation has become a top priority for business. In fact, a recent IBM study of C-level executives found a 93 percent increase in importance for CFOs and revealed that 71 percent of CIOs are planning to make additional investments in risk management and compliance.

The best defense against threat and risk is a systematic approach to reducing exposure and minimizing negative impact. But where do you begin? In an ever-changing world, you must be diligent about managing the threats you are aware of, as well as those yet to be identified. For example, you need to be able to anticipate how an insider might infiltrate your secure IT systems, look for signs of potential terrorist activities, predict the likely impact of future economic events or identify new patterns of fraud—all with a high degree of accuracy.

In this paper we will discuss how to build a proactive threat and risk strategy based on predictive analytics technology. We will provide examples of how organizations worldwide are applying predictive analytics solutions to minimize the negative impact of risk and maximize positive results, and help you to understand the steps you can take to advance your organization's use of predictive analytics to combat threat and risk.

- **The average company infrastructure is attacked 60,000 times a day.[1]**

- **In 2010, organizations worldwide experienced the largest number of vulnerability disclosures ever.[6]**

- **Auto insurance fraud in the US costs an estimated $14 billion each year.[7]**

- **76 percent of US banking fraud is detected by customers.[8]**

Reduce exposure and minimize impact

Mounting regulatory demands, the growth of online transactions and communication, the increased use of mobile devices and the constant shadow of an uncertain economy underscore the importance of proactively managing threat and risk in all its forms—whether related to business, data or events. That means not only understanding what has happened in the past, but being able to look forward to anticipate what might happen in the future, and how your business will respond to these situations. Organizations that do this well can significantly maximize efficiency and reduce the impact of risk.

Predictive analytics is the key to reducing exposure and minimizing the negative impact of the thousands of threats your organization faces every day. It provides you with access to fact-driven predictive insights in real-time, driven by your organization's specific needs.

Today's dynamic environment requires a systematic approach to managing threat and risk. By using predictive analytics throughout your decision-making lifecycle, you can continuously refine the decisions you make and the strategies you use as an organization to take control and make decisions that are based on insight. As illustrated in Figure 1, when you apply predictive analytics, you become empowered to:

- *Define* policies that are adaptive and forward looking, and refine policy definitions and parameters based on actions you have taken, new impacts and internal and external changes in environment, which can include anything from the weather to changes in regulatory requirements.
- *Monitor* your environment continuously using a broad range of data from multiple sources; adding new data as needed and learning from your data to develop insights so that you can identify triggers and alerts.
- *Detect* suspicious behavior such as threats, information breaches, crime and fraud, using predictive analytics to identify anomalies and determine the likelihood that an action poses a potential risk.

- *Prevent or allow* a potential threat based on its anticipated impact on your organization, and either eliminate or manage the risk to ensure a controlled, output-driven approach that reduces exposure or loss and maximizes the positive impact of any action taken. For example, a bank can analyze a credit card applicant's information, including credit score, marital status, longevity at current employer and current salary, to determine how these factor into the relative risk of default. The bank may determine that while the likelihood of default isn't high enough to prevent it from securing the credit card, they cannot afford to issue the card at a low interest rate, thereby mitigating some of the risk it is assuming.

As you can see, this cycle is continuous: as you acquire new data, you analyze it and learn from it. The insights you gain then help you improve policies and parameters so that your organization is constantly shielded from negative risk at each stage.
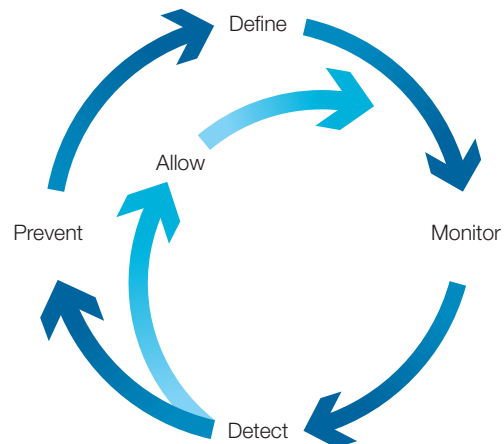

Figure 1: Today's dynamic environment requires a systematic approach to managing threat and risk.

Mastering predictive analytics is a journey that starts with using the information you have to find insights, and continues through determining the next best action for a particular individual, scenario or decision maker. Organizations that apply predictive analytics techniques are able to use insights to identify key areas of risk, accommodate regulations, or refine and monitor policies based on what they know about past events as well as data obtained in real-time.

That can mean, for example:

- Determining that an auto insurance or medical claim is fraudulent as it is processed
- Sending police into areas most likely to have high crime activity on a particular day based on key predictors such as the weather, previous days' behavior, day of the week and other factors
- Identifying the person in your enterprise who suddenly seems to be engaged in irregular network and data activity

Having the answers ahead of time gives you the ability to control what action you take and when so that you can plan, forecast, implement and prevent. Without analytics, you can react only when a risk is identified, which puts your organization into "fight or flight" mode, instead of enabling you to respond in a controlled and formulated way that will ensure the best outcome. This can be very costly to your organization—costly in terms of lost revenue or opportunity; reduced credibility in the eyes of employees, partners and investors; negative environmental impact; or even lives lost.

With a predictive analytics-based risk management strategy in place you become able to:

- **Access risk information across the organization in real time to determine the best time to take the risk or stop it altogether.**
- **Make decisions faster and spend less time "putting out fires."**
- **Gain more confidence and trust in decisions that are made.**
- **Reduce costs and make better use of resources.**
- **Build a stronger organization that is resilient to change and ready to exploit new opportunities.**
- **Support business innovation while reducing or maintaining an acceptable level of operational risk.**
- **Avoid negative publicity.**

The predictive analytics-based approach to threat and risk control

Patterns that point to threats or suspicious behavior are often hidden in huge amounts of data. This is why a proactive approach to risk control starts with analyzing the masses of data your company collects and stores—transactional data, email, network reports, survey data, constituent information, tax records, call center notes, social media content and more.

Predictive analytics solutions feature sophisticated techniques that enable your organization to analyze both the "structured" data found in tables and databases as well as "unstructured" text, including content found in email chains, chat forums, social networks or survey data. In contrast to rules-based analysis and detection methods, predictive analytics can identify relatively unusual behaviors, even those with subtle differences that other methods often miss.

The IBM SPSS platform allows organizations to combine a diverse range of data types, including data that is specific to your industry in terms of benchmarks or external data. Predictive analytics gives you the ability to combine a wide variety of data dimensions, types and sources on an ongoing basis. This makes it possible to quickly and reliably detect inadvertent signatures from hackers, criminals or terrorists generating new cyber chatter or trying new tactics to gain access to sensitive information, or to determine the risk of granting an individual a credit line. Different techniques can be used to help you decide which next best action you should take.

Once you have an understanding of your data, including what constitutes normal and unusual behavior, you can develop key predictors, or indicators of potential threat or risk, that can be used alongside your key performance indicators to highlight areas of concern for your business or organization. You can then begin to base strategic and operational decisions on predictive intelligence that not only shows future outcomes and behavior, but also details the factors that influence those events. This increases your ability to proactively stop threats before they occur.

Predictive analytics also enables organizations to embed into their operational systems the models and business rules that support consistent, automated decisions at the "point of impact": where a company's staff or automated systems interact with customers, prospects, suppliers or partners. Information about results is then used to refine predictive models and future recommended actions.

Let's look at some areas in which predictive analytics-based risk and threat control strategies are particularly effective.

Eliminate insider risk

For most organizations, data has become an invaluable asset—the lifeblood of their operations. Access to this data is available to an expanding user base, including employees, business partners, suppliers and customers. IT infrastructures are more extensive, more complex, more distributed—and more accessible. This interconnectedness affords many benefits for businesses, government agencies and consumers alike—but it also introduces a great deal of potential risk. Companies and government agencies must answer to stringent regulatory requirements and protect intellectual capital from competitors or subversive political entities. And consumers are typically most concerned with the potential for identity theft and other privacy violations.

The recent Wikileaks scandal involving the US State Department is an ideal example of one of the primary challenges to data security: the authorized insider threat. In this instance, massive amounts of secret documents—including thousands of embassy cables and hundreds of thousands of documents relating to the war in Afghanistan and Iraq—were copied by authorized users to CDs and DVDs and leaked to Wikileaks.

Intrusion analysts at a national government agency are often flooded with several million events per day—many of which are mapping requests or information gathering, rather than actual threats. This large number of events makes detecting real attacks or potential problems difficult. Using IBM SPSS data mining software, analysts can focus on the alarms most likely to be cause for concern, in one instance reducing the number of events requiring manual review by 97 percent in a single 30-day period.

Authorized insider threats are not unique to the government or the military. Virtually any organization that possesses sensitive business information such as earnings releases, merger and acquisition plans, marketing plans, research and development data, personal identifiable information, or sensitive internal emails is at risk.

For example, HSBC's Swiss banking operation was rocked in late 2010 by revelations that an IT specialist leaked financial information on as many as 24,000 of the bank's wealthiest clients to French tax authorities, who said they would use the information to pursue French citizens for unpaid taxes.[9] In an industry known for its discretion, this event has tarnished the reputations of Swiss banks, and has HSBC and other Swiss banking organizations scrambling to put in place new security measures to protect their clients' data.

Both the Wikileaks and HSBC events demonstrate the value of implementing predictive analytics technology for the prevention of insider crime.

Reduce credit card risk
 In today's turbulent financial market, credit card issuers need to know as much about their customers as possible. They need to understand the factors and behaviors that indicate whether a potential customer is a good credit risk, as well as patterns or trends that point to the probability a customer or applicant will miss payments or default. In addition, they need to devise more sophisticated strategies to keep the good customers and limit the risks associated with unprofitable ones. IBM SPSS predictive analytics software allows organizations to build credit models that are based upon a more refined segmentation strategy that takes into account customers' unique and individual data, ensuring that credit policies are aligned with customers' level of risk to ensure the most profitable outcome.

A private and independent banking institution in Switzerland improved the performance of its credit risk management system by implementing a new credit risk scoring system based on IBM SPSS predictive analytics. This solution enabled the bank to improve the management of credit risk and the overall collection procedure, and has reduced unpaid debts by 15 percent.

Manage liquidity risk
IBM SPSS solutions can enable a bank's treasury department to provide insight into, and even predict, the effects of stress events on enterprise liquidity, providing on-demand views of forward liquidity exposure into a wide range of business and market scenarios. Predictive analytics delivers value by increasing the effectiveness of liquidity risk managers or treasury managers, who are able to predict and respond to future liquidity exposures and risks, run stress tests against those exposures and ultimately recommend counter-balancing capabilities.

Detect and prevent fraud
Fraud is an expensive problem that costs industries and countries billions of dollars. The range of fraud, and the resourcefulness of fraudsters, poses a daunting problem for those charged with its detection and prevention. Yet these criminal activities have one thing in common: each of them leaves a trail of behavioral and transactional data—insurance claims, mortgage or benefit applications, healthcare submissions, tax returns and so on—which are filed alongside information from legitimate interactions. Conventional analytics can be used to detect fraud after it has happened. IBM SPSS predictive analytics software can forecast what is likely to happen in the future, as well as detect events as they happen.

- The anti-fraud agency of a southern European country implemented IBM SPSS predictive analytics technologies to significantly improve the speed, effectiveness and ease of fraud detection thanks to accurate, automated identification of high-risk taxpayers.
- Leading healthcare organizations around the world use predictive analytics from IBM to minimize the impact of fraudulent claims by ensuring early detection of likely instances before payment occurs.

Claims and warranty departments can reduce costs and improve supplier relationships by redirecting fraudulent warranty claims and presenting this information via reporting methods inside of claims systems.

Minimize inventory loss
Predictive analytics helps identify products, store conditions, personnel or customers who may be linked to stock shrinkage. Shrinkage solutions from IBM provide retailers with insights into product and store performance around stock control and fraudulent activities, and can help increase the profitability of store operations.

Assess network outages
Predictive analytics can help telecommunications companies or large retailers improve network asset management outcomes by predicting which network will fail next, and the impact this will have on operations and customer experience. IBM SPSS solutions ensure that organizations can take quick action to repair at-risk, high-traffic networks, enabling them to avoid the risk of downtime, as well as customer dissatisfaction and lost revenue.

Protect national borders
Protection against threats often begins at border crossings, airports and in harbors. IBM SPSS solutions help agencies identify which containers entering a port could contain unwanted/dangerous materials, which passengers on an airline

should be investigated more thoroughly, or predict the risk level associated with vehicles at land crossings. Predictive analytics enables agencies to make optimal use of inspection staff, increase detection rates and ensure better protection of the country and its citizens.

One large country with approximately 300 border crossing points uses cameras to record the registration plate of every vehicle that attempts to cross. Once the plate is read, screens in the crossing control booth advise supervisors to either let the vehicle pass or direct it to the secondary inspection area. If a vehicle is selected for secondary inspection, information is sent to the mobile device of the inspector showing the likelihood of each risk type (drugs, weapons, contraband, illegal immigrants, etc.), providing the inspector with guidance on what to look for. Vehicle selections, risk assessments and inspection outcomes are recorded to enable ongoing reporting on inspection rates by risk type, hit rates, false positive rates and the amount and value of seizures. This strategy makes optimal use of inspection staff, has increased detection rates, better protects the country and its citizens, and improves the experience of low-risk travelers by expediting their crossing.

Keep communities safer
Police departments and other public safety agencies can use predictive analytics to combine data from disparate sources and help agencies make the best use of the people and information at hand to monitor, measure and predict crime and crime trends. Predictive analytics provides insight that lets officers track criminal activities, predict the likelihood of incidents and effectively deploy resources, helping to reduce crime and increase citizen safety and satisfaction.

The Memphis Police Department deployed IBM SPSS predictive analytics technology to provide unparalleled insight into criminal activity and crime trends as they occurred. Now, the department can change tactics and redirect patrol resources as needed to prevent crimes and catch more criminals in the act. The program has reduced serious crime by 30 percent, cut violent crime by 15 percent, increased conviction rates fourfold—and realized an 863 percent ROI, based on an assessment conducted by independent analyst firm Nucleus Research.[10]

As you can see, predictive analytics solutions enable organizations in every industry to efficiently and reliably analyze the variables related to internal and external risks. Using a comprehensive but flexible set of techniques, including risk scoring and anomaly detection, you can spot suspicious conditions and react quickly to stop fraud or mitigate the consequences. You can also focus your investigative resources on the transactions or events that are most likely to be fraudulent, resulting in increased success rates and reduced costs. And because the models can be updated easily, organizations can continue to detect unusual situations or behavior even when tactics or conditions change.

"On short notice, we're able to shift officers to a particular ward, on a particular day, right down to the shift level. It's a bit like a chess match and the IBM SPSS solution is enabling us to make arrests we never could have before."

Larry Godwin, Director of Police Services, Memphis PD[11]

Identify the next-best action

Predictive analytics is quickly becoming a pervasive technology in organizations of all types. While usage and adoption may vary from the enterprise level to the departmental level, those moving toward a consistent, controlled approach to managing risk are experiencing significant ROI and benefits.

Some organizations are more advanced in their adoption and use of predictive analytics than others, but there are generally two types of approaches. Providing insight for decision makers is the top priority for many businesses, and in such cases advanced analytic techniques help to paint a clear picture of what is happening and why—regulatory reporting and making strategic decisions based on key risk indicators, are examples of this type of approach. Other organizations seek to move beyond insight to actually identify the next best action in a mission critical process—such as determining where a police officer should be stationed on a given day, whether a car should be checked at a border crossing or whether an insurance claim is potentially fraudulent and requires further investigation while it is being processed.

Our experience shows that organizations grow in analytics maturity step by step. Many have some type of reporting or analytical technologies in place but then find that these technologies don't adequately address critical business challenges or give the organization full control of the decisions they can or should make. This realization moves the organization to take steps toward becoming more analytically mature through the use of predictive analytics, which enhances decision-making abilities. Organizations that make this leap are able to differentiate themselves by improving processes and proactively managing their understanding of and responses to threat and risk. We can describe these organizations as "masters"—that is, they are using predictive analytics in sophisticated, innovative ways to protect themselves from potential harm and using the data they have to their best advantage in their decision making.

The most advanced organizations are practicing information-based decision-making to help them manage threat and risk across the enterprise in real time. What is the next best action, based on the information I have? How should I allocate my resources? And how can I ensure that threats are identified at the point of interaction, instead of after the act has occurred? What is the risk that this borrower will default on a potential loan?

Organizations at this level are using their knowledge of what has happened in the past to predict what is likely to occur in the future, and applying that insight to build strategies which enable them to respond appropriately at the point of impact.

- Infinity Property & Casualty Corporation of Birmingham, Alabama, makes business decisions more accurately, more consistently and in less time with predictive analytics. Since implementing IBM SPSS solutions, Infinity has doubled the accuracy of fraudulent claim identification, added $1 million to its bottom line by eliminating about $70,000 per month in third-party collection fees and achieved a 403 percent return on investment from a reduction in claims payments and enhanced subrogation.
- MedeAnalytics, which helps hospitals to optimize the payment collections process, incorporated IBM SPSS predictive analytics into its solution so that clients can prioritize which self-pay patients are likely to pay their bills, and focus their collections efforts on this high-yield segment of the population.

Adoption of predictive analytics for threat and risk management can also help your organization succeed with other critical strategies that are often related, such as customer intimacy and operational excellence. For example, when Infinity Property & Casualty deployed predictive analytics to identify potentially

"With predictive analytics, we were basically able to close a hole in our pocket where money was leaking out steadily."

Bill Dibble, SVP of Claims Operations, Infinity Property & Casualty [12]

fraudulent claims faster and with greater accuracy, it also experienced significant increases in customer satisfaction. Because the entire claims process was more efficient, legitimate claims submitted by low-risk policy holders could be processed and settled quickly, while suspect claims were flagged for special handling and given the time and attention required to determine whether or not fraud was a factor.

Although you may be at a different stage of adoption, achieving "master" status is an achievable target if you approach it with a solid understanding of how you are currently using data to control threat and risk, and the steps you need to take to reach your ideal level.

"We want to maximize the productivity of collectors by giving them a list of patients who are more likely to pay the hospital back and put the people who are unlikely to pay down at the bottom of the list."

David Mould, Ph.D., Predictive Analytics Scientist, MedeAnalytics [13]

Five steps to a proactive threat and risk strategy

In order for organizations to manage threat and risk in today´s intelligent, instrumented and interconnected world, they need to look at how to apply predictive analytics at the point of interaction, where real-time, pattern-based strategies merge with situational context. This level of transformation requires a series of changes in how an enterprise manages information and then applies that information to achieve its goals.

IBM can work with you to create a road map that includes a series of incremental steps designed to move you towards your threat and risk management goals. We recommend that before you make any decisions concerning specific technologies or solutions, you should be able to answer some critical questions about your organization's current strategy and use of enterprise data:

1. *Determine your organization's current risk and threat strategy:* Identify your approach to threat and risk, both as an enterprise and in key operational areas such as finance or customer service, and the types of actions you are currently taking to control risk. Would you describe yourself as reactive, proactive or somewhere in between, depending on the situation or opportunity? How advanced would you like to be in your use of predictive analytics? How are you using analytics to define the parameters of your policies? Is this process dynamic, enabling you to modify policies as conditions change?

2. *Examine how you are using predictive analytics today.* Where are you using it, and how? What types of results have you experienced? Are you accurately recognizing threats and opportunities, and taking preventive measures to cope efficiently with risks? How are you proactively monitoring the activity that is taking place today?

3. *Integrate risk management into business as usual and ensure the positive commitment of all stakeholders.* Are you able to fulfill your regulatory obligations? Can you leverage data further so that it becomes an asset, and not just a deliverable—that is, something that can be used to drive the organization going forward and to minimize costs?

4. *Assess your enterprise data.* What data are you including in your threat and risk analysis, and what other data should you be including? What types of data are available? Are departments operating in silos? Are you taking advantage of the wealth of information that can be found in unstructured data such as social forums, blogs or internal sources such as emails and call center notes?

5. *Identify opportunities for automation and control.* Are you proactively determining which types of risk you will allow versus those that you would like to prevent? Are you controlling the outcome when it comes to threat and risk or is it more of a corrective process? Do you have processes or decisions that can be easily automated? Can any decisions be made in real time?

Your responses to these questions will help you begin to identify the areas in which you can start achieving real results that will benefit your organization.

Drive actionable insights with IBM SPSS solutions

IBM offers you the ability to build upon your existing environment to achieve better business outcomes. IBM offers a full range of tools, all built on open standards, which you can use as needed to take the next steps in your journey toward achieving breakaway results using predictive analytics.

IBM SPSS predictive analytics solutions help organizations drive optimal outcomes in three core areas that are essential for business success: customer analytics, operational analytics, and analytics for threat and risk. Each area focuses on the organizational realities businesses face when optimizing data to gain operational insights and improve critical business functions.

Through solutions such as IBM SPSS Statistics, IBM SPSS Modeler, IBM SPSS Data Collection and IBM SPSS Decision Management, people all across your organization can gain more insight, make better decisions and take more decisive actions when they matter most.

You can enhance and augment your IBM SPSS predictive analytics solutions with complementary technologies from the IBM Business Analytics software portfolio. IBM Cognos® Business Intelligence and financial performance software offers a comprehensive set of capabilities to help you understand performance and make better decisions.

Together, these solutions form a comprehensive, unified platform that works smoothly to deliver insight to your decision-makers. Key capabilities are tightly integrated, and you can build or add capabilities as you need to. All of these software products use open, industry-standard technologies that allow for information to be transmitted and shared securely and efficiently. At whatever point you are starting your predictive analytics journey, IBM has products to assist you.

Conclusion

Our world is becoming more instrumented, interconnected and intelligent. While these factors create many opportunities for both commercial and public sector organizations, they also present challenges—such as increased exposure to threat and risk.

The most forward-thinking organizations are turning to predictive analytics as a proactive approach to controlling threat and risk because it empowers them to:

- *Monitor* their environments by including a wide variety of data across multiple sources.
- *Detect* suspicious behavior to help them identify threats, information breaches, crime and fraud.
- *Control* outcomes so that they can deliver the best response to reduce exposure or loss and maximize the impact of any action taken.

Through predictive analytics, your organization can find a way to gain a deeper understanding of your data, and use that understanding to develop proactive resolutions to the multitude of threats and challenges you face every day.

About IBM Business Analytics

IBM Business Analytics software delivers actionable insights decision-makers need to achieve better business performance. IBM offers a comprehensive, unified portfolio of business intelligence, predictive and advanced analytics, financial performance and strategy management, governance, risk and compliance and analytic applications.

With IBM software, companies can spot trends, patterns and anomalies, compare "what if" scenarios, predict potential threats and opportunities, identify and manage key business risks and plan, budget and forecast resources. With these deep analytic capabilities our customers around the world can better understand, anticipate and shape business outcomes.

For more information

For further information or to reach a representative please visit **ibm.com**/analytics.

Request a call

To request a call or to ask a question, go to **ibm.com**/business-analytics/contactus. An IBM representative will respond to your enquiry within two business days.

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