



The power of performance management: Safety and security

Overview

Like all government organizations, law enforcement agencies now need to do more with less. Managing under tighter policing budgets as government revenues shrink, they must continue to improve public safety and respond to stronger calls for transparency and accountability in all policing actions.

With budgets cuts pressuring law enforcement agencies to fight crime using fewer resources, many agencies are turning to business analytics technology to both respond to and ward off crime. Crime prediction and prevention analytics from IBM helps agencies make the best use of the people and information at hand to monitor, measure and predict crime and crime trends. Analysis of police data provides insight that lets officers track criminal activities, predict the likelihood of incidents, effectively deploy resources and solve cases faster.

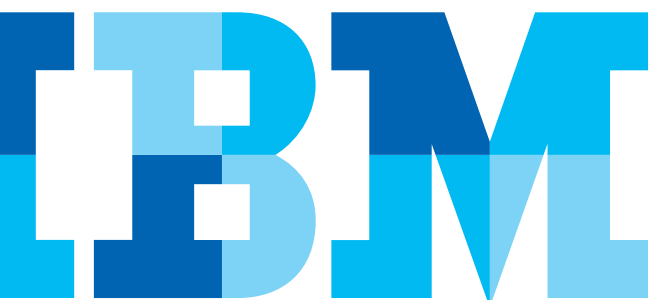
Instead of manually compiling data from multiple spreadsheets, public safety personnel can create scheduled or ad hoc reports and crime maps from a single source. A unified view of financial metrics can support budget decisions that improve public safety. Instead of debating the validity of information, staff can spend their time in the community, fighting crime.

Better access to and control over crime data is letting agencies:

- Uncover crime patterns and solve crimes faster
- Take pre-emptive action by deploying resources more effectively
- Spend budget effectively and demonstrate improvement
- Unite information across data sources, both structured and unstructured
- Analyze staff turnover and plan strategies for retention and development.

Read on to find out how four agencies are using IBM software to better predict and fight crime.

- Using predictive analytics from IBM, the **Richmond Police Department** in the U.S. reduced violent crime rates dramatically by analyzing crime data, generating forecasts and deploying personnel more effectively.



- The **Mecklenburg-Vorpommern State Police** in Germany teamed with IBM to give 750 decision-makers access to crime data that improves everyday police work, resource planning and prevention, allowing greater public safety and more targeted use of public funds.
- The **Edmonton Police Service** in Canada chose IBM Cognos Business Analytics to help police stay on top of criminal activities, identify hot spots, reduce crime rates and communicate more effectively with commanders and the public.
- When the **Greater Manchester Police** in England turned to IBM SPSS to survey and compile public views on policing, the force saved \$25,000 in two weeks and attracted 400 volunteers.

Through their example, other safety and security agencies can make the most of limited funding by gaining deeper insight.

Richmond Police Department

Not long ago, violent crime in the city of Richmond, Virginia, U.S., was spiralling out of control. In 2004, Richmond was the ninth most dangerous city in the U.S., according to annual crime rankings published by Morgan Quitno Press. The following year, the city climbed to fifth. The trend was a wake-up call for the Richmond Police Department, prompting the agency to search for new and innovative ways to combat crime. “There was a lot of pressure to do something, anything, other than just standard policing,” says Stephen Hollifield, the Department’s head of technology.

The city found a large part of the solution in predictive analytics software from SPSS, an IBM company. Tapping the analytical power of IBM SPSS Modeler, the Department now makes better-informed public safety decisions on everything from officer deployment to risk management. “SPSS Modeler and data mining represent a revolution in our ability to access previously unobtainable data,” says Collen McCue, program manager for the Department’s Crime Analysis Unit. “This is as close to a crystal ball as we are ever going to get.” The results speak for themselves. After the Department deployed SPSS Modeler, Richmond’s crime rates began plummeting — and so did the city’s dangerous city ranking, dropping all the way from fifth to 99th.

Happy New Year

Before fully deploying SPSS Modeler, the Department decided to put it to the test on a day that historically saw a spike in crime: New Year’s Eve. By plugging historical crime data into SPSS Modeler, the Department generated forecasts that pinpointed where officers would be most strategically positioned to prevent crime. The test was a success, as evidenced by the big drop in crime that night: the number of weapons seized increased 246% and random gunfire incidents decreased 49%. And because the Department was able to more efficiently deploy its resources, it saved \$15,000 in overtime costs. “That test really stood out to us,” Hollifield says. “There were real benefits to be gained by using this type of technology to give us insight into where to put officers to get the biggest impact.”

The achievement on New Year’s Eve was just the beginning for the Richmond Police Department. At the time, the Department had about 50 million crime records spread across several databases. But like many cash-strapped public agencies, it lacked an efficient way to exploit this wealth of data. Usually, when officers needed a report, they would have to find it themselves or have someone else locate and email it. The system was not only inefficient, but it jeopardized public safety. SPSS Modeler provided an inexpensive and low-maintenance way of analyzing crime records, and required minimal training to run. The software compiles and searches records, identifies complex relationships in the data, predicts the likelihood of violent crime, and automatically generates reports. “SPSS is a very useful, very easy to use tool,” Hollifield says.

Map to success

It usually takes years for police officers to gain a deep understanding of a city’s crime patterns. But with predictive analytics software at their fingertips, even rookie officers can wield veteran-like knowledge. “The big performance boost has been for my new guys on the streets,” Hollifield says. “SPSS essentially does the work that is gained only from experience.” For example, every four hours, SPSS Modeler generates a color-coded crime map that shows the current high-crime areas around the city. Using the laptop in their patrol cars, officers can access the maps and take appropriate action when they enter a high-crime neighborhood. Throughout the day and night, these hot spots will shift due to an array of factors, such as time of day, day of week, paydays, and a range of other circumstances.

Hollifield says it generally takes him less than five minutes to train an officer to use and read the map. “It doesn’t require massive amounts of reading or translation. It’s just common sense—click, click, there’s the map—and that’s what we needed,” he says. But the solution does more than help guide day-to-day policing activities in Richmond. In addition to its regular patrol units, the Department commands special units that can be mobilized anywhere in the city. By analyzing police dispatch data, SPSS Modeler helps the Department build effective long-term deployment plans for these tactical units. For example, it is helping one unit identify certain types of property crimes that may escalate into aggravated assault — and then develop proactive policing strategies in response. The unit also employs SPSS Modeler to expedite on-going investigations, many of which are time-sensitive and require quick action to capture suspects.

Proven performance

Hollifield says that the SPSS solution has become one of the Department’s most effective weapons in the fight against crime. From 2006 to 2007 the city’s homicide rate dropped 32%, rapes declined 19%, robberies fell 3% and aggravated assaults were down 17%. In the following year, crime rates continued to fall: homicides declined another 40%, rapes by 8%, robbery by 20%, and aggravated assault by 5%. The trend was even more impressive given the economic downturn that hit at the same time, which usually sends crime rates upward. The Department is trying to build on this success. Based on feedback from precinct captains, it extended the predictive modeling program to include even more detailed crime reports, allowing officers to further refine their proactive policing tactics. In addition, there are plans to use SPSS Modeler to automatically generate analytical reports every seven and 30 days, which should enable the Department to allocate its resources even more efficiently — and possibly lower violent-crime rates further. Says Hollifield: “Having an even longer-range perspective will give us a better clue as to where to spend our resources.”

Mecklenburg-Vorpommern State Police

Around 6,000 agents and staff work in the offices of the Mecklenburg-Vorpommern State Police, maintaining law and order over an area in northern Germany extending from Schwerin and Usedom to Neustrelitz and Cape Arkona.

This includes the policemen and women on the beat, who attend road traffic accidents, acts of violence, burglaries, eco-crimes and disputes. To patrol its coastline and lakes, the state of Mecklenburg-Vorpommern needs a coastguard, as well as a criminal investigation department and riot police for more serious situations. All of these areas work together, exchanging and generating information, each with different data requirements. They also cooperate with the Federal Criminal Police Office and police forces in other German states.

Readers of newspapers or detective novels understand the importance of comprehensive and up-to-date information for police work. However, it’s not just major crimes that need solid foundations for decision making; this is an essential requirement for day-to-day police work as well. To address this need, the Mecklenburg-Vorpommern state police is relying on an IBM® Cognos® solution to provide its managers at every level with fast and transparent access to all information throughout the organisation. Visibility is improved thanks to standardised data and a wide range of analysis options – in the operational area of inquiries and searches, for resource planning and tactical and strategic control, as well as for long-term analyses of criminological phenomena and scientific investigations of crime trends.

Challenges faced

High data volumes do not necessarily mean high levels of knowledge.

It is police procedure to record every incident attended, including all the relevant details. In a large state such as Mecklenburg-Vorpommern, high volumes of new data are generated every day. “However, there was no standard state-wide system capable of summarising the data from the current police situation and making it available in real time. In many cases paper was still used. Reports were written sometimes in Word, sometimes in Excel, and there were frequent duplications,” says Police Information and Evaluation project manager, Chief Superintendent Johannes Kanski.

The heterogeneous nature of the data meant that rapid analysis was difficult, an essential requirement for inquiries, searches or tactical resource planning. To obtain a complete

picture, managers sometimes had to accept critical delays and significant extra work for their staff. A great deal of manual effort was required to produce variable or tailored analyses of data. In short, there was a lack of valid information, available in the right format, at the right time and in the right place.

Strategy followed

In 2004, the interior ministry of Mecklenburg-Vorpommern launched a long-term project entitled Police Information and Evaluation (PIA), intended to create new foundations for all aspects of the police force's information management. IBM was brought on board as the project partner. The aim of the PIA project was to implement a state-wide reporting and analysis system based on a data warehouse.

“We needed to collect and aggregate decision-making information, derived from the data entered in different systems by every employee at every workstation, in a central database. From here, it could then be made rapidly available to all authorised users based on target groups. Since the users are not IT experts, we needed a simple and intuitive interface – along with a great depth of analysis and flexibility,” explains the project manager.

To achieve this, all organisational knowledge needed to be prepared in a standardised format and made available without delay for operational, tactical and strategic decision making. This improved visibility was also expected to optimise internal structures and processes. The data source was a data entry and processing system introduced in 1999 called Elektronische Vorgangsassistent (EVA). This application records police data in a standardised format.

A clear view of the current situation at all times

Entitled “Situation Updating and Analysis”, the first PIA sub-project was implemented in 2005. Knowledge of the current policing situation is a basic requirement for every department manager and control centre agent. What has happened in the last 8, 24 or 72 hours? Is there anything significant to report from neighbouring police stations? What do I and my staff need to prepare for? The verbal handovers and individual lists used before the PIA project were replaced by a state-wide, standardised updating system. All authorised agents could access consistent and reliable information from all departments throughout the policing organisation, making duplicate entries and media breaks a thing of the past.

The data warehouse is updated automatically every hour on the basis of the information recorded in the EVA system, guaranteeing that no data is lost or unavailable for decision-making. “Users can access standard reports or apply individual filters to quickly and easily display the relevant information on their screen, in table or graph format,” explains Silke Kaiser, application developer from the very start of the project.

Single entry, multiple usage

In addition to day-to-day resource planning, this standardised view also provides the foundations for the decisions made by higher-level organisational units, from the inspectorate to the board and interior ministry. A wide range of analyses can be run on far more reliable data, to support ongoing inquiries or adjust tactical and strategic directions. Are any localised clusters apparent for certain offences? Is our response time fast enough across the board?

“The possibility of combining information and viewing it from all angles has opened up completely new approaches for investigation work,” explains Police Commissioner Thomas Helm, responsible for specialist police aspects of the PIA project.

Users can access extensive search options and ad-hoc analyses to create in-depth, customised views. In future, the PIA sub-project “Multidimensional analysis of incident data and load indices” will also open up the possibility of multidimensional analyses based on data cubes. Predefined dimensions, indicators, levels and categories create a transparent view of information, immediately highlighting any trends.

“The load index shows, for example, how many officers will be occupied, for how long and in which key areas, allowing us to draw conclusions to improve our resource planning in the future. This will help us to develop the organisation on a more reliable and forward-looking basis,” says Helm.

More accurate statistics and prevention

A third PIA sub-project, scheduled for completion by mid-2010, is devoted to police crime statistics. The trigger was the change from sending reports to the Federal Criminal Police Office in the form of aggregated state lists at the end of the year to the real-time transmission of individual data records for each incident. The new police crime statistics system relies mainly on the data entered, once only, in the incident processing system.

“This gives the PIA-based case statistics a new level of detail. They can be analysed by managers in at least nine dimensions, allowing customised and effective insights. Once again, the results can be displayed in list or graph form in one of the 16 cubes, or as bar charts or line diagrams,” explains Kaiser.

Threshold values can be highlighted, with absolute and relative indicators calculated in real time. This means that any statistical peculiarities, patterns or trends are immediately apparent and can be incorporated in subsequent planning and prevention. Thanks to the PIA project, any deficient information with an impact on data quality is quickly identified, while daily updates ensure that statistics are up to date at all times. Data records are transmitted directly to the Federal Criminal Police Office or other states via an interface, eliminating any delay.

Benefits realized

The PIA project has taken information management at the Mecklenburg-Vorpommern State Police to a new level, thanks to the IBM Cognos business intelligence solution. Standardised and up-to-date information is now available throughout the entire state, easily accessible to around 750 decision-makers. User-friendly, customisable analyses are available for everyday police work, as well as for medium and long-term planning and prevention. This allows more targeted control of manpower and financial resources, more efficient working practices across the entire organisation, as well as a clearer and optimised view of structures and processes in context. The citizens of Mecklenburg-Vorpommern therefore enjoy a two-fold benefit: greater public safety and more targeted use of public funds.

Edmonton Police Services

Edmonton, Alberta, Canada, has a population of approximately 780,000, with a regional population of more than 1 million residents. The city's Police Service has more than 1,800 employees.

Today, the Edmonton Police Services (EPS) is better trained, better educated and more diverse than at any other time in its history. This situation is due partly to the technological capabilities that allow officers and support staff to be better equipped and well-informed when problem solving and dealing with day-to-day responsibilities. The service's vision is to maintain a safe, vibrant city, which is achieved through innovative, responsive community policing. In partnership with its citizens, the Edmonton Police Service is building safe communities through leadership and policing excellence.

Challenges faced

EPS's primary mandate is to prevent and reduce crime and victimization, and its secondary goals focus on providing a citizen-centered service. Chief of Police Mike Boyd joined the Edmonton Police Service as its new chief in January 2006, and set very specific goals for aligning performance with expectations.

Because EPS is a public entity, residents expect the organization to provide comprehensive public safety services – when and where they are needed most. To achieve those goals, EPS developed a geographically based deployment model for patrol personnel with specific performance indicators. To help with this initiative, EPS chose to implement IBM Cognos 8 BI and IBM Cognos Data Manager after its IT director saw their capabilities at a product demonstration during the Gartner BI Summit.

Strategy followed

The service decided to take a phased approach to deploying the IBM Cognos system, and its first step was to look at reporting from its Computer Aided Dispatch (CAD) system. Specifically, EPS needed to know what type of calls officers were asked to respond to, and what the public demand was for its services. Early in the project, IBM Cognos technology was implemented to support the new patrol deployment, also based on CAD data, and to create performance measurements that IBM Cognos 8 BI was able to track. Once the performance measurements were set, police officials could identify trends, frequency and even types of crimes happening in specific locations. From there, the service integrated IBM Cognos 8 BI with the EPS records management system, Niche, in order to report on the actual investigative work resulting from the public service. By breaking the corporate picture down into business layers, EPS also gained better insight into specific trends and the reasons behind those trends.

“IBM Cognos 8 BI allows us to track performance objectives specific to how long it takes police to respond to the most important emergencies – such as life-and-death, priority one calls where the goal is to arrive on scene in seven minutes or less,” states John Warden, BI project team lead at Edmonton Police Service. EPS chose the IBM Cognos solution after evaluating several competing vendors, and went live with IBM Cognos 8 BI and IBM Cognos Data Manager in September 2005.

Thanks to support from IBM Cognos Professional Services and IBM Cognos Consulting partner, MB Services, IBM Cognos 8 BI was implemented quickly. The support team also helped EPS implement IBM Cognos Data Manager as their extraction, transformation and loading tool for the data warehouse, together meeting the expectation of supporting performance reporting with the department's vision and strategy. IBM Cognos 8 BI runs in EPS's Microsoft® Windows® environment and pulls data from its Microsoft SQL Server® and Oracle 10G database.

Benefits realized

As part of the service's mandate of providing increased accountability and a higher level of public safety for the Edmonton community, EPS is using the IBM Cognos system to monitor and track crime management and response management more closely. Police are able to see data in near real time, which helps them identify problems, associated trends and locations of crimes, so they can determine their response and problem-solving solutions.

After implementing the IBM Cognos solution, police have also been able to look at the components of response times – such as dispatch delays and travel time – to identify the issues that play a role in overall response time. EPS can monitor performance strategically over time and place, and tactically on a day-by-day and call-by-call basis.

Another new effectiveness objective is for Edmonton's patrol cars to spend 25 percent of a normal 660-minute shift engaged in proactive work in the neighborhoods to which they are assigned. The service has developed a comprehensive reporting tool that tracks all aspects of a patrol unit's time, based on categories of work done, such as: time spent on calls for service, proactive work and administration, and time available. By tracking the amount of time spent on work categories, police officials can determine if they are meeting performance objectives and identify issues affecting efficiency and effectiveness.

Recently, the police have begun using IBM Cognos 8 BI reports to inform the public about the situation of crime in their neighborhoods, so the system is having a direct impact on the public.

With IBM Cognos 8 BI, EPS has found an increase in tactical problem-solving, discovering where and when crimes are likely to take place. The police have improved dimensional modeling, drilling down to divisional, district and neighborhood levels. The IBM Cognos system provides the technology to link performance goals from the executive right down to the constables on the street and hold strategic performance briefings that allow police to examine crimes based on indicators. The solution also assists the department in aligning its performance both strategically and tactically in all these overarching goals.

“Recently, police were able to make more resources available proactively to deal with a potential increase of arson activity. We noticed an upward trend in the crime, based on data made available through IBM Cognos 8 BI reporting,” says Warden. “We were able to recognize an increase in this particular type of crime and by comparing against previous years' data were able to ascertain that the trend was likely to increase during the warmer months of March to July. It was our operational officers, though, who used the trending data to deploy resources to the problem and to take action.” Police efforts were ultimately successful in nearly eliminating arson in that particular area during this timeframe, due in part to the successful implementation of IBM Cognos 8 BI.”

Lastly, using BI reports, EPS can react and solve problems quickly, not just city-wide, but down to the policing boundaries of divisions and districts, and specific boundaries of communities and neighborhoods. Some 450 users in the agency see BI reports, and EPS has more than 100 BI reports in production under the categories of crime management, patrol management and dashboard reports. The agency uses a broad based, push-and-pull dissemination process, and report views scheduled into IBM Cognos portals that are customized for each user. The result is a more holistic approach that makes the department more efficient.

“We look at crime issues of the day, of the week and of the month, on a daily basis to see if there are any trends or spiking concerns that need action. Decision-making by our executive team and our commanders is informed and empowered through BI reporting. For us, the bottom line is to prevent crime, and BI reporting helps us do that,” comments Warden.

Greater Manchester Police

Formed in 1974, Greater Manchester Police (GMP) has a workforce of more than 7,000 police officers and 3,500 support staff. Serving some 2.5 million people covering an area of 500 square miles and 10 metropolitan boroughs, it is one of the largest police forces in the United Kingdom.

Consultation is a statutory function of GMP and is ongoing throughout the year. The Police Authority's Consultative Team (PACT) is responsible for drawing up consultation plans for each local area, and reporting on community concerns, safety, crime and disorder. The police authority also organizes youth forums in a number of schools throughout greater Manchester, bringing together young people and local police officers, with the aim of improving communications and relations.

Identifying "signal crime"

As part of the National Reassurance Project working in the St. Mary's and Failsworth West Wards of Oldham Metropolitan Borough, GMP sent a survey to 9,000 households in order to establish a community-based policing program. The concept focused on identification of "signal crime."

Prior to implementing an IBM SPSS solution, GMP had been using a low-level paper system and Microsoft® Excel®. This method proved unfruitful due to Excel's limited analysis capabilities.

Keith Bentley, chief superintendent (retired) of Operations at Oldham Division, said: "The non-automated data input procedure proved too resource-hungry. We wanted a solution that would not only find answers to questions that basic database and spreadsheet packages would miss, but also make the data entry faster and more reliable."

A re-assuring solution

Already aware that IBM SPSS technology has been used in survey research for more than 40 years, and in similar projects for other police forces in the United Kingdom, GMP decided to adopt the IBM SPSS analytical solution.

By using this sophisticated software, GMP aimed to gather a wide range of public views on area policing that could be incorporated into the National Reassurance Project. The questionnaires were seamlessly created within the system, and the responses were scanned in electronically, eliminating the need for manual data entry.

Saving efficiently

Successful completion of the survey project brought forward 400 persons who were willing to work with the police force to deliver problem-solving initiatives in the relevant two wards—particularly relating to actions to stop youth offenses and anti-social behavior.

The IBM SPSS solution has enabled GMP to reduce cost and time spent on survey research and analysis, as well as become a model organization for other police forces to follow.

"Not only did we benefit from a massive reduction in person time for this project, saving approximately €20,000 (\$25,000) in two weeks, but these results are now being referenced by other Greater Manchester Police divisions as contributions to 'efficiency savings' required by government," said Keith Bentley.

"The scanning process and capability to drill down into our public consultation survey data has become a bedrock on which the project can move forward during the next 12 months. Our increased survey and analysis capability has also impressed several partners who have now fully bought into the National Reassurance Project in Oldham," he added.

Business benefits

The benefits of the project included:

- The cost and time spent on survey research was reduced
- The survey identified 400 persons who were willing to work with the police to deliver problem-solving initiatives relating to youth offending and anti-social behavior
- The programme became a model for other police forces to follow.



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