An Introduction to Big Data

How a buzzword morphed into a lasting trend that will transform the way you do business

March 2014
Your competitors may already be staking out ‘first mover’ advantage

**Highlights**
- Big Data is not a fad but defines a goal of transforming data into insights and intelligence that are delivered to those who need it, when and where it’s needed, to make and implement better strategic and operational decisions.
- Advances in analytical techniques, information technology and declining technology costs are driving the growing use of Big Data.
- Small pilots can quickly demonstrate the potential of Big Data and weed out lower priority ideas to enable companies to make intelligent decisions about where to focus additional investments.
- Leading companies have used Big Data to generate insights that lead to competitive advantage. Organisations that delay the journey risk being leapfrogged by more data-savvy competitors.

Big Data is about much more than data. It represents a new way of doing business – One that is driven by databased decision-making and new types of products and services enriched with data.

The early results are in: Big Data is already transforming the way businesses are run. We see this in our work with PwC clients, who are leveraging Big Data to gain new insights into customers, products, markets and more. Additional evidence of the power of Big Data can be found across industries and in both private and public sectors. The concept of Big Data is not new. What is new are the massive volumes of enterprise-generated and third party data now available (including real-time data streamed from mobile devices) and the emergence of sophisticated tools to organise, manage and analyse the data.

By applying analysis of Big Data to pressing business issues, companies are reshaping their operations – And accelerating their business results. As its potential becomes more evident, Big Data will transform every aspect of the organisation, from strategy and business model design to marketing, product development, HR, operations and more. Over time, organisations will become far more data-driven in how they make decisions, develop products and services, and interact with customers, employees and stakeholders at all levels. Companies that move quickly to capitalise on the potential of Big Data will often gain ‘first mover’ advantage, enabling them to innovate in ways that are difficult to replicate.

**Organisations that delay starting the Big Data journey risk being leapfrogged by more data-savvy competitors.**

**PwC’s 5th Annual Digital IQ survey**

62% of information technology and business executives surveyed by PwC believe that Big Data has significant potential to create business advantage

**Three key challenges**
- Survey respondents also acknowledged three key Big Data challenges
  - 58% indicated that transitioning from data to insight is a major challenge
  - 41% noted that their systems cannot process large volumes of data from different sources
  - 25% said they lacked the talent to undertake deep analysis of Big Data

---

1. PwC’s 5th Annual Digital IQ survey was conducted in September and October of 2012. 1,100 executives participated in the global survey.
Defining the promise of Big Data

Big Data attributes: The four V’s

Big Data has often been described by its attributes – Notably, volume, velocity, variety and veracity.

- **Volume and velocity** refer to the sheer quantity of Big Data available – Often hundreds of terabytes, or even petabytes of data – And the speed at which data must be stored and/or analysed, which could reach tens of thousands of transactions per second in some cases.

- **Variety** refers to the huge variation in the types and sources of Big Data, from highly structured files to unstructured video and audio information.

- **Veracity** refers to the level of quality and trustworthiness that can be ascribed to a data set.

The term ‘Big Data’ encompasses structured, semi-structured and unstructured information created inside a company or available for sale by commercial data aggregators and for free by governments – From demographic and psychographic information about consumers to product reviews and commentary; blogs; content on social media sites; and data streamed 24/7 from mobile devices, sensors and tech-enabled devices.

What’s more important than its definition is what Big Data promises to achieve: the goal of **intelligence at the moment**. Effectively used, Big Data can transform data into insights and intelligence, delivered when and where they’re needed to make and implement better strategic and operational decisions. For the vast majority of organisations, having access to the right information at the right time and place – to interact with customers, build new products, improve customer service and more – is not yet a reality. Limitations in skills, storage costs, tools, connectivity, quality and availability have made the goal unobtainable – until now.

Today new kinds of technology, powerful analytics (and data scientists who can apply them), and novel system architectures are emerging to enable companies to unlock the value in Big Data, to transform the data into insights that help them to address complex strategic and operational challenges – and in many cases, to gain competitive advantage. For organisations that already process vast amounts of data, such as retailers, banks and direct marketers, applying these new tools and skills may unlock additional value in existing stores of data.

**Intelligence at the moment**

Transforming data into insights and intelligence, delivered when and where they’re needed to make and implement better strategic and operational decisions.
Businesses are mining Big Data for insights that create competitive advantage

Internet pioneers led the way

In the use of Big Data, applying it to reshape their business models, and in many cases, to upend the competitive landscape of entire industries. Today, companies in a broad range of industries are applying Big Data to generate better business results. Some examples:

Financial services

Leveraging Big Data and related analytical techniques, an Asia Pacific bank analysed a portfolio of 30 million complex cash flow instruments across 50,000 different scenarios in less than eight hours.

A leading global bank reduced loan default calculation time from a few days to a few hours across its portfolio of over 10 million mortgages, enabling the bank to identify high-risk accounts much more quickly and allowing risk to be more accurately forecast and hedged as necessary.

A major life insurance company recognised that as the Internet advances – Along with customer needs and preferences – Its traditional direct model of insurance underwriting and distribution could be threatened. Using Big Data, the company used predictive analytics to ‘model’ the life insurance market, resulting in dramatic changes in how it markets, sells, underwrites and distributes its products.

Financial firms are harnessing consumer data from social media, blogs, and mobile devices to determine sentiments and feed predictive models for customer acquisition, conversion, behaviours and patterns.

Media and advertising

Big Data has enabled media companies of all types to gain a ‘single view’ of their customers, including their interests and buying habits. This knowledge, when combined with new mobile content delivery channels, allows new product development, content and promotion to be narrowly focused – Resulting in improved sales and margins.

Micro targeting of advertising to individuals or small cohorts has increased the value of ad impressions by orders of magnitude while creating new business models and companies.

Healthcare

Medical devices provide real-time data on patient wellbeing, allowing medical professionals to monitor patient health in real time – and deliver improved medical care at lower cost.

Using Big Data, healthcare providers are now able to perform analyses of clinical experiences and outcomes never before possible. This data can be correlated with vast amounts of research data to generate rapid advancements in medical treatment.

Technology and communications

A software company with millions of customers uses Big Data to better understand how its customers use its products and services. Leveraging Big Data insights, the company has modified its software development in order to enhance the customer experience by improving product usability and friendliness. Analysis of real-time usage patterns allows service specialists to help customers before the customer even perceives a usability problem.

Sophisticated time series analyses of customer behaviour allowed a mobile telecom company to detect formerly unknown predictors of customer churn, and through proactive account management, to lower the churn rate for those customers by over 30%.
Advances in analytical techniques and information management technology are driving the use and possibilities of Big Data

Big Data is changing the fundamentals of how information is managed and analysed. Just ten years ago, the largest datasets were in the hundreds of terabytes, but in today’s Big Data environment, it is not unusual for Fortune 100 companies to deal with datasets in the dozens or even hundreds of petabytes. Limitations in analytical tools made timely and meaningful analysis of large datasets difficult.

Today, increasingly sophisticated information management and analytical tools can manage massive volumes of data at price points that are an order of magnitude lower than they were a few years ago. At the same time, the cost of computing power has declined dramatically. Today, inexpensive hardware that is capable of performing massively parallel computing can be purchased at an electronics store, and software makes it easy to scale by simply adding low-cost computers or moving peak loads, or all loads, to cloud environments.

As an example, working with PwC, the risk management function of a major financial institution quickly developed and deployed an internal cloud in order to better manage portfolio risk – And do so without the help of the IT department. 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 low-cost computers at the rate of 60 per working day and over 15,000 over the course of the year, the risk management function was able to quickly and cost-effectively scale their Big Data solution to effectively manage very large volumes of data while conducting enhanced analysis more quickly than ever before.

More broadly, the emergence of powerful, low-cost analytical tools and computer technology enables companies to mine Big Data to identify emerging trends and develop unique insights that were impractical or impossible to generate just a few years ago. These insights can translate into better, faster, smarter business decisions – and can drive the development of breakthrough products, reveal hidden markets, and spark other innovations that give companies a competitive edge.
Big Data pilots can launch your journey

While business and IT executives recognise the potential of Big Data within their organisations, even some leading companies are not certain where to begin the Big Data journey. In our view, an effective way to begin is by launching a pilot, which does not require a substantial investment of time or money.

**Identifying a business issue to explore**

The primary challenge is to identify a pressing business issue to address through the pilot, and to secure sponsorship within the organisation. The most successful pilots are tailored to the unique needs of the organisation; no one size fits all.

For instance, a pharmaceutical company wanted to increase sales of a mature product line that had been essentially flat over three years. By creating a pilot that mashed up internal sales data with external data about dental offices, dental product consumption, demographics and dental claims, PwC helped to reveal a mismatch between product demand and distribution, and pinpointed geographic areas the company could focus on to boost sales. The pilot produced a sizable sales increase and resulted in modifications to the sales management process relative to more mature products.

**Rapid experiments**

Big Data solutions sometimes focus solely on external data, but the true value of Big Data often comes from combining third party data with internal data assets. Some of the most valuable pilots leverage the wealth of existing data locked in data warehouses, log files and transactional systems. Quickly aggregating without the need for extensive data modelling and pre-processing creates an environment in which rapid experiments can be conducted. With the right analytical tools, data can be aggregated on the fly and mined to reveal new patterns and relationships that yield insights into how to improve the business.

An effectively designed and executed pilot can quickly demonstrate the potential of Big Data to generate insights needed to improve innovation, boost customer loyalty, support profitable expansion, or achieve other business goals – and often, to gain a competitive edge. The results of pilots will provide the direction needed by management to determine where to make the next incremental investment.

**What if...?**

*Imagining the desired outcomes of exploring Big Data can provide the inspiration to begin the journey. Start the process by asking questions, such as...

- What if we knew more about our customers’ or even the total population’s medication history and lifestyle? We might determine why some customers switch to our competitor’s drug.
- What if we could monitor the response to our products and competitor products in real time across social media channels? We could use this knowledge to refine existing products and develop new ones that are even more relevant. We could also rapidly respond to any positive or negative issues that surface.
- What if we could combine the huge volumes of data we have about our customers, products, pricing, promotion and locations across all product categories and brands? We could develop a ‘single view’ of our customers and personalise offers, pricing and promotions based on individual preferences and locations.
- What if we could analyse the shopping behaviour of our loan applicants? We may be able to assess risk more accurately than a credit score does.
- What if we could use data from sensors that track the performance, wear and tear of machinery critical to our production process? We could proactively schedule critical maintenance to minimise disruption and cost.
- What if we could automatically collect and process large volumes of data from an array of sources, including currency transaction reports, suspicious activity reports, negotiable instrument logs, and other unstructured data from Internet-based activity? We could better monitor anti-money laundering while complying with complex banking laws and regulations.
- What if we could capture and analyse 100% of our trade activity in real time? We could monitor compliance with greater confidence and ease, while reducing regulatory cost and burden.
Questions and answers

Is Big Data a one-time technology initiative or solution?
Big Data should be viewed as a goal rather than a specific set of technologies or a solution. The goal is that any piece of information from any source that is relevant to a decision, product, service or interaction is available when and where it’s needed. Limitations in skills, storage costs, tools, connectivity, quality and availability have made this goal unobtainable until now.

Why haven’t more companies begun to explore the possibilities of Big Data?
Most organisations are still in the learning phase. Many don’t yet understand how they will generate value from Big Data, how they will convert the data into insights they can use to improve the business.

We’ve heard several companies say they are not actively exploring Big Data because they lack the technology and/or analytical skills necessary. As the use of Big Data and its related technologies have matured, consulting services and packaged solutions are increasingly available to address these issues.

For companies that are new to Big Data, what is the best way to begin exploring its possibilities?
Because Big Data is broad in scope, each organisation will need to determine how to best apply it. For most companies, the best way to proceed toward the promise of Big Data is by launching one or more pilots to explore particular business decisions and new technologies. A quick, low-cost pilot can be launched to test the viability of using Big Data before a major investment is required.

One of the most fruitful areas for exploration in a pilot is any issue having to do with improving the customer experience. Companies that use Big Data to gain a deeper understanding of their customers’ buying habits, preferences, and buying experience, by combining face-to-face and online interaction data with third party demographics and social media, can gain insights that lead to innovative new products or services or new ways of doing business that strengthen customer loyalty. Many examples of first mover advantage have resulted from learning more about customers.

Over time, more experiments can be conducted, and these will provide further guidance, helping the organisation to build knowledge that will gradually reshape the way it does business. Eventually larger investments will be needed to realise the full potential of Big Data, and change management will have to be addressed as data-driven decision-making becomes more embedded in operations. But the important point is to get started on the journey now, before competitors secure a first mover advantage that may be difficult to overcome.

How important is the role of third party Big Data?
Many companies operate largely on internal data stored across industry-specific systems, ERP and CRM systems, and data warehouses. This internal data helps companies to operate more efficiently. But it represents only a tiny fraction of the potential data that organisations could access to make the next leap in performance. Third party Big Data adds tremendous richness to the information available to improve the business. By combining and mining internal and external data, companies can gain new perspectives and insights into business issues that they could not generate by exploring internal data alone.

Will Big Data impact our existing IT investments?
Depending on the size and structure of new or expanded Big Data datasets, new organisations, management, access and analysis tools may be required. Some organisations may be content to use existing data integration and BI tools while others with very large datasets may find new categories of tools more appropriate.

Big Data will impact the IT infrastructure as new datasets are utilised. IT leaders will need to evaluate storage and access options across many traditional and private/public cloud options. Some third party data providers will stretch existing enterprise network and security approaches.

With these changes also comes the need to develop or acquire new skills and to implement enhancements to management and governance practices to address new data sources, vendors, volumes and speed.

Are new risks introduced with Big Data?
Big Data poses a variety of risk issues. While many may be familiar, some are new, such as the reliance on third party data. Risks often include those associated with storage and retention of large volumes of data, data ownership and quality, information security, reputational risks and various regulatory requirements including privacy issues. Effectively managing these risks will require companies to revisit governance structures and frameworks in order to allow for the effective and timely identification and assessment of risks in order to make informed risk/reward decisions. Risk issues should be considered early in the Big Data planning process, including in the design and evaluation of pilots.
Putting Big Data to work – How PwC can help

PwC can help you quickly explore Big Data opportunities. We provide strategy, technology, analytical and implementation support to help you put Big Data to work now. PwC can help you assess, anticipate and manage changes in culture, people and processes necessary to deploy sustainable Big Data solutions.

Contacts

David Doyle
Partner
T: +44 (0) 7738 845304
E: david.j.doyle@uk.pwc.com

Dominic Knight
Partner
T: +44 (0) 7768 764242
E: dominic.g.knight@uk.pwc.com

Claudio Di Nella
Partner
T: +44 (0) 7968 426646
E: claudio.dinella@uk.pwc.com

For more information, please visit www.pru.co.uk/technology

This publication has been prepared for general guidance on matters of interest only, and does not constitute professional advice. You should not act upon the information contained in this publication without obtaining specific professional advice. No representation or warranty (express or implied) is given as to the accuracy or completeness of the information contained in this publication, and, to the extent permitted by law, PricewaterhouseCoopers LLP, its members, employees and agents do not accept or assume any liability, responsibility or duty of care for any consequences of you or anyone else acting, or refraining to act, in reliance on the information contained in this publication or for any decision based on it.

© 2014 PricewaterhouseCoopers LLP. All rights reserved. In this document, “PwC” refers to the UK member firm, and may sometimes refer to the PwC network. Each member firm is a separate legal entity. Please see www.pwc.com/structure for further details.