# *Where have you been all my life?*



*Unlock value from Big Data and Business Analytics*

pwc

# Point of view

## *Executives know that they now operate in a data rich and data complex market and business analytics is a non-negotiable.*

Not wanting to fall behind the competition, business leaders are looking at ways they can embed big data and business analytics into their organisations to deliver more value for their customers and more growth to their shareholders.

As organisations are evolving their analytics maturity, we see the increased adoption of sophisticated analytics tools, techniques and talent starting to impact speed in which growth, innovation and competitive advantage can be achieved.

So, what are the right steps to take to evolve your business?

### *Our view*

We recommend a business led approach to big data, with analytics and technology as key enablers.

Transforming big data into actionable insights requires sophisticated analytics tools, new skills and execution discipline. It also requires leadership support, strategic focus and a fresh perspective or mindset shift in the way a business can operate. Here are five simple steps to get you started.

***Determine if big data is the right answer for your organisation:*** Do not explore emerging technology for the sake of academic blue sky. Assess what the business problem is, whether it is valuable, and if it can be enabled by big data.

***Design and establish a data-enabled organisation:*** It is imperative that organisations take a systematic approach to build a centralised data organisation to foster innovation and agility.

***Establish a business case evaluation:*** Create a framework to consistently evaluate benefits and risks of those big data driven opportunities to ensure they are valuable and aligned with the needs of the organisation.

***Pilot, assess, and operationalise:*** Run research and development experiments on big data opportunities, and operationalise if they add value.

***Evaluate and improve:*** Determine if the opportunity adds the value that was expected, and look for ways to improve the organisation's big data capabilities and architecture.

# *How analytics empowered is your organisation – really?*

Becoming an analytics-empowered organisation means having at the ready, the power of fact-based decision making to assure and improve current business performance and the intelligence and insight necessary to pursue breakthrough innovation.

So, have you got the basics right?

- ❑ Do you have an enterprise information management strategy – is it an explicit part of our business strategy?
- ❑ What tools, techniques and skills are established within the organisation? Are they leveraged across the organisation or within a silo?
- ❑ To what extent are you able to identify the major business opportunities or threats?
- ❑ Who is responsible for nurturing the use of advanced analytics applications to predict the impact of economic and market forces on the business strategy, customers and workforce?
- ❑ Driven by a clear understanding of the business issues and opportunities, how is big data and analytics leveraged to get to the answers required?
- ❑ What actions are taken to identify and integrate internal and external data sources for the most accurate and insightful approach across the enterprise?

## *I want to ...*

1. Use new business models to drive revenue and profitable growth.
2. Know my customers better. Serve my customers better.
3. Embed data-driven decisions across my supply chain.
4. Transform organisation models and workforce strategies with better insights.
5. Nurture a data-driven culture in my organisation to make and take fact-based decisions and actions.

# *Unlock value from Big Data*

***Where have you been all my life?***

***Using Big Data to get new insights and 'intelligence in the moment' enables organisations to make the right strategic decisions, increase revenue and reduce cost.***

***What does Big Data encompass?***

*The term Big Data encompasses large data sets that are rapidly expanding due to the speed and volume in which information can now be stored and produced. Big Data is produced in a variety of formats and can be referred to as structured, semi-structured, and unstructured information. Big data can exist within an organisation or be produced in new channels, such as social media sites or sensory equipment.*[1]

**Processing increasingly large volumes of data in a timely manner has become a major challenge for many organisations.**

The digital era of this century is pushing the envelope for organisations on many fronts—including customer data, capacity, risk measures, market expectations, and operational efficiencies.

**The numbers tell the story:**

- The Big Data market is at **$5.1 billion** this year and is expected to grow to **$32.1 billion** by 2015—and to $**53.4 billion** by 2017.[2]
- We create **2.5 quintillion** bytes of data daily;[3] **90%** of the data in the world today has been created in the last two years alone.[4]
- **62%** of companies believe that Big Data has significant potential to create competitive advantage.[5]

As we see it, the exponential advancement of technology, social media, mobile, and cloud in today's world—combined with relentlessly escalating competitive pressures around the globe—is in turn pressuring companies and governments to rethink the way that they do business. Before they can succeed in gaining a competitive edge in today's dynamic, digital global marketplace, organisations need to evolve into data-centric intelligence. But this is not just about new Big Data. It's also about leveraging traditional sources of data within the organisation.

***Organisations that leverage Big Data to gain insights into their operations, customers, and market opportunities can position themselves for ongoing success. They do this by harnessing the power of intelligence in the moment. But transforming Big Data into actionable insights requires sophisticated analytics tools, skills and execution discipline.***

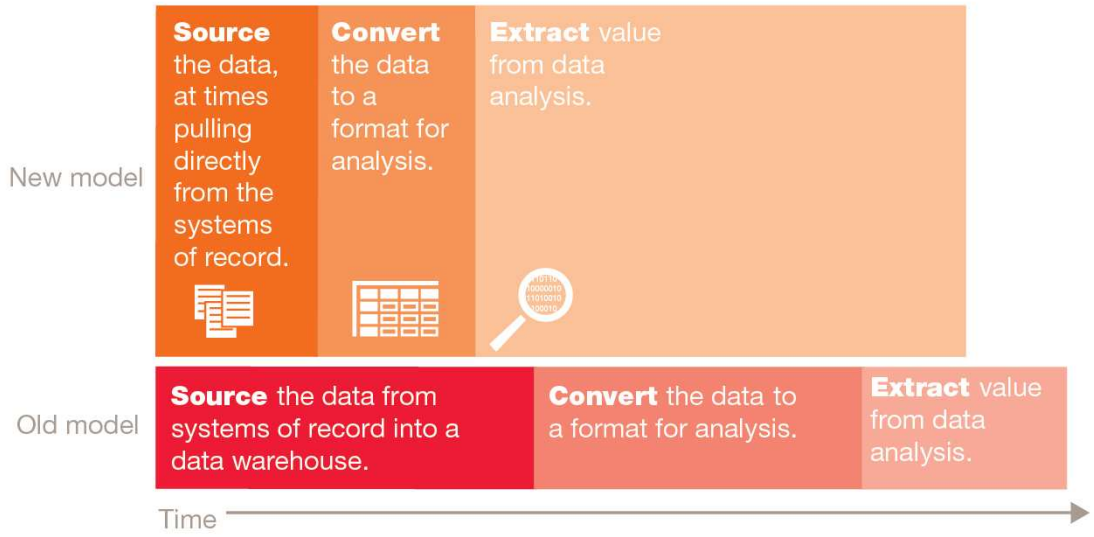
1 PwC, "Capitalizing on the promise of Big Data: How a buzzword morphed into a lasting trend that will transform the way you do business," January 2013, www.pwc.com/us/bigdata.
2 Kyle Alspach, "'Big data' center hack/reduce getting big buzz," November 8, 2012, www.factiva.com, accessed February 5, 2013.
3 Mike Hogan, "Big Data of Your Own," August 2013, www.factiva.com, accessed September 24, 2013.
4 John Adams, "Be Careful or Big Data Could Bury Your Bank," January 25, 2013, www.factiva.com, accessed February 5, 2013.
5 PwC, "Capitalizing on the promise of Big Data: How a buzzword morphed into a lasting trend that will transform the way you do business," January 2013, www.pwc.com/us/bigdata.

***As opposed to more traditional business intelligence systems, Big Data techniques allow organisations to analyse data for patterns more quickly and at a much lower cost.***

**Sophisticated new analytical tools are greatly improving the process by which organisations can analyse Big Data.**

Until recently, organisations that wanted to examine large pools of data needed to devote significant time and resources into organising "structured" data, which may be scattered across several departments and data warehouses, into one location to be indexed, searched, and analysed. In certain cases, some sources of information proved too unwieldy to search, preventing analysis.

Fortunately, advances in technology–including processing power, data warehouse storage, and software–are now enabling speedy organisation of structured data and starting to allow large pools of unstructured data (including previously unavailable sources such as blogs and social media) to be indexed and made searchable in a shorter period of time. In addition, the emergence of sophisticated analytics software tools is enabling organisations to analyse vast stores of Big Data more easily and quickly, using fewer resources in the process.




Note: Big Data enables organisations to spend less time on the first two steps in the diagram above and more time on the third step: Extracting value. Time spent on each step will vary by organisation.

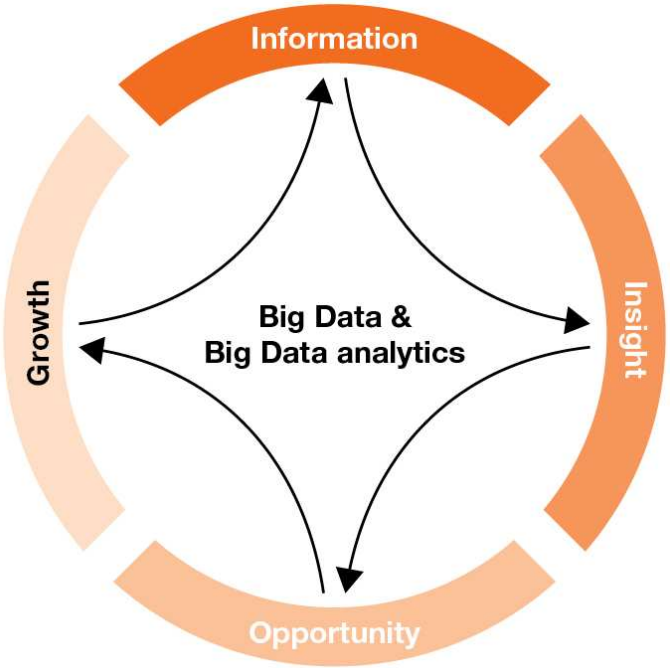
***Trying to unlock the power of Big Data without data analytics is like trying to harness the power of the Internet without a search engine.***

**Without powerful analytics software, organisations cannot unlock the true potential of Big Data.**

Organisations have been doing look-back analysis for years, but generating trends based on historical data is now a very common technique. New software tools on the market today enable organisations to engage in predictive and deep analytics. These tools allow organisations to look forward, helping them to become more competitive and to answer questions such as:

- What do we know and not know about our customers and operations?
- What can we do with this information?
- How can we innovate and transform using this information?

The combination of trend analysis and predictive analytics enabled by Big Data has the potential to be transformative.




**At the root of Big Data lies an important value chain.**

Historically, organisations collected copious amounts of data. However, they were unable to use that data to generate **meaningful information** in a timely manner, which fragmented their view of business **insights**. Because they were unable to develop Big Data analytics and process the data in real time, they had difficulty *predicting and responding* to changing business needs and rising **opportunities**. As a result, business **opportunities** and related **growth** were tied to a much slower roadmap. This value chain is at the foundation of Big Data.

***We have observed three key attributes of Big Data—volume, velocity, and variety—which we refer to as the "3 V's." Traditional data management practices cannot accommodate these attributes.***

***The "3 V's" defined...***

***Volume:*** *The vast quantity of Big Data available—often hundreds of terabytes, or even petabytes of data.*

***Velocity:*** *The speed at which data must be stored and/or analysed—in some cases, up to tens of thousands of transactions per second.*

***Variety:*** *The huge variation in types and sources of new Big Data—from highly structured files to unstructured video and audio information.*

**In the face of fierce competition, growing regulatory constraints, and evolving customer needs, we see organisations seeking new ways of leveraging technology to differentiate themselves and gain efficiencies.**

*Today's organisations require new data management capabilities.*

- **Velocity**: As services such as order management become a commodity, firms have begun to gain a competitive advantage by focusing on the ability to process new information at a faster rate than their competitors.
- **Variety**: Information about an organisation is no longer limited to the structured data generated by the organisation. It varies by source and type. Unstructured social media data—including tweets, status updates, blogs, tags, and videos—is needed to keep up with evolving needs of the customer. Machine to machine data from sensors is an increasing source. Next generation technology needs to be able to manage structured, unstructured, and semi-structured information.
- **Volume**: Complex organisations need the ability to manage a huge amount of data. Many organisations grapple with the need to store large amounts of structured and unstructured data.

When the size of the data deluge exceeds the ability of software tools to acquire, manage, and process data within an acceptable defined duration, organisations need to gear up to accommodate the 3 V's of Big Data.

***Big Data goes beyond the capabilities of traditional data management because it can handle volume, velocity, and variety. That, in a nutshell, is the all-important difference between the two.***

First and foremost, Big Data can handle the 3 V's, while traditional data management practices cannot. Focusing on large-scale data acquisition, **Big Data** requires little organisation, has quick turnarounds for deep analysis, and promotes innovation.

**Traditional data management** practices—such as data warehousing, business intelligence, and master data management—support business operations and focus on creating long-term consistency and trust in enterprise information. But the rise of Big Data need not mean the death of traditional data management practices.

| | Challenges of traditional data management techniques | Big Data differentiators |
|---|---|---|
| **Volume** | • Traditional analytics are often designed to analyse relatively small sample sizes.<br>• Data storage across multiple drives presents problems for traditional techniques.<br>• The cost to analyse large data sets using traditional techniques is too high, both in time and memory. | • Big Data techniques are designed to handle huge amounts of data spread across multiple storage devices and platforms.<br>• Big Data technologies facilitate massive parallel processing for faster access and analytics.<br>• Low-cost storage and cloud storage are becoming more prevalent. |
| **Velocity** | • Rapidly updating data sets require dynamic, real-time analysis that is not available with traditional techniques.<br>• Information management processes need to intelligently decide in real time what data to save and what to discard. | • Big Data techniques that dynamically analyse data in near real-time can efficiently update results based on new information.<br>• Advanced algorithms can identify useful data to keep versus low-value data to discard so as to appropriately address storage needs. |
| **Variety** | • The proliferation of data types and models creates compatibility issues with traditional tools.<br>• The increasing demand for data mash-ups and deep insights challenges traditional data techniques that struggle with non-numerical data. | • Big Data frameworks are designed to accommodate varying data platforms and data models.<br>• Advanced technology stacks are designed to provide insightful analysis on a diverse range of structured and unstructured data sets. |

***Organisations are no longer questioning the need for Big Data. Yet, we see many holding back.***

***IT plays an important role in driving the Big Data initiatives but is not the sole owner of Big Data:***

- *Big Data leads to important business insights that only the business can drive.*
- *The Big Data platform serves as a space for the business to conceive and develop ideas. Once these ideas are determined to be valuable, they can be put into production.*

**Even among those that "get" the Big Data differential and the power and potential that it can deliver when effectively applied, many organisations feel that they are not yet ready to join the Big Data revolution.**

Perceptions of Big Data differ from organisation to organisation. Concerns and questions persist, keeping some from moving ahead to use and enable Big Data tools and technologies.

- Organisations often mistakenly view Big Data as primarily being a technology challenge rather than a business opportunity. In reality, data is created by the business, owned by the business, and used by the business. As the custodian of Big Data, IT is still in the process of figuring out how to gain the buy-in of their business leaders.
- Many organisations are not sure what it will take to translate the flood of information into business insights and intelligence. Additionally, Big Data policies are still evolving in many organisations.
- Some view Big Data exclusively as a technical efficiency play; while that is important, they overlook Big Data's ability to get to the analysis step faster and with greater depth.
- Others are concerned about whether they have the right analytical skills and technologies in place and, if not, whether they will be able to attract the data scientists they need.
- And those that are ready to join the data management revolution are asking where and how to begin transforming data into insights, intelligence, and ultimately, competitive advantage.

Despite these concerns, organisations are recognising that Big Data is the wave of the future, and that they need to gear up to prepare for the surge. In our experience—and as research shows—investment in data management is rapidly increasing among organisations globally.

***We do see industry leaders actively seeking strategies and solutions that will empower their organisations to comply with differing cross-border business initiatives, become more nimble, seize business opportunities, foster innovation, and improve their position in the marketplace.***

***Recognising that Big Data is an innovation that delivers business insights and opportunities, we see leading organisations beginning to utilise the power of Big Data.***

**Leading organisations are now considering how to apply Big Data in ways that are right for their business. These "right movers" are laying the foundation for an innovative Big Data culture that empowers them to learn more, create more, and do more.[1]**

Due to advances in information technology, access to powerful new analytics, innovative system architectures, and declining costs, we see barriers to success beginning to slowly topple. Some leading organisations have begun to apply Big Data to their pressing business issues—reshaping their operations and quickly seeing business results.

Proactive companies are experimenting with harvesting consumer data from social media, blogs, and mobile devices to gain intelligence on customers' changing perceptions, needs, and expectations—and then funneling that information into predictive models to gain insights into customer acquisition, conversion, behaviors, and patterns. In short, organisations are beginning to apply Big Data to generate solid business results, specifically in the customer space.[2]

To effectively leverage data, leading organisations are adopting an enterprise view of data. They are toppling their silos, and units are working together to align themselves with this new initiative. Big Data is seen as a platform to support business operations, as well as a *transformation* achieved through innovation.

***In our view, most industries still has a long way to go in terms of the data management revolution.***

1 PwC, "Capitalizing on the promise of Big Data: How a buzzword morphed into a lasting trend that will transform the way you do business," January 2013, www.pwc.com/us/bigdata.
2 *Ibid*.

## *What does it take to turn information and insights into gold?*

***In our view, collaboration between IT and the business should take place not only at the outset, but also throughout the entire initiative:***

- ***Upfront**—So that the overall needs and objectives are well defined at the enterprise level, not just unit by unit.*
- ***Ongoing**—Throughout the creation, evolution, and ownership of the Big Data initiative.*

*Based on the 2013 PwC Digital IQ survey, companies with collaborative C-suites intertwine business strategy and information technology, and are often rewarded with stronger company performance.[1] They can also adapt quickly to market changes to maintain an advantage over competitors. Approaching Big Data as a business problem is a key factor in realising greater benefits.[2]*

Big Data has the power to transform data into real-time, real-world insights and intelligence, innovation, data monetisation, effective risk management, and other key goals. To that end, we believe that organisations should:

### Upfront

- Recognise that Big Data is not a technology problem. Rather, it is a business opportunity. Look beyond technology challenges and objectives alone to include business needs and goals in their strategy to implement and leverage Big Data.
- Prepare their organisation to face the Big Data storm that is a whirlwind of data, technology, skills, business models, and economies. The analyst community will need to shift their thinking to ask new or different questions, and IT will need to shift its role from primarily data movers to idea enablers.
- Educate their business leaders around both the *value* and the *how-to* of making Big Data-driven, fact-based business decisions. Relying on "gut instinct" can result in erroneous actions that can be very costly in terms of poor return on investment (ROI) and competitive positioning in the marketplace.

### Ongoing

- Be prepared to fail early and dispose of unused data that is not adding value.
- Recognise that Big Data technologies are still evolving and require careful and ongoing needs assessments.
- Rather than focusing solely on external data, strive to achieve the benefits of Big Data by combining third-party data with internal data assets. While most companies are, for the most part, not yet buying third-party Big Data information, we recommend moving in that direction—especially for capabilities such as sentiment analysis.
- Look at Big Data as an *enterprise asset* that should be leveraged to create opportunities using analytics. With Big Data, firms can break ground in new areas by gaining deeper insights into the business they think they already know.
- Leverage Big Data to think globally and act locally. Collect and analyse information from across regions and divisions, and use insights to improve the enterprise and local organisations.

1 PwC, "PwC's 5th Annual Digital IQ Survey: Digital Conversations and the C-suite," February 11, 2013, www.pwc.com/us/digitaliq.
2 *Ibid*.

## *How can organisations apply Big Data to take advantage of opportunities and solve problems?*

***A real-life example of Big Data's power to transform an institution.***

*Working with PwC, the risk management function of a major financial institution quickly developed and deployed a solution to better manage portfolio risk. Due to high volumes of data, the solution demanded increased computing power to manage, store, and analyse data quickly in support of dynamic business needs. By adding powerful low-cost computers over the course of the year, the risk management function was able to quickly and cost-effectively scale its Big Data solution to effectively manage very large volumes of data while conducting enhanced analyses more quickly than ever before. By doing this on its own, the risk management function was able to lighten the burden on the IT function.*[1]

The nature and complexity of analytics have migrated from simple to advanced analytics, such as predictive modeling and deep analytics. These tools and techniques present distinct opportunities for most organisations—especially when it comes to *customer impact, operational efficiency, and risk management*.

**Customer data monetisation**: Gaining a *360-degree view of the customer* is a critical success factor for organisations striving to compete effectively in today's rapidly evolving marketplace. Organisations should apply the combined power of Big Data and deep analytics. By getting customer buy-in, organisations can integrate *external unstructured* data sources (social media and correspondence) into their traditional *internal structured* data sources (transaction records, product catalogues, loyalty, etc.).

**Operational efficiency**: In the past, it was difficult for the operations team to perform the analysis required at the level required—simply because it was difficult to process huge volumes of data in almost real time. But today, operations managers and service groups have the ability to optimise capacity and yield, improve workforce productivity and deliver superior profitability by leveraging Big Data.

**Risk management**: Increasing global regulatory risk and reporting requirements are requiring today's organisations to store transactional data for longer periods of time and to hone their ability to report across geographies despite disparate databases and technology platforms. Faster access to large amounts of unstructured and structured data is vital. They also need to protect the privacy of customer data and increasing threats of cyber attack.

To actively measure, monitor, and mitigate risk, organisations with global footprints need to stay on top of their enterprise risk across markets, geographies, and counterparties. They must be able to integrate and analyse data from disparate sources on demand to see that activities stay within their defined risk thresholds.

For a deeper example of Big Data applications, please refer to pages 16–20.

1 PwC, "Capitalizing on the promise of Big Data: How a buzzword morphed into a lasting trend that will transform the way you do business," January 2013, www.pwc.com/us/bigdata.

***Organisations that successfully transform Big Data into insights and intelligence—and at the same time adopt a more flexible mindset so as to make the most of Big Data's capabilities—will position themselves to reap significant benefits in key areas.***

| Topic | | Key benefits of Big Data |
|---|---|---|
| **Customer data monetisation** | Customer centricity | Organisations with multiple touch points can apply Big Data to develop a single view of the customer, which can promote delivery of an enhanced customer experience and, in turn, improve branding and increase revenues. |
| | Customer value | Organisations can also apply Big Data to analyse product profitability, behaviour profiles, spending habits, and cultural segmentation—thereby gaining a 720-degree view of the customer that will enhance both customer and business value. |
| | Customer retention | Using Big Data, organisations can analyse their internal customer logs and social media activity to generate indications of customer advocacy or dissatisfaction, allowing time to act. |
| | New products and services | Social media analytics generated from Big Data can be leveraged in various stages of new products and services—from conceptualisation to launch. Organisations can use Digital innovation to ascertain pre-launch sentiments and expectations to effectively define marketing strategies. |
| **Operational efficiency** | Operational effectiveness | Organisations can leverage root cause data analytics to identify process improvement. New tools allow larger data sets to be matched in near or real time to identify (and often predict) optimal network management, capacity bottlenecks, fleet efficiency, service delivery and cost behaviour. |
| | Workforce productivity | Organisations can use Big Data to improve workforce planning, optimise field workforce and deliver analytics capability. In addition, a Big Data-based culture of innovation empowers workers to learn more, create more, and do more. |
| **Risk management** | Risk management | Increased regulatory focus requires organisations to manage enterprise risk across multiple risk dimensions. Big Data can enable market events across geographies to be captured in real-time via unstructured data sources such as news, research, graphs, audio, visuals, and social media. Data assurance provides more comfort. |
| | Cyber prevention | Increasing sharing of data assets and technology change increases the risk of cyber threat. Data security can be used to identify and protect key data assets. Technology can be used to monitor and remediate unauthorised access to mitigate financial risk. |

***Organisations are finding it challenging to enable data-oriented business capabilities with Big Data, but are finding ways to overcome these barriers.***

| Barriers to adoption | Big Data solutions |
|---|---|
| Confusion around which problem Big Data is intended to solve. | Define a business statement that will describe the Big Data vision; characterise how it will be used to create new capabilities and improve existing ones. |
| Lack of the right tools; or having too many tools in-house for Big Data. | Understand what technology is intended to solve which business problem, and standardise. Develop and deploy common infrastructure execution environment(s). |
| It is unclear how to determine if the capability will deliver value once implemented. | Measure value realisation in small segments and in each step. Consider risks early-on in the Big Data planning process. If it is going to fail, fail fast and discard the capability if it is not delivering value. |
| Undefined or ill-defined data policies. | Create a data policy that addresses how long certain types of data should be retained, who should be allowed to see it, and the appropriate field of use. |
| Unpreparedness to drive a shift in organisational mindset. | Think through the ways that the business model, processes, and people skills will need to change. Develop the Big Data capability, and coordinate efforts so it will add value when applied. |
| Big Data is viewed as an IT problem. | For Big Data to be successful, IT must collaborate with the business so that the insights pursued and gained are relevant to the overall business strategy. |
| Fear of expensive vendor led programs. | Take a business led approach and beware the hype. Prove up value with use case pilots before automating to scale. |
| Concern that past data investments are not fully utilised or connected across silos. | Conduct an inventory of data assets, tools and capability. Execute on the process and organisational changes to get more out of existing assets and infrastructure. |

## *Where do I begin?*

**It is important to begin with a real-world view of Big Data—what it is and what it isn't.**

Most organisations still struggle to integrate the data they have collected over the years. Realistically, Big Data alone will not solve that problem—*but enabling Big Data will reveal opportunities and lead to potential solutions.*

**Before investing in Big Data, first consider whether your organisation is already using its existing data effectively.**

***Does your organisation currently:***

- ***Collect*** *the data you need?*
- ***Analyse*** *what you need?*
- ***Discard*** *what you do not need?*
- ***Distribute*** *what adds value?*

If the answers to these questions are *yes*, then all systems are go for launch. It's time to start your engines.

**PwC's framework for response provides the structure of a well-defined approach to Big Data.**

1. **Determine if Big Data is the right answer for you**: Do not explore emerging technology for the sake of academic blue sky. Assess what the business problem is, whether it is valuable, and if it can be enabled by Big Data.
2. **Design and establish an organisation**: It is imperative that organisations take a systematic approach to build a centralised data organisation to foster data innovation and agility.
3. **Establish a business case evaluation:** Create a framework to consistently evaluate benefits, risks, and strategic alignment of Big Data implementations.
4. **Pilot, assess, and operationalise**: Run research and development experiments on Big Data opportunities, and operationalise if they add value.
5. **Evaluate and improve**: Determine if the opportunity adds the value that was expected, and look for ways to improve the organisation's Big Data capability.

***Despite the concerns and complexities surrounding the adoption of Big Data, doing nothing is not an option for most organisations.***

**To remain relevant, and compete effectively amid a new era of data management, organisations must rethink the way they manage the data deluge. Those that sit back and do nothing will leave major opportunities on the table. These organisations will be unable to:**

- Generate insight from documents, news, graphs, Interactive Voice Response (IVR), emails, internal data (such as payment information) and external data (such as social media).
- Process data that is growing exponentially in terabytes, petabytes, or even exabytes.
- Leverage their significant data assets.
- Maximise the value of technology investments.
- Leverage internal data across businesses, geographies, and IT platforms to better manage enterprise level risk.
- Predict business needs to grow and generate higher revenues based on proprietary data.
- Leverage insights from analysing relationships with customers and patterns of behavior to get out in front of competitors.
- Listen to customers and markets before someone else does.
- Achieve sustainable top-quartile cost efficiency relative to similar organisations.

# *A deeper dive*

***Financial services institutions as a case study – B2C, B2B, multi-product, multi channel, high volume, risk focused***

## *Financial institutions can leverage Big Data to improve customer impact across multiple channels.*

***Projected benefits:***

- *Greater focus on customer centricity.*
- *Improved customer risk analysis.*
- *Higher customer retention.*
- *Improved ability to introduce new products and services.*

### Common challenges

Financial institutions are seeking ways to achieve more focused marketing. The global adoption of Web 2.0 transformed consumer behavior and created new opportunities for marketing in online banking. However, there is a multitude of customer information that is not being leveraged to its true potential, including;

- Online banking service channels—customer service, credit card payments, consolidated bank statements, account management, and Interactive Voice Response (IVR) logs—that contain a wealth of information about customers.
- Know Your Customer (KYC) regulatory requirements, which are often seen only as a cost of doing business and not used for additional benefits.
- Marketing campaigns, which rely heavily on business executive heuristics and customer information available to the public.
- Payments and statement-related transactions, which are extensive, but only used as a historical record.

### Possible Big Data approach

- Leverage Big Data technology to extract unstructured information from IVR and customer service systems, and combine it with the power of social media.
- Use Big Data distribution technologies to integrate data from both traditional sources (such as internal structured data) and new sources (such as social media and customer correspondence).
- Perform predictive analytics on payment and statement information to forecast buying patterns.

### Potential value to the organisation

- More relevant proprietary marketing campaigns and product recommendations.
- Better service to clients due to improved utilisation of integrated data from online delivery channels.
- More robust customer profiles for improved customer micro-segmentation.
- More effective front-office customer engagement.

***Financial institutions can use Big Data to make fact-based investment decisions by improving the trade lifecycle and managing risks related to structured products with underlying loans.***

***Projected benefits:***

- *Real-time trade governance.*
- *Detailed historical market data to power algorithm trading and analytics.*
- *Improved insight into organisational intelligence.*

## Common challenges

Investment banks underwrite, buy, and sell mortgage-related products such as mortgage-backed securities (MBSs), collateralised loan obligations (CLOs), and collateralised mortgage obligations (CMOs), also known as secured loans. But fast-managing macro and micro parameters around interest rates, the declining housing market, and escalating regulatory constraints made managing credit risk on such products a challenge. As IT platforms have become unable to address the issue, financial institutions are seeking opportunities to build efficient predictive models to measure and monitor the performance of secured loans.

Retail banks also have large branch networks. As demographics and digital engagement changes, banks seek opportunities to optimise the branch network, shift to lower cost digital channels, prioritise capital expenditure and drive cost savings.

## Possible Big Data approach

- Develop and deploy a distributed "compute farm" that uses commodity hardware to execute mortgage models.
- Create functionality that allows a mortgage analyst to submit a model for processing, both on demand and in batch form.
- Integrate data throughout the lifecycle of the loan—from origination, to servicing, to close—for better quality and consistency.
- Model the future branch network to optimise the footprint, predict shifts in product profitability and focus capital investment.

## Potential value to the organisation

- Shorter processing times and the ability to process a high volume of trades.
- Value-based risk management. Smarter and faster investment decisions.
- Efficient analytical platforms that reduce processing costs.
- Reduced technology, operations and capital spend.

***Financial institutions can leverage market and pricing data to manage enterprise risk across markets, geographies, and counterparties.***

***Projected benefits:***

- *Improved risk management that incorporates multiple data sources.*
- *Efficient and responsive regulatory reporting.*

## Common challenges

Institutions struggle to integrate large volumes of transactional data into real-time market data and aggregate global positions, pricing calculations, and the Value-at-Risk (VaR) crossing capacity of current systems. They also struggle to assess counterparty exposures in near real-time and amass unstructured market data to calculate market risk. These institutions operate in a dynamic economic environment further stressed by ongoing regulatory changes, emerging market trends, and declining economies. These challenges necessitated IT improvements, which further expose the institution to risk and related costs.

## Possible Big Data approach

- Use Big Data distribution technologies to integrate both structured and unstructured data from firm-wide sources.
- Measure risk and exposures by applying Big Data to integrate external market data into internal transaction data.
- Develop stress strategies, and perform parallel simulations.
- Build dynamic data structures to increase agility when faced with changing compliance and reporting requirements.

## Potential value to the organisation

- Insights from an “on demand” enterprise risk view.
- Front-office efficiency and productivity in conducting VaR testing and generating outputs via dashboards.
- Faster analytics to track anti-money laundering, counterparty exposure, cash management, and fraud.
- Improvements in operational efficiency, funding projections, and collateral management.
- The ability to model derivative contracts for structured products and deal management using hypothetical data.

# *Example: How can the financial services industry use Big Data?*

| | Asset management | Banking | Capital markets | Insurance |
|---|---|---|---|---|
| **Customer data** | • Sentiment analysis-enabled sales forecasting<br>• Sentiment analysis-enabled lead/referral management<br>• Quality of leads analytics<br>• Closed loop marketing campaigns<br>• Investment product distribution channel effectiveness<br>• Micro-segmentation<br>• Sentiment analysis-enabled brand strategy management<br>• Cross-asset class product impact analytics<br>• Fund price discovery analytics | • Client experience closed feedback loop<br>• Customer life event analytics<br>• Next best offer<br>• Real-time location based offerings<br>• Sentiment analysis-enabled sales forecasting<br>• Sentiment analysis-enabled lead/referral management<br>• Micro-segmentation<br>• Customer gamification<br>• Sentiment analysis-enabled brand strategy management | • Sentiment analysis-enabled sales forecasting<br>• Sentiment analysis-enabled lead/referral management<br>• Closed loop marketing campaigns<br>• Sentiment analysis-enabled brand strategy management | • Micro-segmentation<br>• Closed loop marketing campaigns<br>• Sentiment analysis-enabled brand strategy management<br>• Client experience closed feedback loop<br>• Customer life event analytics<br>• Next best offer<br>• Real-time location based offerings<br>• Sentiment analysis-enabled sales forecasting<br>• Sentiment analysis-enabled lead/referral management<br>• Customer needs sentiment analysis |
| **Operations & transactions** | • Best trade templates<br>• Log analytics<br>• Real-time capital calculation<br>• Operational data store (ODS) consolidation<br>• Trading sentiment analysis<br>• Time series data management | • IVR analysis<br>• Business-to-business (B2B) merchant insight<br>• Real time capital calculation<br>• Log analytics<br>• ODS consolidation<br>• Branch network optimisation | • Time series trade data management<br>• Real-time margin calculation<br>• Log analytics<br>• Over-the-counter (OTC) contract optimisation<br>• ODS consolidation<br>• Trading sentiment analysis | • Customer experience analytics<br>• Log analytics<br>• ODS consolidation<br>• Claim leakage/increased payout analytics<br>• Field workforce planning |
| **Risk management** | • Centralised data and cyber risk management<br>• Counterparty risk management<br>• Reputational risk management<br>• Anti-money laundering | • Centralised data and cyber risk management<br>• Management information systems (MIS)/regulatory reporting<br>• Disclosure reporting<br>• Real-time conversation keyword tracking<br>• Anti-money laundering<br>• Indirect risk exposure analytics<br>• Reputational risk management | • Centralised data and cyber risk management<br>• Counterparty risk management<br>• Insider trading analytics<br>• MIS/regulatory reporting<br>• Disclosure reporting<br>• Reputational risk management | • Centralised data and cyber risk management<br>• Social media customer behavior fraud analytics<br>• Reputational risk management |

# *Competitive intelligence – what others are doing*

***Financial services institutions as a case study - our observations of industry practices.***

***In our experience, few financial institutions have figured out how to truly integrate Big Data into their organisation, but leading firms are taking the first steps.***

| | Financial institution 1 | Financial institution 2 | Financial institution 3 | Financial institution 4 |
|---|---|---|---|---|
| **Organisation profiles** | Sales and Trading and Wealth Management divisions of a large investment bank. | Capital arm of global conglomerate with focus on retail finance, mortgages, corporate debt, and funding. | Commercial banking business of a large financial services conglomerate. | The Institutional Transactions division of a large asset management firm. |
| **Assessment of Big Data** |  The departments are assessing Big Data as an opportunity, and have already taken steps toward implementing Big Data solutions. |  The departments assess Big Data as the way to solve some specific business problems, such as compliance, and have taken some steps toward implementation. |  The organisation is assessing which business opportunities can be resolved. |  The organisation views Big Data as an opportunity and is planning to move ahead with an assessment in the near future. |
| **Analytical models** |  The institution is looking into ways to marry Big Data sources with their analytics and build analytical models. |  The organisation is looking into building analytical models using proprietary data. There is no focus on market or social media. |  The organisation has started an assessment for new avenues of information and their value to business. |  The organisation has not yet considered new sources of information for analytical models. |
| **Commitment to Big Data** |  The needs of the department trump the needs of the enterprise. |  The firm is committed to make each entity data driven but is still lacking organisation-level commitment. |  The enterprise has invested in a Chief Data Office that focuses on the strategy and execution of data-driven projects. |  The organisation is still trying to determine how to make data-driven versus heuristic decision making, but some departments leverage analytics extensively. |

## *In our experience, few financial institutions have figured out how to truly integrate Big Data into their organisation, but leading firms are taking the first steps (continued).*

| | Financial institution 1 | Financial institution 2 | Financial institution 3 | Financial institution 4 |
|---|---|---|---|---|
| **Human capital** | The organisation has the right skill set for experimenting with new technologies, and has set up an organisational structure for Big Data initiatives. | The organisation has not only a good mix of in-house technical and functional talent, but it also has good partnerships with consulting firms to bring in new talent related to Big Data initiatives. | The organisation has not thought about what roles would be needed to enable the Big Data capability in detail. | The organisation has recently invested in an emerging technologies group to evaluate new technology options and will set up an organisational structure for Big Data initiatives. |
| **Analytics techniques** | The organisation has highly qualified analysts who leverage sophisticated infrastructure to run complex models. | The organisation has analysts who perform look-back analytics, but not predictive analytics. | The organisation has highly qualified analysts who leverage sophisticated infrastructure to run complex models. | The organisation has a large staff focused on advanced look-back and predictive analytics, but they are not able to run complex models. |
| **Evaluating new technologies** | The organisation is constantly evaluating new technologies it can leverage to be more competitive. Also, it has built capabilities by hiring experienced personnel and the organisation plans to scale up for implementation in the near future. | There is a technology research group reporting to the CIO, which constantly evaluates new technologies from technical, operational, and value perspectives, and they are able to scale their new technology for implementation. | The organisation is evaluating new technologies, but has not adopted anything yet. | The organisation is evaluating new technologies, but has not adopted anything yet. |
| **Benefit and costs monitoring** | One division has a mature chief data office with cost control and benefits realisation monitoring capabilities. The organisation plans to establish an enterprise-wide cost monitoring capability. | The organisation has good processes to monitor costs and return on investment (ROI) during initial periods, but lacks feedback mechanisms for improvements. | Currently, no control is in place to monitor benefits realisation. | The organisation has project management controls to monitor costs. Benefits realisation is measured only indirectly. |

# *A framework for response*

***Our recommended approach to the issue.***

## *A well-defined approach to Big Data consists of five steps.*

| | Upfront | | | Ongoing | |
|---|---|---|---|---|---|
| | **Determine if Big Data is the right answer for you.** | **Design and establish a Big Data organisation.** | **Establish business case evaluation.** | **Pilot, assess, and operationalise.** | **Evaluate and improve.** |
| **Actions** | Identify potential Big Data opportunities (for example, need for product/servicer differentiation, need for customer intimacy).<br><br>Determine if Big Data has been used previously to solve the problem in question.<br><br>Determine whether these opportunities align with the organisation's current and future goals, culture, and appetite for risk and innovation. | Develop Big Data organisational structure and confirm that the Big Data goals align with firm goals.<br><br>Determine current state of appropriate skill sets within the organisation and how the Big Data team would integrate with current structure and strategy. Assess recruitment, training and partnering needs. | Determine costs, request funding to establish a Big Data organisation, and execute on the approved ongoing initiatives.<br><br>Outline benefits to the organisation.<br><br>Detail risks and alternatives.<br><br>Promote strategic alignment with goals of the organisation.<br><br>Help prioritise proposed initiatives.<br><br>Establish key performance indicators (KPIs) to be measured. | Enable opportunity with Big Data by running pilots.<br><br>Assess potential business value.<br><br>Determine if any valuable insight was found in exploration and if the opportunity met or exceeded expectations.<br><br>If met/exceeded, determine how to capitalise on future opportunities.<br><br>If not met/exceeded, determine alternate approach.<br><br>Automate successful pilots to scale. | Keep current with Big Data industry trends and themes.<br><br>Continually incorporate improvements into Big Data capability. |
| **Outputs** | Foundational goals and objectives of Big Data opportunity. | Alignment of Big Data organisation with enterprise.<br><br>Identification of resources with the right skill set.<br><br>Identification of execution partners. | Opportunity prioritisation.<br><br>Resource allocation. | Go/no-go decision on opportunity.<br><br>Executed and embedded solutions. | Value stemming from Big Data solution.<br><br>Constantly maturing Big Data capability. |


# *Determine if Big Data is the right answer for you.*

## Does your organisation have business issues or opportunities that point to Big Data?

- Have competitors recently adopted Big Data to leapfrog ahead?
- Have business unit leaders initiated projects where they need new types of business intelligence analysis?
- Is the organisation able to monitor its image on social media?
- Would specific lines of business benefit from Big Data-enabled analysis?

## Is Big Data the right way to solve your problems?

- Does your institution have the right resources to quickly and easily analyse its vast stores of data?
- Do the challenges your business faces lend themselves to proven applications of Big Data, such as pattern recognition, predictive modeling, time series analysis, or visualisation?

## Is Big Data a good fit for your organisation?

- Does your organisation have a culture and appetite for risk and innovation?
- Does your institution have the right resources to quickly and easily analyse its vast stores of data?
- Do some of your departments leverage analytics extensively?
- Does your institution have the right skill set for experimenting with new technologies?
- Does your organisation have experience in evaluating new technologies from technical and operational perspectives in addition to measuring their value?

# *Design and establish a Big Data organisation.*

**Big Data adoption can be likened to a perfect storm of data, technology, business management, and economics. Adopting a systematic approach is critical for Big Data initiatives, as is building a centralised data organisation to foster data innovation and agility. Analytics can be performed in the business units (decentralised) however should be aligned to a common data model and strategy.**

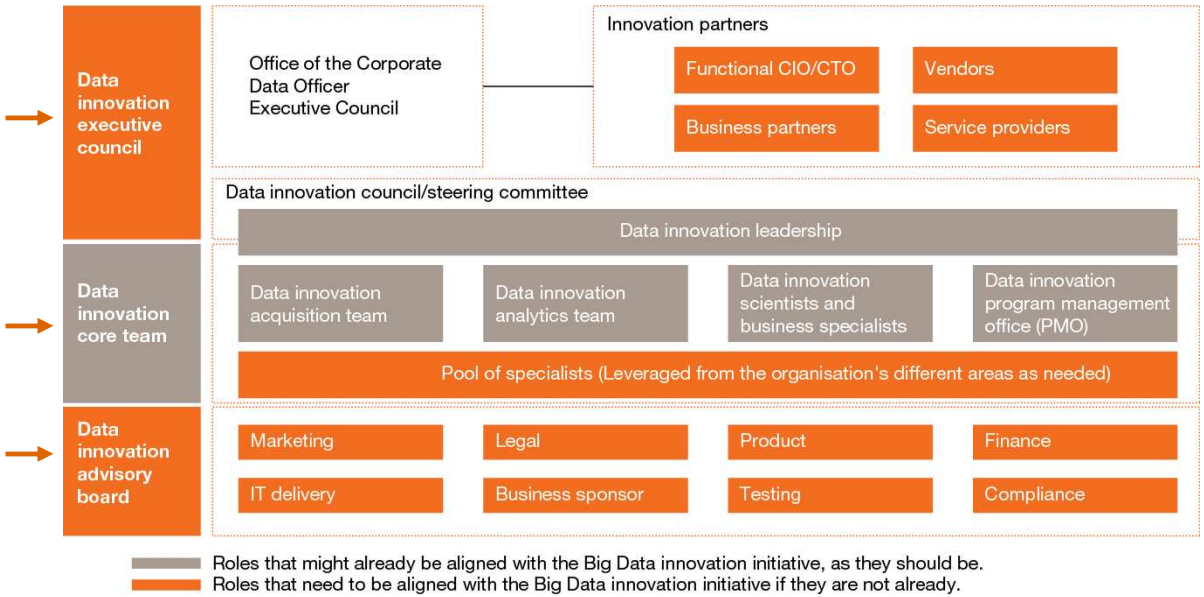
It is critical that the Big Data organisation is led by an Executive Council, has a core solution team, and is governed by strong guiding principles. This team should have a vision of how Big Data can transform the organisation. The Executive Council would help to formalise a strategy and facilitate business decisions.

A core development team, composed of business strategists, data scientists, and data architects, should focus on delivering solutions.

**Guiding principles:**

- Insulated, but not isolated.
- Emphasise experimentation and learning.
- Ideas should be based on qualified business values.
- Leverage ecosystems and partnerships.
- Innovation cannot be constrained by heavy processes and compliance.
- Test fast, fail fast, adjust fast.

## Example: Big Data talent organisation



# *Build a standard business case model with which to evaluate Big Data pilot opportunities.*

**Big Data organisations need to promote and foster innovation, and shift the focus away from immediate needs. As such, they should establish a business case framework to:**
**(a) assess potential business value;**
**(b) promote strategy alignment;**
**(c) help prioritise, in a sustainable way, proposed Big Data initiatives; and**
**(d) measure KPIs.**

The business case framework defines the sponsors, rationale, risks, investments, benefits, users, stakeholders, resources, and required services.

The framework will serve as a funnel for Big Data opportunities and help to establish that opportunities align with business goals.

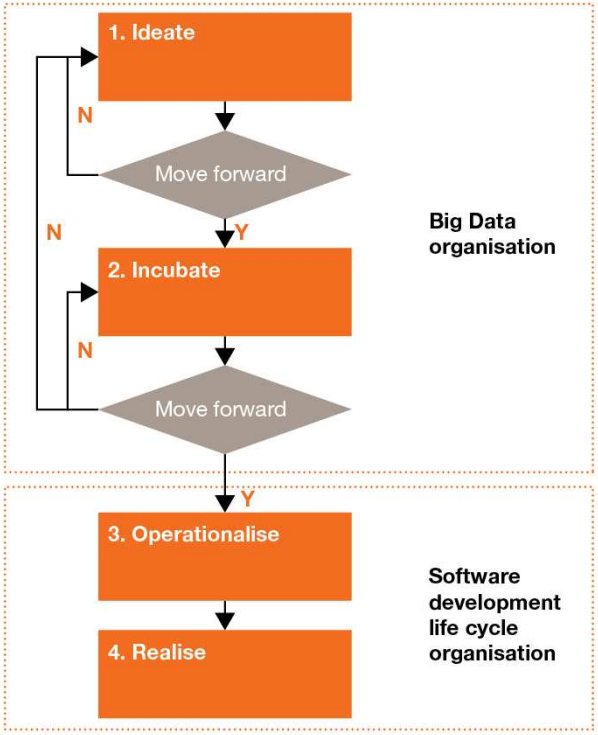
Use organisational drivers as inputs into the decision-making process along with horizontal (for example, cost takeout, growth) and functional (for example, products, customers) drivers to assess and prioritise the opportunity.

The specific value of the initiative may not be known at this time, but the goal is to make sure the direction of the initiative is valuable and aligned with the needs of the organisation.

This phase is **intended to be a very high-level and quick activity** that will determine if moving forward with the opportunity is directionally a good idea. Business executives, IT executives, and architects should be involved in the assessment.

# *Pilot, assess, and operationalise.*

**By adopting and implementing a business-oriented approach to Big Data, an organisation can improve performance and IT investments, and have better success at achieving business strategy. A well thought-out Big Data approach consists of the following steps.**



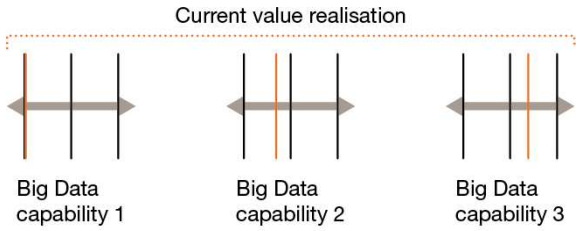

1. **Ideate**—Once the business problem has been vetted in the D*etermine if Big Data is the right answer for you* and the business case has been defined and prioritised in the *Design and establish a Big Data organisation* phase, brainstorm potential technical solutions that will enable the capability.
   - If the idea is viable with the given technology and skill set, move on to the next step.
   - If the idea is not realistic, continue brainstorming alternative solutions.
2. **Incubate**—Create a small-scale execution environment to conduct proof of concept (POC) activities on ideas that passed the Ideate step. Any data needed to conduct the POC will be made available. Work with the business units to confirm if value is realised.
   - If value is realised, then move on to the next step.
   - If value is not realised, consider alternative ways to code the solution or consider alternative ideas.
3. **Operationalise**—Transition the POC developed in the Incubate step to the standard software development process. Promote the solution from the development to the production environment, and meet with your production support team to work out how the solution will be maintained once it is in production. Execute and embed the solution into processes.
4. **Realise**—Realise the value of the capability and operate it in production. The business can now use the features implemented, and the capability is owned and maintained by the production support team.

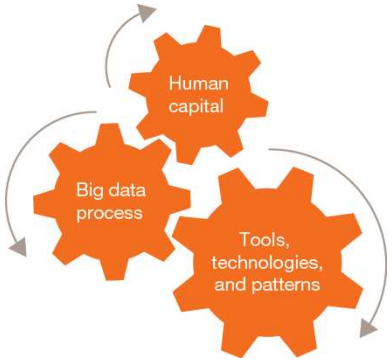
Note: Steps 1 and 2 are owned by the Big Data organisation so that innovation momentum is not thwarted. Steps 3 and 4 are owned by the organisations involved in the software development life cycle (SDLC), and the capability must abide by the required guidelines.

# *Evaluate and improve.*

**Measuring the value of Big Data initiatives keeps the organisation focused and aligned with the needs of the enterprise. Without this step, firms run the risk of adopting new technologies without having anything to show for them in the end.**

**Determine if Big Data capabilities are delivering value by continually monitoring performance. To continuously improve Big Data capabilities, focus on improving performance by taking action in response to staff feedback and market trends.**




Big Data is a rapidly evolving domain that is not as mature as many of the other data management domains. There is significant opportunity to improve the Big Data capability, as most organisations are at a relatively low level of maturity.

Once in production, the capabilities should be reevaluated on a regular schedule (for example, quarterly, annually) to measure progress until either full value is realised or it is determined that full value realisation is not needed.

Existing implemented architecture should occasionally be reevaluated to determine if the architecture can be improved.

Employees should have the right mix of on-the-job training and formal education, so that their Big Data knowledge is up to date with the rest of the industry.

As the Big Data capability matures in an organisation, how the capability is enabled should also be assessed to understand steps that should be added, removed, or improved.

# *How can PwC help*

***Our capabilities and tailored approach.***

## *What makes PwC's Data Analytics and Consulting practice so distinctive.*

| | |
|---|---|
| **Integrated global network** | With 34,000 industry-dedicated professionals worldwide, PwC has a network that enables the assembly of both cross-border and regional teams. PwC's large, integrated global network of industry-dedicated resources means that PwC deploys the right personnel with the right background on our clients' behalf, whenever and wherever they need it. PwC's Consulting practice has a specialist data analytics team with dedicated connected centres of expertise in the United States, United Kingdom, Australia and India. |
| **Extensive industry experience** | PwC serves organisations across the Financial Services, Government, Energy and Resources, Retail and FMCG, Health, Telco, Transport and Logistic sectors. As a result, PwC has the extensive experience needed to advise on the portfolio of business issues that affect your industry, and we apply that knowledge to our clients' individual circumstances. |
| **Multidisciplinary problem solving** | PwC's Consulting service teams include specialists in strategy, customer experience, operations, people and change, analytics, cyber security, digital change, technology and risk management. This multidisciplinary approach allows us to provide support to corporate executives as well as to key line and staff management. We help address business issues from client impact to product design, and from go-to-market strategy to operating practice, across all dimensions of the organisation. We excel at solving problems that span the range of our clients' key issues and opportunities, working with the heads of business, risk, finance, marketing, customer, innovation, operations, and technology. |
| **Practical insight into critical issues** | PwC believes in strategy through execution. We recognise that operational factors not technology factors typically inhibit the adoption of information advantage and Big Data. Our business led approach is focused on decisions and outcomes with technology as an important enabler. In addition to working directly with clients, our practice professionals regularly produce points of view on the critical issues that face each industry. These publications—as well as the events we stage—provide clients with new intelligence, perspective, and analysis on the trends that affect them. |
| **Focus on relationships** | PwC helps organisations and individuals create the value they are looking for. We are a member of the PwC network of firms with 180,000 people in more than 158 countries. We are committed to delivering quality in consulting, assurance, tax and deals services. |

## *Our Big Data service offerings.*

### Big Data innovation

Develop information-driven innovation models by defining new processes and then creating an operating model – using existing data sources as well as outside data sources to discover new insights.

- **Executive workshops:** Educate and identify opportunities for Big Data through a catalyst workshop.
- **Innovation operating model design:** Establish the processes and capabilities for innovation using Big Data.
- **Outside-in data innovation:** Identify outside data sources that are impactful for improved insights.
- **On-demand analytics:** Pilot the use of a Big Data source to prove out value.

### Big Data strategy

Identify and define business capabilities that are enabled through improved insights achieved through Big Data, and develop a roadmap for execution.

- **Capability strategy and roadmap:** Identify the capabilities required for Big Data and conceptual architecture; develop roadmap.
- **Information strategy:** Create a cohesive information strategy for realising traditional and Big Data insight capabilities.
- **Risk and governance:** Develop approach for managing risks with Big Data and establish overall governance.

### Big Data design

Architect solutions that create scalable harvesting of large data sources into Big Data solutions that interlock with existing analytical solutions.

- **Opportunity prototyping:** Use a pilot case to test Big Data design. Set up the infrastructure, data provisioning, and analytics to jump-start corporate Big Data capabilities – and then evaluate if the opportunity is worth significant investment.
- **Solution design:** Develop Big Data solutions, which can then be used for construction, including tool selection and request for proposal.
- **Platform architecture:** Develop an overall platform architecture for Big Data.

# *PwC's broader Business Analytics capabilities.*

## Insight Analytics

- Customer insights
- Price analytics
- Promotion effectiveness
- Predictive analytics
- Value discovery (data insights)
- Market and policy analysis
- Productivity analytics & cost modelling
- Workforce optimisation
- Root cause analysis

## Operational Execution

- Project and change management
- Test and learn analytics
- App development
- Technology program management
- Benefits realisation
- Process redesign
- Cost reduction execution
- Benefits tracking
- Complex modelling

## Data Protection

- Ethics and privacy
- Data risk assessment
- Data governance review
- Cyber security

## Enterprise Information Management

- Information management strategy
- Big Data Strategy
- Content management strategy
- Analytics maturity assessment
- Analytics organisation design
- BI operating model design
- Analytics training

## Business Intelligence

- Data discovery and proof of concept
- BI and analytic tool selection
- BI solution design
- BI implementation

## Data Assurance

- Digital audit
- PwC certified audit approval
- Data visualisation

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