Analytics: The real-world use of big data in financial services

How innovative banking and financial markets organizations extract value from uncertain data

*By David Turner, Michael Schroeck and Rebecca Shockley*

"Big data" – which admittedly means many things to many people – is no longer confined to the realm of technology. Today it is a business imperative and is providing solutions to long-standing business challenges for banking and financial markets companies around the world. Financial services firms are leveraging big data to transform their processes, their organizations and soon, the entire industry.

Our newest global research study, "Analytics: the real world use of big data," finds that executives are recognizing the opportunities associated with big data.[1] But despite what seems like unrelenting media attention, it can be hard to find in-depth information on what financial services firms are really doing. In this industry-specific paper, , we will examine how banking and financial markets industry firms view big data – and to what extent they are currently using it to benefit their businesses. The IBM Institute for Business Value partnered with the Saïd Business School at the University of Oxford to conduct the 2012 Big Data @ Work Survey, the basis for our research study, surveying 1144 business and IT professionals in 95 countries, including 124 respondents from the banking and financial markets industries, or 11 percent of the global respondent pool.

Big data is especially promising and differentiating for financial services companies. With no physical products to manufacture, data – the source of information – is one of arguably their most important assets. The business of banking and financial management is rife with transactions, conducting hundreds of millions daily, each adding another row to the industry's immense and growing ocean of data. So the question for many of these firms remains how to harvest and leverage this information to gain a competitive advantage?

We found that 71 percent of these banking and financial markets firms report that the use of information (including big data) and analytics is creating a competitive advantage for their organizations, compared with 63 percent of cross-industry respondents. Compared to 36 percent of banking and financial markets companies that reported an advantage in IBM's 2010 New Intelligent Enterprise Global Executive Study and Research Collaboration, this is a 97 percent increase in just two years (see Figure 1).[2]

Realizing a competitive advantage
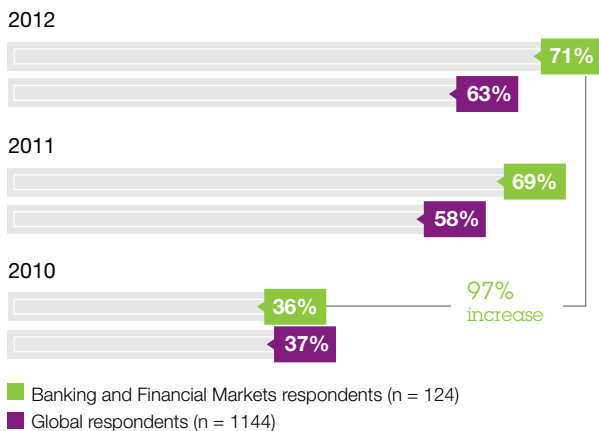
Source: Analytics: The real-world use of big data, a collaborative research study by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford. © IBM 2012

Figure 1: **Financial services companies are outpacing their cross-industry peers in their ability to create a competitive advantage from analytics and information.**

At the same time, these firms are dealing with a very diverse and demanding customer base that insists on communicating and transacting business in new and varied ways, any time of the day or night. While the banking industry's structured customer data is growing in size and scope, it is the world of unstructured data that is emerging as an even larger and more important source of customer insight. Investment bankers, financial advisors, relationship managers, loan officers and countless other front-office employees must have ready access to detailed product and customer information in order to make better and more informed decisions, while also supporting regulatory and compliance reporting requirements.
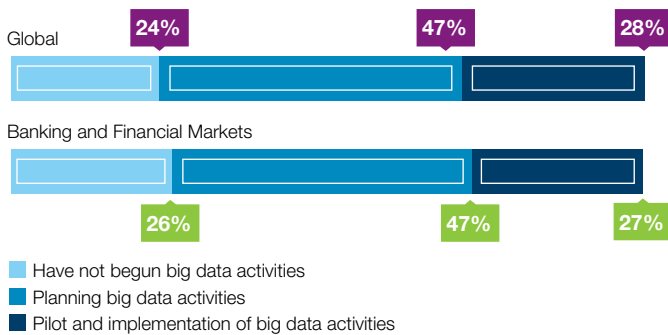
The banking and financial industries are not immune to the growth of social media as their reputations and brands are discussed by customers within their large personal networks. The creation of useful data now stretches well beyond the bank's control.

Further, the study found that banking and financial services organizations are taking a business-driven and pragmatic approach to big data. The most effective big data strategies identify business requirements first, and then leverage the existing infrastructure, data sources and analytics to support the business opportunity. These organizations are extracting new insights from existing and newly available internal sources of information, defining a big data technology strategy and then incrementally extending the sources of data and infrastructures over time.

Organizations are being practical about big data

Our Big Data @ Work survey confirms that most organizations are currently in the early stages of big data planning and development efforts. Banking and financial markets companies are on par with the global pool of cross-industry counterparts. While 26 percent of banking and financial markets companies are focused on understanding the concepts (compared with 24 percent of global organizations), the majority are either: defining a roadmap related to big data (47 percent) or already conducting big data pilots and implementations (27 percent, see Figure 2).

Big data activities

Global

24% **47%** **28%**

Banking and Financial Markets

26% **47%** **27%**

- ■ Have not begun big data activities
- ■ Planning big data activities
- ■ Pilot and implementation of big data activities

Source: Analytics: The real-world use of big data, a collaborative research study by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford. © IBM 2012

Figure 2: **Almost three-quarters of financial services companies have either started developing a big data strategy or implementing big data as pilots or into process, on par with their cross-industry peers.**
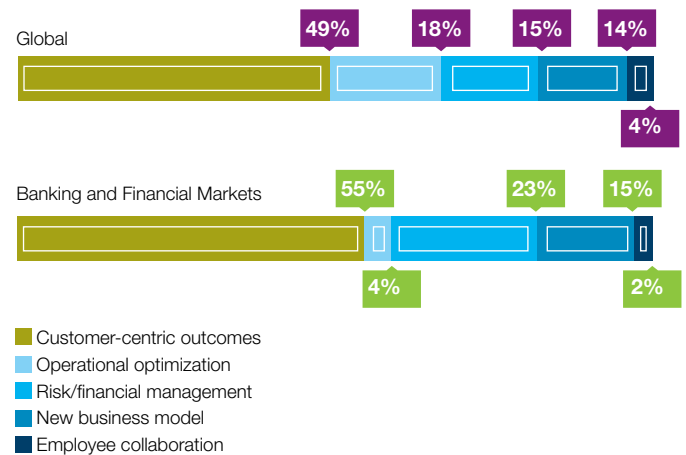
In our global study, we identified the following five key findings that reflect how financial services organizations are approaching big data. For a more in-depth discussion of each of these findings, please refer to the full study, "Analytics: The real-world use of big data."[3] In this industry analysis, we will examine the maturity of banking and financial markets organizations with respective to these key findings, and our top-level recommendations directed at the needs of banking and financial markets companies:

1. Customer analytics are driving big data initiatives

When asked to rank their top three objectives for big data, 55 percent of the banking and financial markets industry respondents with active big data efforts identified customer-centric objectives as their organization's top priority (compared to 49 percent of global respondents, see Figure 3).

This is consistent with what we see in the marketplace, where banks are under tremendous pressure to transform from product-centric to customer-centric organizations. Today, the customer must be the central organizing principle around which data insights, operations, technology and systems revolve. By improving their ability to anticipate changing markets conditions and customer preferences, banks and financial markets organizations can deliver new customer-centric products and services to quickly seize markets opportunities while improving customer service and loyalty.

Big data objectives

Global

49% **18%** **15%** **14%**

4%

Banking and Financial Markets

55% **23%** **15%**

4% **2%**

- ■ Customer-centric outcomes
- ■ Operational optimization
- ■ Risk/financial management
- ■ New business model
- ■ Employee collaboration

Source: Analytics: The real-world use of big data, a collaborative research study by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford. © IBM 2012

Figure 3: **More than half of big data efforts underway by financial service companies are focused on achieving customer-centric outcomes.**

For example, one of the largest banks in the Singapore-Malaysia markets has been widely successful with its customer-focused big data initiatives. The Oversea-Chinese Banking Corporation (OCBC) analyzed historic customer data to determine individual customer preferences. It designed an event-based marketing strategy that focused on a large volume of coordinated, personalized marketing communications across multiple channels and touch points including email, call centers, branches, ATMs, direct mail, text messages and 3G mobile banking.[4]

Today, using marketing algorithms atop a sophisticated analytics infrastructure, OCBC more precisely targets customers based on their activity, yielding double- and triple-digit percentage increases in key customer performance metrics since the program began in 2005. OCBC achieved a positive return on investment (ROI) on its implementation within 18 months.[5] To date with these campaigns, OCBC has experienced a 45 percent increase in overall conversion rates and 60 percent increase in cross-sales. Overall, campaign revenues have increased by more than 400 percent. The bank has also increased its overall marketing productivity and is running over 1,200 campaigns a year – 12 times more than it did before its enterprise marketing management system was installed.[6]

In addition to customer-centric objectives, almost a quarter of the banking and financial markets companies (23 percent) with active big data pilots and implementations are targeting ways to enhance enterprise risk and financial management. These organizations are using big data to optimize return on equity, combat fraud and mitigate operational risk while achieving regulatory and compliance objectives.
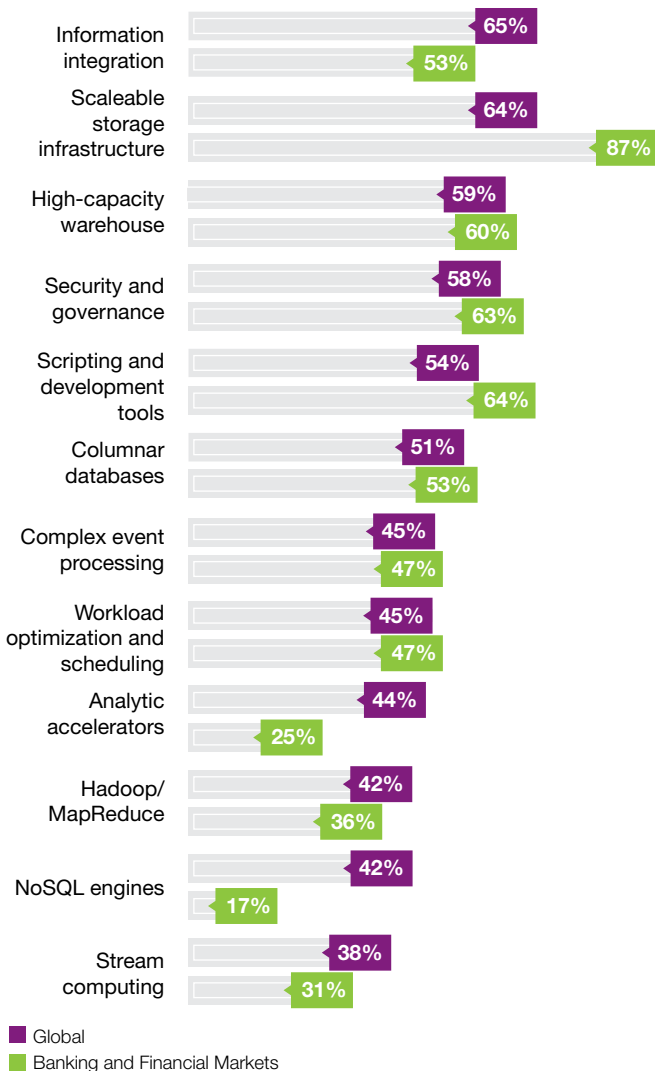
2. Big data is dependent upon a scalable and extensible information foundation

The promise of achieving significant, measurable business value from big data can only be realized if organizations put into place an information foundation that supports the rapidly growing volume, variety and velocity of data. We asked respondents with current big data projects to identify the current state of their big data infrastructures. Only slightly more than half of banking and financial markets companies reported having integrated information, although 87 percent say they have the infrastructure required to manage this growing volume of data (see Figure 4).

The inability to connect data across organizational and department silos has been a business intelligence challenge for years, especially in banks where mergers and acquisitions have created countless and costly silos of data. This integration is even more important, yet much more complex, with big data. About a third of bankers reported Hadoop and stream computing pilots underway, and market activity suggests the pace continues to pick up. Where bankers lag, such as in the use of NoSQL engines and analytic accelerators, reflects the strong skills already in place based on the industry's long history with business intelligence (e.g. SQL programmers) and quantitative modeling.

In other key big data infrastructure components, such as high-capacity warehouse, columnar databases, security, governance and optimization engines, banking and financial markets companies are mostly on par with their cross-industry peers.

Big data infrastructure

Information integration
65%
53%

Scaleable storage infrastructure
64%
87%

High-capacity warehouse
59%
60%

Security and governance
58%
63%

Scripting and development tools
54%
64%

Columnar databases
51%
53%

Complex event processing
45%
47%

Workload optimization and scheduling
45%
47%

Analytic accelerators
44%
25%

Hadoop/ MapReduce
42%
36%

NoSQL engines
42%
17%

Stream computing
38%
31%

■ Global
■ Banking and Financial Markets

Source: Big Data @ Work survey, a collaborative research survey conducted by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford. © IBM 2012

Figure 4: **Financial services companies start their big data efforts with an infrastructure that is scalable and extensible.**

NYSE Euronext, a prominent global stock exchange company, employed big data analytics to detect new patterns of illegal trading. It implanted a new markets surveillance platform that both sped up and simplified the processes by which its experts analyzed patterns within billions of trades.[7] "Everything we do is about analyzing information and looking for a 'needle in a haystack'," says Emile Werr, head of Enterprise Data Architecture and vice president of Global Data Services for NYSE Euronext. "We currently process approximately two terabytes of data daily, and, by 2015, we expect to exceed 10 petabytes a day. So we must select the appropriate technologies to analyze these huge volumes in near real time."[8]

NYSE Euronext reports the new infrastructure has reduced the time required to run markets surveillance algorithms by more than 99 percent and decreased the number of IT resources required to support the solution by more than 35 percent, all while improving the ability of compliance personnel to detect suspicious patterns of trading activity and to take early investigative action, thus reducing damage to the investing public.[9]

3. Initial big data efforts are focused on gaining insights from existing and new sources of internal data

Most early big data efforts are targeted at sourcing and analyzing internal data, and we find this is also true within banking and financial markets companies. According to the survey, more than half of the banking and financial markets respondents reported internal data as the primary source of big data within their organizations. This suggests that banking and financial markets companies are taking a pragmatic approach to adopting big data, and also that there is tremendous untapped value still locked away in these internal systems.

More than four out of five banking and financial markets respondents with active big data efforts are analyzing transactions and log data. This is machine-generated data produced to record the details of every operational transaction and automated function performed within the bank's business or information systems – data that has outgrown the ability to be stored and analyzed by many traditional systems. As a result, in many cases this data has been collected for years, but not analyzed.
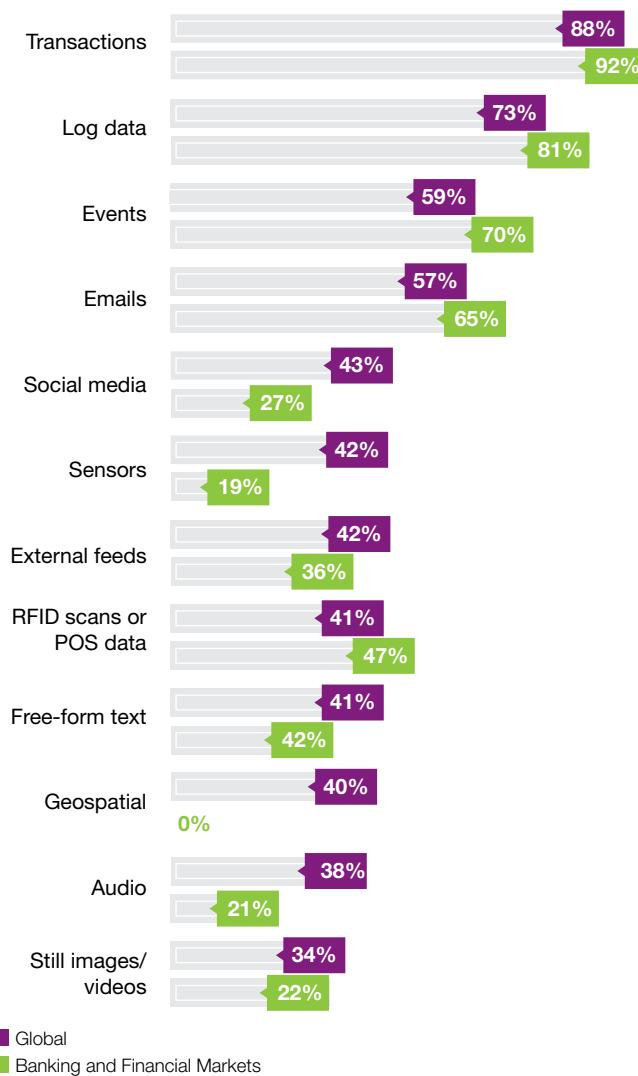
Where banks and financial markets firms lag behind their cross-industry peers is in using more varied data types within their big data pilots and implementations. Slightly more than one in five (21 percent) of these firms is analyzing audio data – often produced in abundance in retail banks' call centers – while slightly more than one in four (27 percent) report analyzing social data (compared to 38 percent and 43 percent, respectively, of their cross-industry peers). Most industry experts attribute this lack of focus on unstructured data to the ongoing struggle to integrate the organizations' structured data (see Figure 5).

4. Big data requires strong analytics capabilities

Big data itself does not create value, however, until it is put to use to address important business challenges. This requires access to more and different kinds of data, as well as strong analytics capabilities that include not only the tools, but the requisite skills to use them.

Most early big data efforts of financial services organizations are targeted at sourcing and analyzing internal data, which suggests a pragmatic approach.

Big data sources

Source	Global	Banking and Financial Markets
Transactions	88%	92%
Log data	73%	81%
Events	59%	70%
Emails	57%	65%
Social media	43%	27%
Sensors	42%	19%
External feeds	42%	36%
RFID scans or POS data	41%	47%
Free-form text	41%	42%
Geospatial	40%	0%
Audio	38%	21%
Still images/videos	34%	22%

■ Global
■ Banking and Financial Markets

Source: Big Data @ Work survey, a collaborative research survey conducted by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford. © IBM 2012

Figure 5: **Financial services companies are focusing initial big data efforts on internal sources of data.**
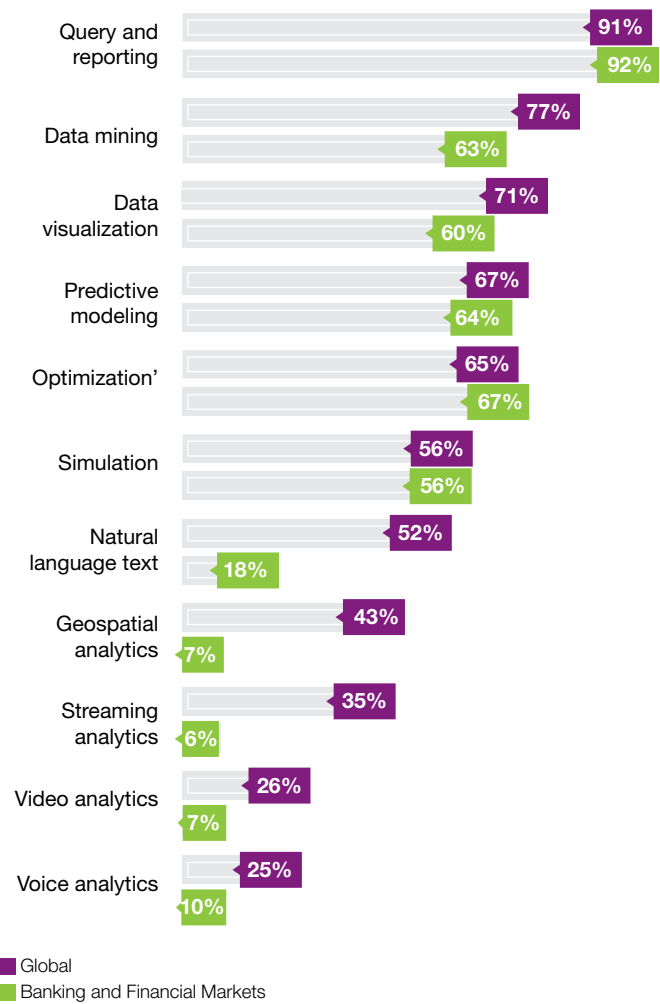
Examining those banking and financial markets companies engaged in big data activities reveals that they start with a strong core of analytics capabilities designed to address structured data, such as basic queries, predictive modeling, optimization and simulations. However, they lag behind their cross-industry counterparts in core capabilities of text analytics and data visualization (see Figure 6).

The need for more advanced data visualization and analytics capabilities increases with the introduction of big data. Datasets are often too large for business or data analysts to view and analyze with traditional reporting and data mining tools. In our study, banking and financial markets respondents said that only three out of five active big data efforts utilize data visualization capabilities.

Big data also creates the need to analyze multiple data types, and this is where banking and financial markets firms lag significantly behind their peers in other industries. In fewer than 20 percent of the active big data efforts, banking and financial markets respondents use advanced capabilities designed to analyze text in its natural state, such as the transcripts of call center conversations. These analytics include the ability to interpret and understand the nuances of language, such as sentiment, slang and intentions, and are often used to bolster efforts to understand behavior and preferences and improve the overall customer experience.

Fewer than one in 10 active big data efforts in banking and financial markets report having the capabilities to analyze even more complex types of unstructured data, including geospatial location data (7 percent), voice data (10 percent), video (7 percent) or streaming data (6 percent). While the hardware and software in these areas are maturing, the skills are in short supply. Additionally, banks are still struggling to monetize these capabilities.

Analytics capabilities

- Global
- Banking and Financial Markets

Capability	Global	Banking and Financial Markets
Query and reporting	91%	92%
Data mining	77%	63%
Data visualization	71%	60%
Predictive modeling	67%	64%
Optimization'	65%	67%
Simulation	56%	56%
Natural language text	52%	18%
Geospatial analytics	43%	7%
Streaming analytics	35%	6%
Video analytics	26%	7%
Voice analytics	25%	10%

Source: Big Data @ Work survey, a collaborative research survey conducted by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford. © IBM 2012

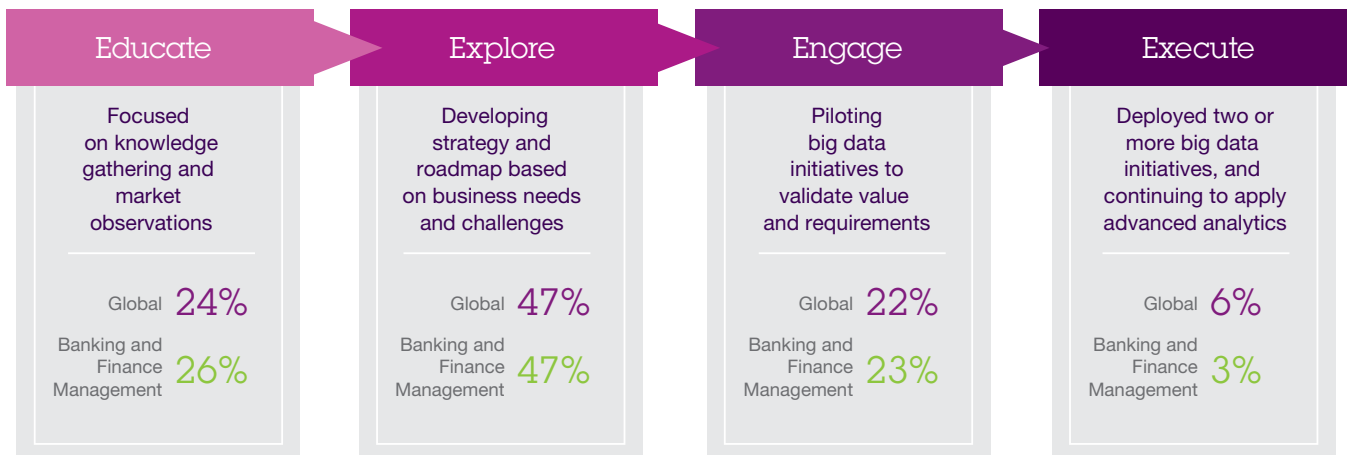*Figure 6:* Financial services companies lag behind their cross-industry peers in key analytics capabilities.

The current pattern of big data adoption highlights banking and financial markets companies' hesitation, but confirms interest too

To better understand the big data landscape, we asked respondents to describe the level of big data activities in their organizations today. The results suggest four main stages of big data adoption and progression along a continuum that we have identified as *Educate, Explore, Engage and Execute.* For a deeper understanding of each adoption stage, please refer to the global version of this study (see Figure 7).

- **Educate** – Building a base of knowledge: 26 percent of banking and financial markets respondents
- **Explore** – Defining the business case and roadmap: 47 percent of banking and financial markets respondents
- **Engage** – Embracing big data: 23 percent of banking and financial markets respondents
- **Execute** – Implementing big data at scale: 3 percent of banking and financial markets respondents.

At each adoption stage, the most significant obstacle to big

Big data adoption

Educate	Explore	Engage	Execute
Focused on knowledge gathering and market observations	Developing strategy and roadmap based on business needs and challenges	Piloting big data initiatives to validate value and requirements	Deployed two or more big data initiatives, and continuing to apply advanced analytics
Global 24%	Global 47%	Global 22%	Global 6%
Banking and Finance Management 26%	Banking and Finance Management 47%	Banking and Finance Management 23%	Banking and Finance Management 3%

Source: Analytics: The real-world use of big data, a collaborative research study by the IBM Institute for Business Value and the Saïd Business School at the University of Oxford. © IBM 2012

Figure 7: **Most financial service companies are either developing big data strategies or pilots, but few have moved to embedding those analytics into operational processes.**

data efforts reported by banking and financial markets firms is the gap between the need and the ability to articulate measurable business value. Executives must understand the potential or realized business value from big data strategies, pilots and implementations. Organizations must be vigilant in articulating the value, forecasted based on detailed analysis when needed and tied to pilot results where possible, for executives to commit to the investment in time, money and human resources necessary to progress their big data initiatives.

Recommendations: Cultivating big data adoption

IBM analysis of our Big Data @ Work Study findings provided new insights into how banking and financial markets companies at each stage are advancing their big data efforts. Driven by the need to solve business challenges, in light of both advancing technologies and the changing nature of data, banking and financial markets companies are starting to look closer at big data's potential benefits. To extract more value from big data, we offer a broad set of recommendations tailored to banks and financial markets firms.

Commit initial efforts to customer-centric outcomes

It is imperative that organizations focus big data initiatives on areas that can provide the most value to the business. For most banking and financial markets companies, this will mean beginning with customer analytics that enable better service to customers as a result of being able to truly understand customer needs and anticipate future behaviors. Financial institutions use these insights to generate sales leads, enhance products, take advantage of new channels and technologies (for example, mobile), adjust pricing and improve customer satisfaction.

To effectively cultivate meaningful relationships with their customers, banking and financial markets companies must connect with them in ways their customers perceive as valuable. The value may come through more timely, informed or relevant interactions; it may also come as organizations improve the underlying operations in ways that enhance the overall experience of those interactions.

Banking and financial markets companies should identify the processes that most directly interact with customers, then pick one and start. Even small improvements matter as they often provide the proof points that demonstrate the value of big data, and the incentive to do more. Analytics fuels the insights from big data that are increasingly becoming essential to creating the level of depth in relationships that customers expect.

Define big data strategy with a business-centric blueprint

A blueprint encompasses the vision, strategy and requirements for big data within an organization. It is critical to aligning the needs of business users with the implementation roadmap of IT. A blueprint defines what organizations want to achieve with big data to help ensure pragmatic acquisition and use of resources.

An effective blueprint defines the scope of big data within the organization by identifying the key business challenges involved, the sequence in which those challenges will be addressed, and the business process requirements that define how big data will be used. It is not meant to "boil the ocean," but rather to serve as the basis for understanding the needed data, tools and hardware, as well as relevant dependencies. The blueprint will guide the organization to develop and implement its big data solutions in pragmatic ways that create sustainable business value.

For banking and financial markets organizations, one key step in the development of the blueprint is to engage business executives early in the development process, ideally while the company is still in the Explore stage. For many banking and financial markets organizations, engagement by a single C-suite executive is sufficient. But more diversified companies may want to tap a small group of executives to cross organizational silos and develop a blueprint that reflects a holistic view of the company's challenges and synergies.

Start with existing data to achieve near-term results

To achieve near-term results while building the momentum and expertise to sustain a big data program, it is critical that banking and financial markets companies take a pragmatic approach. As our respondents confirmed, the most logical and cost-effective place to start looking for new insights is within the organization's existing data store, leveraging the skills and tools most often already available.

Looking internally first allows organizations to leverage their existing data, infrastructure and skills, and to deliver near-term business value while gaining important experience as they then consider extending existing capabilities to address more complex sources and types of data. While most organizations will need to make investments that allow them to handle either larger volumes of data or a greater variety of sources, this approach can reduce investments and shorten the timeframes needed to extract the value trapped inside the untapped sources. It can accelerate the speed to value and enable organizations to take advantage of the information stored in existing repositories while infrastructure implementations are underway. Then, as new technologies become available, big data initiatives can be expanded to include greater volumes and variety of data.

Build analytics capabilities based on business priorities

The unique priorities of each financial institution should drive the organization's development of big data capabilities, especially given the tight margins and regulatory compliance requirements that most banks and financial markets firms face today. The upside is that many big data efforts can concurrently reduce costs and increase revenues, a duality that can bolster the business case and offset necessary investments.

For example, several financial institutions leverage customer insights gleaned from big data to design marketing activities, execute campaigns and capture sales leads across all channels, product lines and customer segments. This can improve relationships and lower the cost of operations while increasing revenues. Others are using big data technologies to enable data integration across channels. This positions them to provide superior and consistent channel user experience, improve customer satisfaction and reduce costs.

Banking and financial markets companies should focus on acquiring the specific skills needed within their own organizations, especially those that will increase their ability to analyze unstructured data and visually represent it to be more consumable to business executives.

Create a business case based on measurable outcomes

To develop a comprehensive and viable big data strategy and the subsequent roadmap requires a solid, quantifiable business case. Therefore, it is important to have the active involvement and sponsorship from one or more business executives throughout this process. Equally important to achieving long-term success is strong, ongoing business and IT collaboration.

Getting on track with the big data evolution

An important principle underlies each of these recommendations: business and IT professionals must work together throughout the big data journey. The most effective big data solutions identify the business requirements first, and then tailor the infrastructure, data sources, processes and skills to support that business opportunity.

To compete in a consumer-empowered economy, it is increasingly clear that banks and financial markets firms must leverage their information assets to gain a comprehensive understanding of markets, customers, channels, products, regulations, competitors, suppliers, employees and more. Financial institutions will realize value by effectively managing and analyzing the rapidly increasing volume, velocity and variety of new and existing data, and putting the right skills and tools in place to better understand their operations, customers and the marketplace as a whole.

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