

IBM Institute for Business Value

Accelerating economic growth and vitality through smarter public safety management



IBM Institute for Business Value

IBM Global Business Services, through the IBM Institute for Business Value, develops fact-based strategic insights for senior executives around critical public and private sector issues. This executive report is based on an in-depth study by the Institute's research team. It is part of an ongoing commitment by IBM Global Business Services to provide analysis and viewpoints that help companies realize business value. You may contact the authors or send an e-mail to iibv@us.ibm.com for more information. Additional studies from the IBM Institute for Business Value can be found at ibm.com/iibv

By Mary Keeling and Mark Cleverley

Public safety systems affect well-being, quality of life and economic prosperity. Yet, in the face of escalating crime, natural disasters and security threats, many systems are ill-equipped to protect the citizens they were created to serve. These siloed systems are overwhelmed by an ever-increasing volume of data and, as a result, agencies are unable to orchestrate a coordinated approach to public safety issues. Further, agencies are finding it hard to tackle recidivism and link spending with outcomes. A new, smarter approach to public safety is needed, with key competencies ranging from accessing and integrating the right data, to developing a unified response capability. With new competencies, governments and agencies will be better positioned to improve public safety and enable enhanced growth and vitality.

Public safety matters for economic growth and vitality

Law enforcement agencies, firefighters, emergency and disaster management entities, and other first responders all protect the general public from danger, harm, or damage. Public safety plays a critical role in supporting economic growth and vitality by reducing the cost of crime and enhancing the desirability of communities as places to live and locate businesses. It also has a direct impact on the levels of societal trust and interaction.

Crime creates a significant drag on growth

Public safety is often thought of in terms of number of crimes committed or detected and emergency response. Each incident of crime and response has an economic and social cost. These costs include the direct economic losses suffered by crime victims, such as medical care costs, lost earnings, and property loss/damage, as well as costs from government spending on police protection, legal services, and corrections programs (see Figure 1).¹ For example:

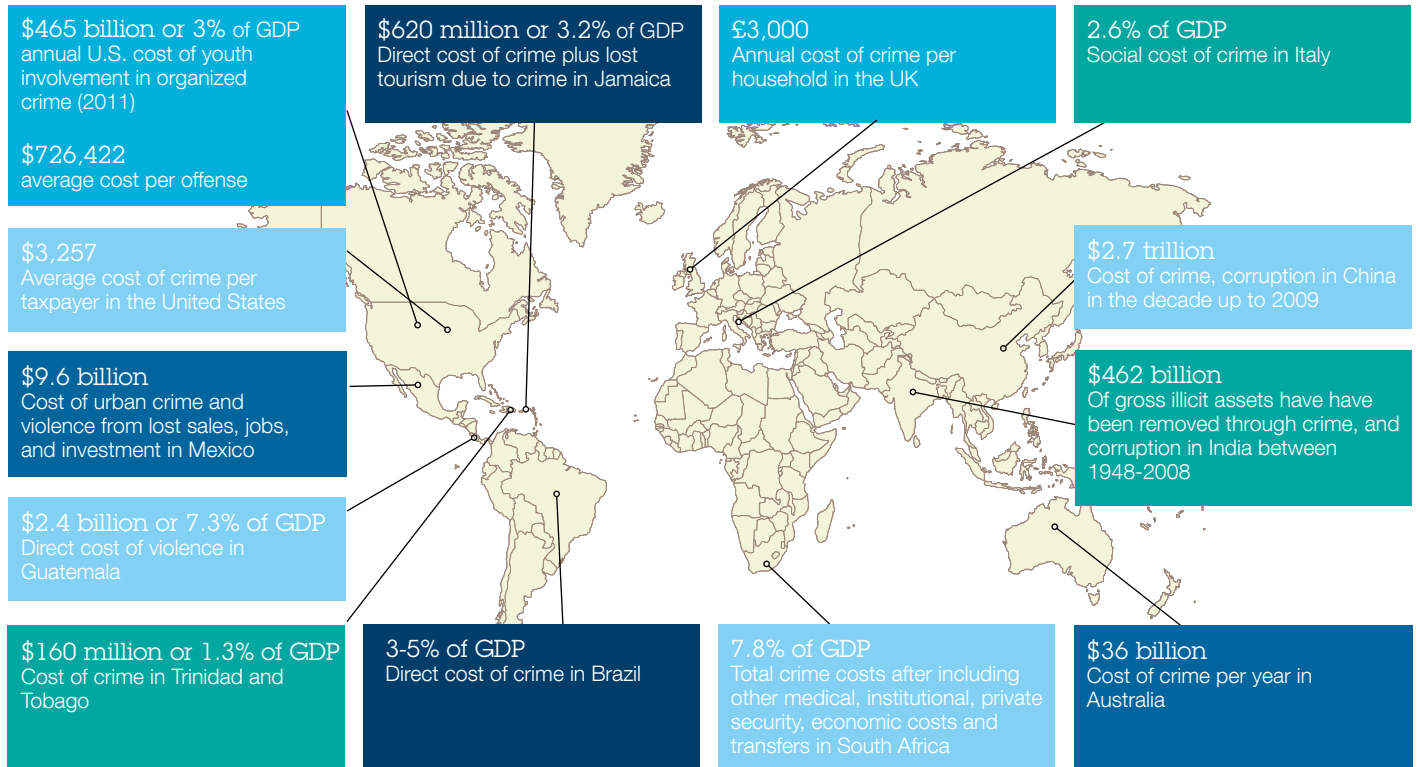
- In the United States, the average cost of crime per taxpayer is \$3,257.²

- The average cost of crime per household in the United Kingdom is £3,000 – or about US\$4,800.³
- The direct costs of crime are estimated at 3-5 percent of Gross Domestic Product (GDP) in Brazil and at 7.8 percent in South Africa.⁴

The full costs of crime are likely to be higher than estimates as the intangible costs, such as pain and suffering, decreased quality of life, and psychological distress, are usually not captured.⁵ The net impact of these costs is an overall reduction in economic growth.

Improving public safety reduces costs and makes locations more attractive for businesses

Crime negatively impacts businesses in three key ways. First, it creates additional costs for physical security and insurance. This effectively adds a tax – one that reduces profits without creating the funding improvements for infrastructure or services that a “normal” tax would provide.⁶ Second, it creates a distortion in the allocation of resources. This leads to a lower-than-optimal level of investment as funds are diverted from other productive uses to combat terror, crime and corruption.⁷ Third, it affects business location decisions as



Source: BEA, 2011; FT, 2011; World Bank, 2006, 2011; Alda and Cuesta, 2011; AIU, 2012; Global Financial Integrity, 2010; The Guardian, 2011; Detotto and Otranto, 2010; Policy Exchange, 2009; The Gleaner, 2012; Holder and Mutota, 2006.

Figure 1: Reducing crime cuts costs that would otherwise act as a significant drag on growth.

lower levels of public safety lead to increased uncertainty in decision making and can be perceived as a signal of a socio-institutional environment unfavorable for investment.⁸ Evidence for the United States shows that a 1 percent increase in a state's relative crime rate depresses that state's share of inward Foreign Direct Investment by 1 percent.⁹ Similarly, in Mexico, the cost of urban crime and violence from lost sales, jobs and investment is estimated at US\$9.6 billion annually.¹⁰ High-technology firms are particularly sensitive to crime and other factors that make areas less desirable to skilled workers. Cities with lower crime levels tend to have a higher proportion of employment in high-technology services.¹¹

Greater public safety improves the attractiveness of communities

Public safety perceptions are widely used in rankings of places and indexes measuring quality of life.¹² Almost universally, places with lower crime rates are perceived as more desirable.¹³ In mature and rapidly developing economies, the levels and quality of a city's talent pool – the education, skills, creative and innovation capacity of a city – can be directly correlated to the overall levels of public safety.¹⁴ A symbiotic relationship exists between the location decisions of individuals and businesses: knowledge-intensive firms follow knowledge workers to gain access to deep pools of highly skilled labor. The migration of firms to areas where they can attract and retain skilled labor, in

turn, encourages further in-migration of skilled workers.¹⁵ Public safety also affects the attractiveness of a location for visitors, as the perceived threat of crime or terrorism is taken as a signal for the lack of safety.¹⁶

Better public safety fosters social interaction and trust, creating growth

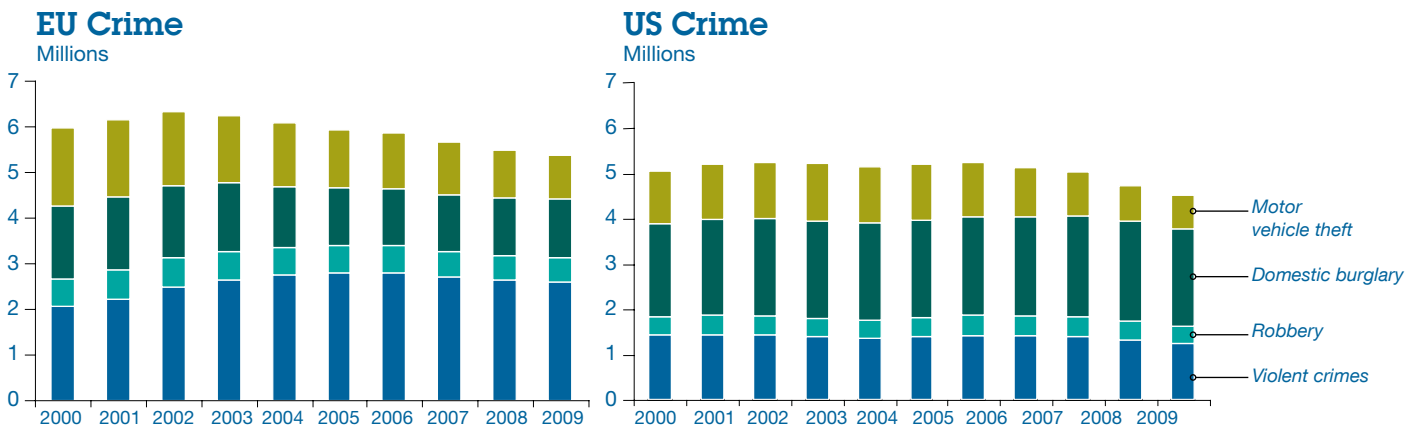
Public safety fosters trust, helps people get engaged in their communities and supports economic activity. It improves the social fabric in a way that makes people less likely to commit crime. In so doing, public safety creates a virtuous circle. When citizens are afraid of being victimized, they tend to withdraw from social interactions, negatively impacting trust levels in the community.¹⁷ Diminished social trust reduces solidarity and cohesiveness, increasing the potential for individual opportunistic behavior and social contention and conflict. This, in turn, increases deviance and crime.¹⁸ Further, social capital directly affects growth by facilitating economic transactions, helping transform resources into outcomes. Social capital also positively impacts innovation, education, investment and financial development.¹⁹

A new approach to public safety challenges

Despite the importance of public safety for economic growth and vitality, many types of crime continue to rise. Borderless crime, such as cybercrime and Internet fraud, is becoming more prevalent. Agencies face incremental mission requirements from more common natural disasters and security threats. Yet many agencies are unable to effectively deal with these challenges. Systems remain siloed and cannot cope with the relentless growth in data. Agencies are not effectively tackling recidivism and are failing to link spend with outcomes, collectively reinforcing the need for a new approach to public safety.

Crime remains an issue in both growth and mature economies

While both the United States and the European Union have made some progress in reducing crime over the last decade, levels are still significant (see Figure 2). Recent data shows that there were still over 4.5 million and 5.4 million incidents in each region respectively.²⁰ At the same time, many growth markets have seen rapid economic expansion, which has often



Source: Eurostat; Uniform Crime Reporting Statistics

Figure 2: Crime levels in mature markets are static or falling, but a shift is taking place in the types of crime being perpetrated.

been accompanied by increases in crime. For example, Brazil's murder rate has increased from 11.7 per 100,000 people in 1980, to 26.2 per 100,000 in 2010, almost four times higher than the global average of 6.9 per 100,000 people.²¹ In the first six months of 2012, Russian prosecutors detected 1,238 anti-corruption laws violations, up almost 40 percent from the same period in 2011. Even with this increase, crime in Russia is widely believed to be underreported.²² In India, the number of crimes rose 17 percent between 2001 and 2011.²³ In China, the growth has been even more dramatic. The number of public security cases increased from 3.8 million in 2000 to 9.9 million in 2009, a rise of 159 percent.²⁴

Borderless crimes are growing rapidly in scale and impact

Globally, the economic impact of cybercrime in 2011 was US\$388 billion.²⁵ In the United States, the total number of cyber incidents reported increased over 2,500 percent from 2005 to 2011. In 2011 alone, these crimes cost U.S. citizens US\$140 billion.²⁶ The FBI anticipates that cybercrime will pose the greatest threat to U.S. national security. The agency foresees a merging of organizations from two categories – those that have been hacked, and those that will be – into a single category: those that have been hacked and will be again.²⁷ Cybercrime costs the European Union US\$63 billion every year.²⁸ In India, more than 100 government websites were hacked in the first three months of 2012.²⁹ Fraud is also growing in scale – the global cost increased from US\$2.9 trillion in 2009 to \$3.5 trillion in 2011, with organizations in the public and private sectors losing an average of 5 percent of revenues each year.³⁰ Effectively dealing with these evolving crime trends will require new capabilities and solutions and greater collaboration among law enforcement agencies to both combat these kinds of threats and to ensure the resiliency of critical infrastructure, such as power plants, hospitals and emergency services.

Public safety agencies face intensifying threats from disasters

The number of terrorism incidents worldwide has grown dramatically, from 440 in 1995 to almost 10,300 in 2011.³¹ While transnational terrorism remains the most significant national security threat for many countries, threats are increasing from home grown terrorism. Lone actors and organized underground groups also pose threats.³² Extreme weather events, such as heavy rainfall, heat waves, forest fires and droughts, are occurring at an increasing rate and with damaging intensity.³³ In 2011 alone, 332 natural disasters affected 244.7 million people, with economic damages estimated at a record US\$366.1 billion.³⁴ Effectively dealing with these incremental mission requirements will require improved capabilities for crisis management and greater collaboration among public safety agencies.

Data is growing at an unprecedented rate

Ninety percent of all data in the world has been created in the last two years.³⁵ Data is being created in a variety of forms, such as structured and unstructured. Social media inundates the world with data in the forms of text, multimedia and video. Uncertainty about the veracity of data is also increasing. The growing glut of data makes it significantly more difficult for agencies to sort and analyze pertinent information. By 2015, 80 percent of the world's data will be uncertain, compared to just 10 percent in 2010.³⁶ While this offers a massive opportunity to augment current sources with new data, many existing data storage, retrieval and analysis systems will need to be adapted and evolved so that public safety agencies can access and utilize relevant data and information to support investigations, detect crime and manage emergencies.

Existing public safety information and communication systems are often based on silos

Interoperability barriers among public safety communication systems are present at regional and national levels, as well as among different nations in the same geopolitical area.³⁷ For example, in the United States, 80 percent of city emergency networks were incompatible with those of federal agencies, such as the Department of Justice and the Department of Homeland Security.³⁸ In the European Union, although there are 100 million cases of emergency responses each year, there are no interoperable crisis management systems and procedures apart from the implementation of the “112” number for calling emergency services.³⁹ Information systems often exist as silos. Mug shots, fingerprints and arrest records are often still not digitized, and other records are in proprietary data formats.⁴⁰ These barriers make it difficult to analyze all relevant data to better understand and predict criminal activity. As a result, information sharing, collaboration and coordinated emergency management become more difficult.

Prison populations and recidivism are rising

Prison populations are on the increase in 78 percent of the world’s countries.⁴¹ In tandem with improved detection of crime, public safety also needs to have effective ways to ensure that those who do offend are rehabilitated to reduce the chances of reoffending or recidivism. This will require more options to incarceration. In the United States, recidivism rates have consistently remained around 40 percent since 1994, despite a rise in corrections expenditures of 52 percent.⁴² In the United Kingdom, the prison population has increased by 23 percent in the last decade, to almost 87,000. UK prisons now house 7,300 more inmates than they were designed for. Ninety percent of those convicted in 2011 for serious crimes were repeat offenders.⁴³ Between 1995 and 2009, Brazil’s prison population increased by over 300 percent to almost 500,000 people, the third largest in the world behind the United States

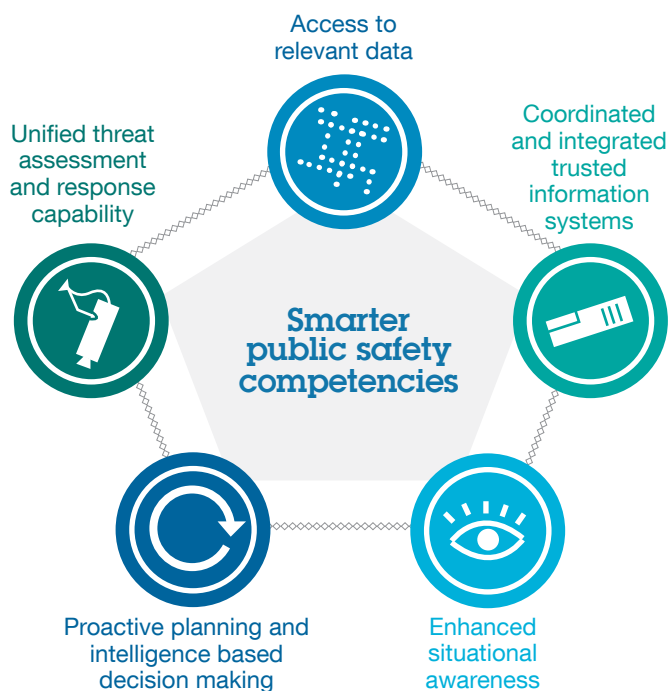
and China. Brazil’s rate of repeat offenders is almost 70 percent.⁴⁴ The high rates of reoffending highlight the need to develop more effective ways to deter recidivism as part of a full spectrum of strategies to improve public safety.

Many public safety agencies need to do more with less and link spending to outcomes

The global trends highlighted in this report show the increasing challenges and issues confronting public safety agencies. In many developed economies, agencies are tasked with facing these challenges with static or declining real expenditures.⁴⁵ For example, the police forces in England and Wales are anticipating a loss of 34,100 officers and staff by 2015.⁴⁶ Los Angeles cut US\$54 million from the fire department’s budget for 2011-2012.⁴⁷ Canada’s public safety services are facing cuts of CAD\$687.9 million, or 9.9 percent, between 2011 and 2015.⁴⁸ While public safety agencies in emerging markets may not be faced with resource issues, the pace of organizational change required to deal with the growth in crime means they need to find new ways of working. The challenge for public safety agencies globally is to be able to more effectively link existing resources and spending with outcomes.

A smarter approach to public safety management provides new competencies to tackle challenges

Developing competencies in five key areas can help public safety agencies more effectively do their jobs in the face of extremely important and difficult sets of issues (see Figure 3).⁴⁹ In this section, we will outline how agencies can begin developing these competencies and will provide examples of agencies that have already embarked upon this path.



Source: IBM Corporation.

Figure 3: A smarter approach to public safety management provides the new competencies required to more effectively tackle these challenges.

Providing access to a wider range of data sources builds a more valuable information foundation

Non-digitized data, such as field reports, investigative reports, arrest records and fingerprints, make it difficult to process and share data. This data has to be pooled and expanded by including a wider range of information and adding new sources, such as digital video and audio, the Internet and social networking. Quality of data also needs to be assessed and checked to identify where improvements need to be made in format, consistency and storage.

Once existing and new data from a wide variety of sources is collated, it can be processed to optimize its use across public safety organizations, crime and fraud agencies, and their partners. Amalgamating data in this way helps overcome existing information silos and creates the foundation for reliable information that can then be fully exploited through other competencies (see *Case Study – UK Ministry of Justice*, page 7). It can also generate cost savings as agencies move from manual or paper-based data methods to digital data collection and sharing.⁵⁰

A coordinated information system turns raw data into reliable insights

The second competency focuses on connecting information across an organization (see *Case Study – City of Madrid*, page 8). Existing sources are often siloed, with duplicated information and data inconsistencies. Knowing when apparently disparate data actually refers to the same individual is becoming a critical part of creating this consistency. Data needs to be processed and presented in formats that enhance usability. Better information needs to be provided more readily to key users – from detectives to crime analysts to department leadership – in appropriate formats to strengthen their ability to synthesize information into actionable intelligence. Individuals can form networks and capture knowledge from multiple sources, enabling emergency personnel to make better decisions and solve pressing problems quickly. Better communication within functions improves mobilization and coordination of resources for rapid, efficient emergency management. As crimes such as fraud are committed through new, essentially borderless means – the Internet, for example – the more vital international cooperation and exchange of information becomes.⁵¹

Situational awareness helps mitigate the impact of incidents

The third competency requires a more integrated approach to public safety to enable better situational awareness for first responders so that they can react more quickly and effectively based on better and more timely assessment of the situation. A centralized and automated system helps expedite data sharing and monitors and alert individuals to changing real-time conditions. Delivering relevant information directly to the first responder, in an appropriately designed way and using high-function mobile devices, will be a critical part of this competency. Uniting emergency management infrastructure and improving cross agency collaboration can lead to near real-time situational awareness. For example, linking dispatch systems and GPS feeds from vehicles with communications officers enable faster and more dynamic decision making (see *Case Study – Madison County, Mississippi*, page 9). Continually updated information can also be used to help position emergency vehicles to ensure optimal coverage and dispatch resources to where they are needed.

Analytics supports planning, decision making and resource deployment

The core of investigative and analysis work is finding the correlating clues and information from tremendous amounts of seemingly unrelated data and turning it into operational intelligence. Advanced analytics can help to rapidly establish correlations between different entities, uncover hidden connections to build evidence chains among and within individual cases, and map these relationships. This capability is particularly critical for detecting borderless crimes, such as cybercrime and fraud (see *Case Study – Addison Lee*, page 10). It can also help to identify hot spots so that preventive measures can be deployed to stop crime before it happens. Analytics can play a significant role in improving emergency management by more accurately identifying areas likely to be affected and deploying preventative measures. Improved early warning alerts, faster response and improved resource allocation decisions are also facilitated.

Case Study – UK Ministry of Justice⁵²

One of the UK Ministry of Justice's most important objectives is to gain insight and predict offender behavior. This requires accurate, timely and efficient analysis of vast amounts of data for the organization to understand those proactive measures that are likely to prevent recidivism.

The ministry identified that merging offender data held in various Ministry of Justice files was essential to gain a clearer and more comprehensive view of the offender. Data from offender assessments was collated centrally within a database of over 4 million prisoner assessments that included a wide range of information, from emotional well-being to alcohol and drug use. A predictive analytics solution was then implemented to analyze data and deliver actionable insights by uncovering trends to develop more effective treatment for prisoners.

Key information on criminals is shared among agency staff to help anticipate future problems and plan intervention programs. Crime prediction rates are now more accurate, with violent crime recidivism prediction improving by almost 10 percent and general offenses recidivism prediction by 4 percent. The data provided greater understanding of which interventions are likely to prevent recidivism.

“With almost 4 million records on file, it simply wouldn’t be feasible to trawl through this manually... technology gives us valuable insight into offender data, helping us predict who may reoffend and enabling us to advise on preventive measures.”

– Spokesperson, Ministry of Justice, United Kingdom

Case Study – City of Madrid⁵³

Following the 2004 Madrid train bombings, to radically improve its emergency response capability and better protect the public, the city commissioned an advanced emergency command center - the Centro Integrado de Seguridad y Emergencias de Madrid, or CISEM.

The CISEM's integrated system absorbs information from first responders, the public, video surveillance, traffic control and other sources. With this system, diverse agencies with shared, interoperable equipment and protocols are now connected to enable better coordination and situational awareness for first responders.

A unified, holistic and real-time view of incidents gives commanders an understanding of how complex emergencies affect the city as a whole, enabling them to more rapidly and effectively assess and respond to incidents and better protect the public. Emergency managers can better assess needs, prioritize and coordinate actions and proactively deploy assets to simultaneously address – and potentially prevent—multiple, complex incidents.

The system enables end-to-end coordination of emergency and municipal assets. Emergency response time has been reduced by 25 percent.

“The most innovative aspect of the center is its scope – the integration of all the people involved and the systems they use.”

– Fernando Garcia Ruiz, Head of Innovation and Development, Department of Security, City of Madrid

Collaboration identifies incidents and orchestrates optimal response

The final competency is about bringing all competencies together and increasing the level of collaboration among emergency services and other city departments (see Case Study – Rio de Janeiro's Operations Center, page 11). An area can drastically improve its ability to assess, predict, prepare and respond to public safety incidents through a command center, which provides a single, real-time, comprehensive picture of public safety and emerging and actual emergencies. It provides the functionality and capabilities needed to coordinate police, firefighters, emergency medical services and government agencies across a district for optimal public safety management.

Putting the five new public safety competencies to work

Public safety agencies play a critical role in making our communities and society safer places to live and work. This, in turn, generates broad-based benefits for citizens, businesses and the economy. The path realizing these benefits begins with assessing the skills-related and cultural changes necessary to achieve smarter public safety. By focusing existing activities and action on developing the five competencies outlined in this report, organizations will be better positioned to achieve the difficult mission of improving public safety and supporting economic development, vitality and growth.

1. Start on the journey by knowing what data you already have and improving access to it.

- Conduct an organization-wide inventory to identify data sources and ownership.
- Clearly define procedures to deal with data legal, privacy and data ownership issues.
- Eliminate unnecessary or obsolete data, duplicate data and resolve conflicts in data stores.
- Build on and broaden your existing sources of data to include new sources, such as social media, digital video and audio

- Develop an action plan to collate new and existing sources into formats that can be effectively processed and used. For example, digitize existing physical records.

2. Once you have improved access to data, focus on coordinating and integrating information in your organization.

- Start connecting existing sources of unconnected data within your organization and consider new ways to view and share data. For example, use hosted solutions, portals or build a data warehouse.
- Ensure that all records pertaining to an individual identity are understood and appropriately connected.
- Develop a system for data governance to guide integration efforts and help classify, organize and make decisions about data.
- Proactively reach out to other public safety agencies to start sharing information. For example, set up a charter for data sharing; Look across traditional boundaries for information sharing on fraud and cybercrime.

Case Study – Madison County, Mississippi⁵⁴

Because of the county's rapid growth, the Madison County Sheriff's Office needed a centralized and automated system that expedited data sharing, and at the same time, monitored and alerted employees to changing real-time conditions. A new system was implemented that uses laptop computers to connect officers with each other and to a centralized, proactive database at police headquarters.

This system allows officers to receive critical information, such as incidents, accidents, citations and warrants, in real-time. Increased connectivity helps support officers in making arrests and identifying suspects and victims.

The system provides the ability to pinpoint the exact location of other officers at all times, should additional help be required.

Remote report writing allows deputies to stay on the streets, remaining highly visible within the community and discouraging crime.

“Real-time data.....makes critical decision making easier for all officers – immediately. That’s a law enforcement tool we’ve never had before.”

– Mary Rooney-Lucas, President, DCS, Inc.

Case Study – Addison Lee⁵⁵

Addison Lee is Europe's largest minicab fleet, booking 25,000 taxi requests a day.

For every fraudulent transaction processed with a stolen credit card, the company was losing up to 150 percent of the sale. Not only was the company responsible for reimbursing the bank for the processed charge, it also had to pay a commission to the driver for rendering the service.

In an effort to protect the business from fraud, Addison Lee began to keep a database of fraudulent transactions.

Addison Lee applied analytical technology to existing data to organize it and apply risk scores to suspect identities.

With the database organized and weighted, Addison Lee could then set alerts for those identities that scored highest fraudulent activity potential and proactively catch fraudulent transactions at the booking stages.

Addison Lee reduced its fraud to sales ratio from 5-10 percent to less than 1 percent and reduced the chargebacks from as high as £1,400 per month to £60 per month.

“...gave us real-time protection against fraud, as we were able to run incoming requests against our own intelligence in our existing fraud database and receive automatic alerts on any matches.”

– Mark Wilson, Fraud Control Manager, Addison Lee

3. Then focus your efforts on enhancing situational awareness by putting usable information into the hands of responders.

- Look at areas where front-line workers are accessing information through multiple, separate systems.
- Develop a plan for integrating separate front-line systems and collaborate with front-line responders to understand and prioritize the delivery of information that meets their needs.
- Incorporate technologies to provide information in real-time to help first responders and decision makers to act. For example, deploying mobile devices, link dispatch systems and provide GPS feeds; Work with other public safety agencies to develop a plan for real-time integration of data and collaboration.

4. Enable proactive planning and intelligence-based decision making by using analytics.

- Explore how your organization can use analytics by starting on historical data from operating and resource management systems.
- Invest in developing your capacity to perform more detailed analyses that allows you to mine information, identify patterns and trends, support investigations and recommend preventative actions.
- Use the output from analytical tools to inform strategic and tactical decision making and improve allocation of resources; Aim for more sophisticated routine reporting, including real-time alerts.

5. Collaborate across borders and share information to create a unified threat assessment and response capability.

- Ensure supporting competencies are fully developed before focusing on building a unified threat and response capability.
- Identify and address barriers to sharing information and resources across departments and jurisdictions.
- Expand partnerships and coordination efforts beyond public safety organizations to incorporate transport, utilities, government and other organizations; work together to establish a unified, central command, with clear lines of responsibility, governance and processes for all organizations involved.

Finally, it is important that organizations assess their existing operations, goals and capabilities to identify changes they need to make and develop a roadmap for action.

- Specify what your performance goals, targets and outcomes are for public safety.
- Assess your spending so you can start connecting it with outcomes and use this insight to influence decision making and allocation of resources within your organization.
- Assess the level of maturity of your operations and capabilities for each competency to help identify the changes your organization needs to make to develop and progress each competency.
- Develop a roadmap with timelines that sets out the specific actions needed to develop smarter public safety competencies in your organization.
- Assess the skill-related and cultural changes required by your organization to implement an effective roadmap.

Case Study – Rio de Janeiro's Operations Center⁵⁶

Hosting both the World Cup in 2014 and the Olympics in 2016, as well as dealing with several emergencies in the recent past, Rio de Janeiro was looking to add new capabilities to improve public safety in the city. At the end of 2010, the city launched the Rio Operations Center with the mission to consolidate data from various urban systems for real-time visualization, monitoring and analysis of public safety.

The Operations Center integrates information from across 30 different city agencies. It generates a holistic view of how the city is functioning to potentially enable improvement in traffic congestion management, crime response, predicting brownouts in the power grid and coordinating large-scale events. It provides analytical models that help more effectively predict and coordinate reaction to emergency incidents.

An automated alert system uses instant mobile communications to reach emergency personnel and citizens and speeds public alerts and warning systems about potential floods and landslides. The Center simplifies and speeds communication among multiple city agencies and reduces time from days to hours to understand emergencies and coordinate rescue efforts. The wealth of data for analysis after the fact improves system settings and operational procedures, further improving response time and coordination.

“In Rio de Janeiro, we are applying technology to benefit the population...so as to empower them with initiatives that can contribute to an improved flow of city operations.”
– Mayor of Rio de Janeiro Eduardo Paes

Conclusion

Public safety agencies are charged with an important and difficult mission, and a vital public service. But they are also facing several significant and intensifying challenges that, if unaddressed, will impede their ability to deliver against this mission. By targeting the development and improvement of key competencies that are the hallmarks of smarter public safety management, agencies can more effectively improve public safety, meet the expectations of those whom they serve, and help build more prosperous communities. This will enable agencies to realize the full potential of public safety as a critical enabler for economic growth and vitality.

This study was written by the Center for Economic Analysis, which is part of the IBM Institute for Business Value. You can browse a full catalog of our research at:

ibm.com/iibv

Be among the first to receive the latest insights from the IBM Institute for Business Value. Subscribe to IdeaWatch, our monthly e-newsletter featuring executive reports that offer strategic insights and recommendations based on IBV research:

ibm.com/gbs/ideawatch/subscribe

Access IBM Institute for Business Value executive reports on your tablet by downloading the free “IBM IBV” app for iPad or Android from your app store.

The right partner for a changing world

At IBM, we collaborate with our clients, bringing together business insight, advanced research and technology to give them a distinct advantage in today’s rapidly changing environment. Through our integrated approach to business design and execution, we help turn strategies into action. And with expertise in 17 industries and global capabilities that span 170 countries, we can help clients anticipate change and profit from new opportunities.

Authors

Dr. Mary Keeling is a senior managing consultant and manager of the IBM Institute for Business Value Center for Economic Analysis. She has been with the Center since it was founded in 2007. The Center’s work focuses on publishing and presenting research and developing recommendations on a wide range of economic issues relating to growth and development of relevance for the public and private sectors. Mary joined IBM with over a decade of experience in the private sector and academia, including as lecturer in economics at the University of Limerick and at Trinity College Dublin, as well as an economist in Ireland’s largest stock broking firm, Davy Stockbrokers. She has coordinated and participated in a number of research projects for public and semi-state bodies, such as the European Commission and Ireland’s National Economic Development Authority & Advisory Board (Forfas). She holds a first-class honors degree in Economics and Anthropology and an M.A. in Economics and Finance from NUI Maynooth and was awarded a Ph.D. by Trinity College Dublin in 1998. Mary can be reached at mary.keeling@ie.ibm.com.

Mark Cleverley is IBM Global Sales Leader for Public Safety and a key part of IBM's Global Public Safety and Security team. Mark has over 25 years experience working with public sector organizations around the world. He is a regular presenter and writer on issues relating to the public sector, innovation and the adoption of technology. Since the mid-1990s, Mark has retained a specific interest in public safety and security and now leads IBM's global team in defining solutions and service offerings, working with governments and a wide range of international public safety organizations and institutions. Mark can be reached at mark.cleverley@us.ibm.com

Acknowledgements

We would like to extend our thanks to IBM executives and colleagues for their valued time in the development of this study: Jim Cortada, Scott Cook, Craig Lahue, James Lingerfelt, Gerry Mooney and Rich Varos. Thanks, also, to Rory Breslin and Emma Feerick for research support on the study.

References

- 1 There are multiple typologies for measuring the costs of crime. See for example, Kathryn E. McCollister, Michael T. French and Hai Fang. "The Cost of Crime to Society: New Crime-Specific Estimates for Policy and Program Evaluation." National Institutes of Health. April 2010. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2835847/pdf/nihms170575.pdf>. The World Health Organization draws a distinction between direct costs (medical, legal, policing, prisons, foster care and private security) and indirect costs (lost earnings and time, lower human capital, lower productivity, lower investment, psychological costs and other non-monetary costs). See "The economic dimensions of interpersonal violence." World Health Organization. 2004. <http://whqlibdoc.who.int/publications/2004/9241591609.pdf>
- 2 "2012 United States Peace Index." Institute for Economics and Peace. 2012. <http://www.visionofhumanity.org/wp-content/uploads/2012/04/2012-United-States-Peace-Index-Report.pdf>
- 3 Max Chambers, Ben Ullmann, and Professor Irvin Waller. "Less Crime, Lower Costs; Implementing effective early crime reduction programmes in England and Wales." Policy Exchange. 2009. http://www.policyexchange.org.uk/images/publications/less_per_cent-20crime_per_cent20lower_per_cent20costs_per_cent20- per_cent20may_per_cent2009.pdf
- 4 "Crime, Violence and Economic Development in Brazil: Elements for Effective Public Policy. World Bank. June 2006. <http://pdba.georgetown.edu/Security/citizenssecurity/brazil/documents/docworldbank.pdf>; Alda, Erik and Jose Cuesta. "A comprehensive estimation of costs of crime in South Africa and its implications for effective policy making." Journal of International Development. Volume 23, Issue 7, pages 926–935. October 2011. <http://onlinelibrary.wiley.com/doi/10.1002/jid.1721/abstract?systemMessage=Wiley+Online+Library+will+be+disrupted+on+26+May+from+10+per+cent3A00-12+per+cent3A00+BST+ per+cent2805+per+cent3A00-07+per+cent3A00+EDT+per+cent29+for+essential+maintenance> (accessed on September 7, 2012)
- 5 Kathryn E. McCollister, Michael T. French and Hai Fang. "The Cost of Crime to Society: New Crime-Specific Estimates for Policy and Program Evaluation." National Institutes of Health. April 2010. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2835847/pdf/nihms170575.pdf>
- 6 Detotto and Otranto. "Does Crime Affect Economic Growth?" *Kyklos*, Volume 63. Issue 3. August 2010
- 7 "Konrad, Kai A and Stergios Skaperdas. "Extortion". *Economica*. London School of Economics and Political Science. Volume 65. November 1998. For example, security costs for firms in the Eastern Europe and Central Asia region costs are about eight times what firms spend on R&D. From: Amin, Mohammad. "Crime and Security in the Eastern Europe and Central Asia Region." *Enterprise Note Series. Enterprise Surveys*. 2010. <http://www.enterprisesurveys.org/~media/FPDKM/EnterpriseSurveys/Documents/Enterprise+per+cent20Notes/Crime-15.pdf>
- 8 Uncertainty affects the investment environment in general. But in particular, it increases the fear of physical damage to investment assets (or to people) or their returns, especially in the case of assets and products that can be damaged relatively easily. These concerns make investment less worthwhile ex ante. See Konrad, Kai A and Stergios Skaperdas. "Extortion". *Economica*. London School of Economics and Political Science. Volume 65. November 1998; Daniele, Vittorio and Ugo Marani. "Organized crime and foreign direct investment: the Italian case." CESifo working paper, No. 2416. October 2008. <http://www.econstor.eu/dspace/bitstream/10419/26461/1/583127762.PDF>

- 9 Axaroglou, K. "What Attracts Foreign Direct Investment Inflows in the United States." *The International Trade Journal*. Volume 19. Issue 3. 2005.
- 10 "Violence in the City: Understanding and Supporting Community Responses to Urban Violence." World Bank. April 2011. http://siteresources.worldbank.org/EXTSOCIALDEVELOPMENT/Resources/244362-1164107274725/Violence_in_the_City.pdf
- 11 Ravallion, Martin and Menno Pradhan. "Demand for Public Safety." World Bank Policy Research Working Paper No. 2043. November 1998. <http://ssrn.com/abstract=604914>; Based on IBV analysis plotting violent crime rate per 100,000 population from the FBI (<http://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2008>) against the proportion of population employed in high-tech services for cities included in the World Knowledge Competitiveness Index 2008 (see <http://www.cforic.org/downloads.php>).
- 12 See, for example, "Quality of Living Survey." Mercer. <http://www.mercer.com/articles/quality-of-living-survey-report-2011> "Gallup-Healthways Well-being Index." Gallup-Healthways. <http://www.well-beingindex.com> "European Quality of Life Survey." European Union. <http://www.eurofound.europa.eu/surveys/eqls/2011/index.htm>; "Measuring National Well-being." UK Office of National Statistics. <http://www.ons.gov.uk/ons/guide-method/user-guidance/well-being/index.html>; "OECD Your Life Better Index." OECD. <http://www.oecdbetterlifeindex.org/>
- 13 Blair, J.P. "Quality of life and economic development policy." *Economic Development Review* 16. 1998; Luger, M.I. "Quality-of-life differences and urban regional outcomes: A review." *Housing Policy Debate* 7. 1996.
- 14 Dasgupta, Partha and Ismail Serageldin. "Social Capital: A Multifaceted Perspective." World Bank. 1999; Ayres, Robert. "Crime and Violence as Development Issues in Latin America and the Caribbean." World Bank Latin American and Caribbean Studies Viewpoint. 1997
- 15 Salvesen, D. and Renski, H. "The Importance of Quality of Life in the Location Decisions of New Economy Firms." Center for Urban and Regional Studies. January 2003. <http://curs.unc.edu/curs-pdf-downloads/recentlyreleased/neweconomyreport.pdf>
- 16 For example, Enders, W. and Sandler, T. "Causality Between Transnational Terrorism and Tourism: The Case of Spain." *Terrorism*. Volume 14. 1991. found evidence that terrorism had a negative impact on tourism in Spain between 1970 and 1988; Evidence from the World Bank shows the negative impact of crime and violence in tourism in the Caribbean: "Crime, Violence, and Development: Trends, Costs, and Policy Options in the Caribbean." World Bank. March 2007. <http://siteresources.worldbank.org/INTLACREGTOPGENDER/Resources/Crimeandviolenceinthecaribbeanfullreport.pdf>; and more recently from the UN: "Caribbean Human Development Report 2012: Human Development and the Shift to Better Citizen Security." UNDP. 2012. http://www.undp.org/content/dam/undp/library/corporate/HDR/Latin%20America%20and%20Caribbean%20HDR/C_bean_HDR_Jan25_2012_3MB.pdf
- 17 Cheon Guen Choi. "Exploring the Effects of Social Capital on Police Performance in U.S. Cities." Florida State University. PhD Thesis. March 22, 2010; See also Goodstein, L. and Shotland, R. L. "Crime Causes Crime Model - A Critical Review of the Relationships Between Fear of Crime, Bystander Surveillance, and Changes in the Crime Rate." *Journal of Victimology*. Volume 5. Issue:2-4. 1980 and Liska, Allen E. and Warner, Barbara D. "Functions of crime: a paradoxical process." *The American Journal of Sociology*. 1991.
- 18 See, for example: Sampson, Robert J. and Stephen W. Raudenbush. "Systematic Social Observation of Public Spaces: A New Look at Disorder in Urban Neighborhoods." *American Journal of Sociology*. Volume 105. 1999; Bellair, Paul E. "Informal Surveillance and Street Crime: A Complex Relationship." *Criminology*. Volume 38. 2000; Markowitz, Fred E., Paul E. Bellair, Allen E. Liska, and Jianhong Liu. "Extending Social Disorganization Theory: Modeling the Relationships Between Cohesion, Disorder, and Fear." *Criminology*. Volume 39. 2001; Liska, Allen E. and Warner, Barbara D. "Functions of crime: a paradoxical process." *The American Journal of Sociology*. 1991; Ross, Catherine E., Mirowsky, John and Pribesh, Shana. "Powerlessness and the Amplification of Threat: Neighborhood Disadvantage, Disorder, and Mistrust." *American Sociological Review*. Volume 66. 2001; Skogan, Wesley G. "Disorder and Decline: Crime and the Spiral of Decay in American Neighborhoods." New York: Free Press. 1990; For example, evidence shows that crime is strongly negatively predicted by social capital - murder rates in the United States are lower in states where social capital is higher. See Putnam, Robert. "Social Capital: Measurement and Consequences." <http://www.oecd.org/innovation/researchandknowledgemanagement/1825848.pdf> ; In the Netherlands, social capital accounts for a significant part of the observed differences in crime rates across cities. See I. Semih Akçomak and Bas ter Weel. "The Impact of Social Capital on Crime: Evidence from the Netherlands." *IZA*. July 2008. <http://ftp.iza.org/dp3603.pdf>

- 19 Torsvik, G. "Social capital and economic development: A plea for the mechanism." *Rationality and Society*. 12: 451-476. 2000.; Zak, P.J. and Knack, S. "Trust and growth." *Economic Journal* 111. 2001. Becker, G. "A theory of social interactions." *Journal of Political Economy*. 82. 1974. Becker, G. "Accounting for Taste." Cambridge: Harvard University Press. 1996.; For example, Jane E. Fountain. "Social Capital: A Key Enabler of Innovation" in "Investing in Innovation: Toward A Consensus Strategy for Federal Technology Policy." Ed. Lewis Branscomb and James Keller. Cambridge, MA. MIT Press. 1998; Sapienza, P. And Zingales, L. "The Role of Social Capital in Financial Development." NBER Working Paper 7563. 2000.; Akçomak, I. Semih and ter Weel, Bas. "Social Capital, Innovation and Growth: Evidence from Europe." IZA Discussion Papers, No. 3341. 2008. <http://www.econstor.eu/dspace/bitstream/10419/35000/1/560201257.pdf>; Erkan Acar. "Effects of social capital on academic success: A narrative synthesis." *Educational Research and Reviews* Vol. 6. 2011. <http://academicjournals.org/err/PDF/Pdf%202011/June/Acar.pdf>; Pelle Ahlerup, Ola Olsson and David Yanagizawa. "Social Capital vs Institutions in the Growth Process." *European Journal of Political Economy*. March 2009. <http://www.hks.harvard.edu/fs/dyanagi/Research/Social%20Capital.pdf>; Social capital has also been consistently shown to be associated with improved mental and physical health. See, for example, "Social Capital." UCLA Health Impact Assessment Clearinghouse Learning and Information Center. <http://www.hiaguide.org/sectors-and-causal-pathways/pathways/social-capital>
- 20 Crime figures here cover homicides, violent crimes, robbery, domestic burglary and motor vehicle theft; Most recent data for EU is 2009 and for US is 2010; "Crimes recorded by the police." Eurostat. March 6, 2012. http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=crim_gen&lang=en (accessed September 7, 2012); "State-by-state and national crime estimates by year(s)." Uniform Crime Reporting Statistics. March 29, 2010. <http://www.ucrdatatool.gov/Search/Crime/State/StatebyState.cfm> (accessed September 7, 2012)
- 21 de Sainte Croix, Sarah. "Murder Rates Doubled Since 1980: Daily." *The Rio Times*. December 15, 2011. <http://riotimesonline.com/brazil-news/rio-politics/brazil-murder-rates-doubled-since-1980/>; "Global Study on Homicide 2011." UNODC. 2011. http://www.unodc.org/documents/data-and-analysis/statistics/Homicide/Globa_study_on_homicide_2011_web.pdf
- 22 "Corruption detection rate soars in Moscow." *Russia Beyond the Headlines*. August 5, 2012. http://rbth.ru/articles/2012/08/05/corruption_detection_rate_soars_in_moscow_17050.html
- 23 Crime in India 2011." National Crime Records Bureau. 2012. <http://ncrb.nic.in/CD-CII2011/Statistics2011.pdf>
- 24 Li Lin. "Annual Report on China's Rule of Law No. 8." Social Sciences Academic Press. February 2010.
- 25 Definition of cybercrime: Criminal activity conducted via the Internet is referred as cyber attacks and can take many forms including theft of organizational intellectual property, confiscation of online bank accounts, creation and distribution of viruses, online release of confidential business information and disruption of critical national infrastructure. Definition is taken from "Second Annual Cost of Cyber Crime Study: Benchmark Study of U.S. Companies." Ponemon Institute. http://www.hpenterprisesecurity.com/collateral/report/2011_Cost_of_Cyber_Crime_Study_August.pdf (accessed September 7, 2012); "The Shocking Scale of Cybercrime." Norton. 2011. <http://uk.norton.com/cybercrimereport/promo>
- 26 "National Cyber Security Division US-CERT Overview." US-CERT. <http://www.slideserve.com/akiko/national-cyber-security-division-us-cert-overview>; "Fiscal Year 2011 Report to Congress on the Implementation of The Federal Information Security Management Act of 2002." U.S. Government. March 7, 2012. http://www.whitehouse.gov/sites/default/files/omb/assets/egov_docs/fy11_fisma.pdf; "The Shocking Scale of Cybercrime." Norton. 2011. <http://uk.norton.com/cybercrimereport/promo>
- 27 "FBI Director: Cybercrime Fastest Growing Threat." CIOZone. <http://www.ciozone.com/index.php/Security/FBI-Director-Cyber-crime-Fastest-Growing-Threat.html> (accessed September 7, 2012)
- 28 "The Shocking Scale of Cybercrime." Norton. 2011. This figure is the sum of 10 EU countries available in this paper. <http://uk.norton.com/cybercrimereport/promo>
- 29 Kannan, Shilpa. "India steps up battle against rising cyber crime wave." *BBC News*. May 7, 2012. <http://www.bbc.co.uk/news/business-17950502> (accessed September 7, 2012)
- 30 "Report to the Nations on Occupational Fraud and Abuse." Association of Certified Fraud Examiners. 2010. http://www.acfe.com/uploaded-Files/ACFE_Website/Content/documents/rtnn-2010.pdf; "Report to the Nations on Occupational Fraud and Abuse." Association of Certified Fraud Examiners. 2012. http://www.acfe.com/uploadedFiles/ACFE_Website/Content/rtnn/2012-report-to-nations.pdf
- 31 "Patterns of Global Terrorism 2003." United States Department of State. April 2004. <http://www.state.gov/documents/organization/31912.pdf> and "Country Reports on Terrorism 2011." Bureau of Counterterrorism. July 2012. <http://www.state.gov/documents/organization/195768.pdf>
- 32 "EU Terrorism Situation and Trend Report: TE-SAT 2012." Europol. April 25, 2012. <https://www.europol.europa.eu/content/press/eu-terrorism-situation-andtrend-report-te-sat-2012-1567>; Gunaratna, Rohan. "The Global Landscape of Terrorism 2012." Nanyang Technological University, Singapore. January 2012. <http://www.pvtr.org/pdf/CTTA/2012/CTTA-January12.pdf>

- 33 “Managing the risks of extreme events and disasters to advance climate change adaptation.” IPCC. 2011. http://www.ipcc-wg2.gov/SREX/images/uploads/SREX-All_FINAL.pdf
- 34 Guha-Sapir, D., Vos, F., Below, R., Ponslerre, S. “Annual Disaster Statistical Review 2011.” Centre for Research on the Epidemiology of Disasters. July 2012. http://cred.be/sites/default/files/2012.07.05.ADSR_2011.pdf; “G20 Urges Action to Counter Rising Costs from Natural Disasters.” World Bank. June 16, 2012. <http://www.worldbank.org/en/news/2012/06/16/g20-urges-action-counter-rising-costs-natural-disasters>
- 35 “From Stretched to Strengthened. Insights from the IBM Global CMO Study.” IBM Institute for Business Value. 2011. <http://www-935.ibm.com/services/us/cmo/cmstudy2011/cmo-registration.html>
- 36 Ibid.
- 37 Baldini, G., Sallent, O., Subik, S., Wietfeld, C. “The Evolution of ICT in the Public Safety Domain: Challenges and Opportunities.” International Journal of Disaster Recovery and Business Continuity. Vol. 2. November 2011. <http://www.sersc.org/journals/IJDRBC/vol2/2.pdf>
- 38 “Interoperability Survey.” The United States Conference of Mayors. Homeland Security Monitoring Center. June 2004. http://www.usmayors.org/72ndannualmeeting/interoperabilityreport_062804.pdf
- 39 Paul-Morandini, Olivier. “112: European Emergency Telecommunications.” European Journal of Navigation. Vol. 3. No. 3. August 2005. <http://www.eena.org/ressource/static/files/urgentneed.pdf>
- 40 “The value of smarter public safety and security: Reducing threats, increasing efficiency, delivering prosperity.” IBM Center for Applied Insights. February 2012. <http://public.dhe.ibm.com/common/ssi/ecm/en/gpe12345usen/GPE12345USEN.PDF>
- 41 Walmsley, R. “World Prison Population List, Ninth Edition.” International Centre for Prison Studies. 2011. http://www.prisonstudies.org/images/news_events/wpl9.pdf
- 42 “State of Recidivism: The Revolving Door of America’s Prisons.” The PEW Center on the States. April 2011. <http://i.usatoday.net/news/pdf/Pew%20Center%20on%20the%20States,%20PSPP%20Recidivism%20Report.pdf>; “1996 State Expenditure Report.” National Association of State Budget Officers. April 1997 http://www.nasbo.org/sites/default/files/ER_1996.PDF; “2010 State Expenditure Report.” National Association of State Budget Officers. 2011. <http://www.nasbo.org/sites/default/files/2010%20State%20Expenditure%20Report.pdf>
- 43 Meikle, James. “Prisons holding 7,300 more inmates than they were designed for.” The Guardian. August 28, 2012. <http://www.guardian.co.uk/society/2012/aug/28/prisons-holding-more-inmates?newsfeed=true> (accessed September 7, 2012); “Criminal Justice Statistics Quarterly Update to December 2011.” Ministry of Justice. May 24, 2012. <http://www.justice.gov.uk/downloads/statistics/criminal-justice-stats/criminal-justice-stats-dec-2011.pdf>
- 44 “Brazilian Prison System on Verge of Collapse.” InSight. January 4, 2011. <http://www.insightcrime.org/component/k2/item/398-brazilian-prison-system-on-verge-of-collapse>
- 45 In many OECD countries, even where public safety budgets have been increased, this has failed to keep pace with inflation, resulting in a decline in real expenditures. IBM Institute for Business Value analysis based on comparison of OECD data on Government Expenditure on Public Safety, % change, 2005-2010 and average inflation rate over the same period. See OECD Statistics. Table 11. Government Expenditure by Function. http://stats.oecd.org/Index.aspx?DatasetCode=SNA_TABLE11. Israel, Poland, Portugal, Belgium, Sweden, France, Finland, Netherlands and Norway all increased public safety expenditure, while Denmark, Switzerland, Luxembourg, Slovenia, Austria, Germany, Spain, United States, Italy, Czech Republic, Hungary, UK, Iceland, Estonia and Ireland had a decline in spending.
- 46 “Adapting to Austerity: A review of police force and authority preparedness for the 2011/12-14/15 CSR period.” HMIC. July 2011. <http://www.hmic.gov.uk/media/adapting-to-austerity-20110721.pdf>
- 47 Nakamoto, A. “Fire Chief Addresses LAFD Response Time Data.” University of Southern California. March 20, 2012. <http://www.atvn.org/news/2012/03/fire-chief-addresses-lafd-response-time-data> (accessed September 7, 2012)
- 48 Kovessy, Peter. “2012 Budget: DND, Public Safety hit hardest.” *Ottawa Business Journal*. March 29, 2012. <http://www.obj.ca/Other/Special-Reports/2012-03-29/article-2942826/2012-BUDGET%3A-DND,-Public-Safety-hit-hardest/1> (accessed September 7, 2012)
- 49 “The value of smarter public safety and security: Reducing threats, increasing efficiency, delivering prosperity.” IBM Center for Applied Insights. February 2012. <http://public.dhe.ibm.com/common/ssi/ecm/en/gpe12345usen/GPE12345USEN.PDF>
- 50 Ibid

- 51 Raluca Georgiana POPA. "Borderless Crime - Computer Fraud." Database Systems Journal vol. 3, No. 1. 2012 http://www.dbjournal.ro/archive/7/7_6.pdf
- 52 "IBM SPSS predictive analytics aids offender management." IBM. March 25, 2011. http://www-01.ibm.com/software/success/cssdb.nsf/CS/GREE-8F8M82?OpenDocument&Site=default&cty=en_us
- 53 "City of Madrid: Coordinated emergency response raises public safety to a new level." IBM. August 6, 2012. http://www-01.ibm.com/software/success/cssdb.nsf/CS/JSTS-7ZWSPF?OpenDocument&Site=default&cty=en_us
- 54 "Madison County Sheriff's Department: Fighting crime with critical, real-time information." IBM. March 6, 2012. http://www-01.ibm.com/software/success/cssdb.nsf/CS/CARD-87UPS3?OpenDocument&Site=default&cty=en_us
- 55 "Addison Lee: IBM i2 solutions help the UK's leading taxi service distinguish good passengers from fraudulent ones." IBM. May 2012. <http://www.i2group.com/documents/premium-content/case-studies/us/Addison%20Lee.pdf>
- 56 "City of Rio de Janeiro and IBM Collaborate to Advance Emergency Response System; Access to Real-Time Information Empowers Citizens." IBM. November 9, 2011. <http://www-03.ibm.com/press/us/en/pressrelease/35945.wss>



© Copyright IBM Corporation 2012

IBM Global Services
Route 100
Somers, NY 10589
U.S.A.

Produced in the United States of America
September 2012
All Rights Reserved

IBM, the IBM logo and ibm.com are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. If these and other IBM trademarked terms are marked on their first occurrence in this information with a trademark symbol (® or ™), these symbols indicate U.S. registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is available on the Web at “Copyright and trademark information” at ibm.com/legal/copytrade.shtml

Other company, product and service names may be trademarks or service marks of others.

References in this publication to IBM products and services do not imply that IBM intends to make them available in all countries in which IBM operates.



Please Recycle