The Connected Business

Wednesday March 26 2014

www.ft.com/reports | @ftreports

Illustration: Øivind Hovland

Inside »

On FT.com »

Big data sparks cultural changes

Workers at all levels will have to overhaul their approach to decision making, says *Richard Waters*

It only takes a quick internet search of the terms "UPS" and "telematics" to understand why the promised benefits of big data are likely to take longer to arrive than many have been led to believe.

Among the links to technology information sites and Teamsters Union web pages is a comment from a blogger known as Denverbrown.

Addressing drivers for the US parcel delivery service UPS, it sums up the mood of workers who sometimes find themselves at the sharp end of new technologies like this: "The system should be known as Harassamatics. They tell you it's about safety, and seat belts . . . It's all about stealing your break time for their profit, and harassing you into a heightened state of frenzy about your job."

Big data is facing its human moment. Many companies have ambitious plans to use data to make operations more efficient, build stronger relationships with customers or develop new revenue streams. But it will not count for much if they are not ready for the revolution ahead.

Five years after it started installing sensors to monitor its vehicles and using GPS to track their movements, UPS launched one of its most ambitious technology projects: a system capable of handling the massively complex task of optimising the routes taken by its tens of thousands of drivers. No matter how impressive the technology, it is only as good as the people who use it.

"For the first time in their 100-year history, they can make real-time routing decisions about picking something up and dropping it off," says Tom Davenport, a US management expert and author, most recently, of *Big Data*

Continued on Page 3

Executives tune into online chatter to analyse public's views

Social media

Clever techniques can find out what people really think about businesses, reports *Jane Bird*

People discussing products on social media tend to be more truthful than when they are responding to customer surveys, says Craig Hepburn, global director of digital and social media at Nokia, the Finnish technology group.

In traditional consumer surveys, people may say things they think researchers want to hear, but Mr Hepburn says: "Raw data from online conversations . . . give a more accurate reflection of what people genuinely think."

The problem is the sheer volume of data and the fact that much is transient and trivial. Twitter's 500m daily tweets account for less than half the deluge generated by social networks, blogs, forums and content sharing services, says Nick Halstead, founder of DataSift, which helps companies understand big data.

The most popular way of identifying useful information is sentiment analysis – simply counting the number of positive and negative comments. But this is like polling everyone regardless of demographic, Mr Halstead says.

"To make sense of the situation you need to understand who is saying what. Does the conversation relate to a marketing campaign or a website that can't be accessed, and is it urgent?"

Jonathan Opperman, senior solution specialist, UK & Ireland, at SAS, the business intelligence company, agrees sentiment analysis on its own is unhelpful. "If you just count the most frequent words, you get rubbish. This is why so many businesses have become sceptical about the usefulness of social media data."

To work, the process needs to be aligned with part of a business, such as marketing, customer service, reputation, loyalty programmes, merchandising and branding.

To meet the challenges, social media analytics software attempts to learn the nuances of language that people use when discussing specific topics. This is done by collecting sample data from several thousand previous online conversations.

Linguists use this to build "dictionaries", or taxonomies, that help analytic software realise that when people discuss big companies they often use sarcasm. Words such as 'like', 'love' and 'good' are not always positive. If an organisation wants to assess what people are saying about its corporate reputation, it might need to include words such as "awards", "company policies", "ethics", and "announcements", says Mr Opperman. A hotel group that has designed a new entrance area in one location might want feedback before rolling it out across the group.

For this, it might create a taxonomy "perception of our hotels" that would include words such as "lobby", "foyer" and "reception desk". Then, even if only 100 people commented that the design was "fantastic", this would be found.

Nokia began analysing social media for marketing and business intelligence information after its mobile phone sales began losing out to Apple's iPhone and Google's Android.

"With the launch of the Lumia Windows phone, we wanted to find out in real time what people care about, what they don't like, and what they might like in future," says Mr Hepburn.

SAS has shown that "mood" analytics, dissecting phrases to assess human feelings, can work well.

During a UN project, SAS found rises in unemployment could be forecast three months ahead by comments people made about cutbacks on grocery shopping or increased use of public transport, as they saw work problems looming.

Room service Listening for bad news is 'basic but vital' to hotel booking business

Watching brief: customers say what they think online Getty

In 2010, LateRooms, an online hotel booking service, introduced "Lucy", a made-up character who sent offers to prospective customers. But she was dropped after a survey of social media sites found she was disliked.

Such insights are invaluable for discovering how customers feel, says Rich Kemp, LateRooms' global social media manager.

They are particularly useful when responding to complaints, Mr Rich says. "When people are having a private rant with their mates about their problem with a hotel, we can apologise and try to resolve the issue proactively."

This listening for bad news is the "basic but vital" level of social network analysis, Mr Kemp says.

LateRooms also uses Brandwatch, a social analytics service to which subscribes, for ad hoc reporting. This lets it set up queries about customers, events and competitors.

"If a competitor launches a TV campaign, we can find out how viewers feel about it, or discover when people are watching," says Mr Kemp.

"If the advertisement appears during Coronation Street, this provides useful information about the target audience."

Monitoring tools also make it easier to target customers who might not have asked for help, says Mr Kemp. "They might be having an open conversation with friends about going to a Beyoncé concert in Manchester and needing to find a hotel."

LateRooms does not want to appear intrusive, Mr Kemp says, so it takes a soft approach. "We might contact them to say we have heard that they are looking for accommodation, telling them about Social Concierge, our personal hotel finding service, and sending a link to a short video for more information."

Social media analysis is now a vital part of LateRooms' business, he says, and is driven by senior management.

"The board of directors wants to know how we are being discussed on networks, blogs and forums.

"Social media analysis has made us much more aware of what people really think about us."

At first it was done piecemeal as a side activity to marketing, Mr Kemp says. Now, such insights are important in planning strategy and making business decisions.

Jane Bird

Demand for analytics skills outstrips supply in all sectors

Understanding the numbers: analysts look for trends in masses of data AFP

Staffing There is a drive to train data scientists but some believe employees with the right tools could do some of the work, writes *Paul Solman*

The rapid growth of big data has been such that few sectors can ignore it. A survey last year by SAP, the business software group, found that 92 per cent of respondents had seen the volume of data in their organisation increase during the past 12 months, while three-quarters of respondents believed their organisation needed new data science skills.

The problem for many is finding the analytics expertise to understand what this information means as the demand for data scientists outstrips supply.

"We have seen a significant year-on-year increase in the demand for data scientists in both the UK and overseas," says Jon Palling, global sector head for technology at SThree, the recruitment group. "The laws of supply and demand have encouraged many permanent employees to switch to contracting for greater financial reward."

Yet the signs are that analytics software companies are moving to help fill the skills gap by offering training, not only on their own products but in data science. Cloudera, which provides software based on the Hadoop data storage and processing framework, reports strong demand for its courses.

The group claims to have trained 20,000 people in the classroom, and another 100,000 through online courses and partnerships.

"We focus on the entire breadth of audiences," says Ryan Goldman, senior product marketing manager at Cloudera. "The primary focus is on current data professionals who want to first take on big data and move into building data science tools.

"But we also understand there is a larger audience trying to learn more about big data," he says. "So we also have online courses for those people who are just coming out of college or thinking about moving into big data."

Hands-on experience and a programme of certification means Cloudera's training can produce professionals who are "ready to be hired", says Mr Goldman. "We're taking what we know from the market . . . to understand what their end-user needs to know how to do. So we build our training around those real-world skill sets," he says.

"Part of the value of the certification process is bringing some kind of standard definition to what it means to be a data scientist," adds Sean Owen, director of data science at the company. "Not everyone is going to agree, but at least we're out there with a working definition as defined by the training course and the certification."

Alwin Magimay, head of digital and analytics at KPMG UK, the consultancy, says: "The analytics market is a bit like computer programming was in the 1990s – we're in the phase of building up competence and it's the beginning of a long journey,"

To help meet demand in the finance, retail, technology and media sectors, KPMG is sponsoring the first UK Data Science Summer School, which aims to recruit 100 PhD students in Europe and turn them into data scientists during a five-week intensive course.

Again, the emphasis is on practical skills. "The summer school will give clients a platform to see how students can work on the data," says Mr Magimay. "Sixty per cent of the summer school will be theoretical but 40 per cent will be live client issues."

He adds: "The mobile app industry didn't exist five years ago. Some companies are blazing a trail and some are just trying to figure out what they can do. The title 'data scientist' implies an academic slant, but it's increasingly important to business."

"Businesses increasingly need insight to drive decision making," says Lance Fisher, chief information officer at SThree. "There is undoubtedly an increase in demand for good data analysts who understand the business and can look for trends in masses of data."

Nevertheless, some believe demand for data skills may only be satisfied when analytics becomes accessible to a wider cross-section of employees.

Twenty-eight per cent of workers use predictive tools regularly, according to the SAP survey, and that figure is expected to rise to 42 per cent over the next five years.

Further, 84 per cent of respondents said they wanted training to integrate analytics into their daily work.

US company QlikTech has developed QlikView, analytics software it says can be used without any data science expertise. The group's clients range from retailers, healthcare trusts and local governments to the Swedish police and even a Peruvian fishing co-operative.

"People are natural data scientists and have the capacity to carry out quite complex evaluations," says Donald Farmer, a vice-president at QlikTech. "The problem has been that traditional analytics systems have often become highly technical.

"QlikView is constructed in a natural way, so people can understand it easily. Only very rudimentary training is needed to find your way around the screen, and certainly no training needed in statistical analysis."

Mr Farmer adds: "We're not negating the role of data scientists – they will always be needed at some level. But it sometimes seems that the only way to do business is for a data scientist to learn the business or the business person to learn data science. We think there is another way."

> 'People are natural data scientists and have the capacity to carry out quite complex evaluations'

Jet boss charts revenue stream

Data monitoring

Personalised metrics are helping one company to increase profitability, reports *Michael Dempsey*

High ambition: data dashboards assist in keeping JetSuite's fleet in the air for longer

Executive jets exude glamour. They also burn dollars in crew salaries and fuel costs, not to mention flight schedules that often see them travelling between private charter jobs with no paying passengers.

Operating such jets at a profit is a big challenge.

However, one company, JetSuite, which flies across the US from its Californian home, thinks it has found the way to maximise private jet operations' profits through an internet booking system that fills planes on the empty leg between formal charters.

The company's main commitment is to its 600 registered regular customers, who account for 70 per cent of flights, as well as journeys that are booked by brokers or bargain-seeking online passengers.

Anyone can log on to the JetSuite site, and if they spot an aircraft that is due to fly empty between two locations, they can book it for as little as $536 for a trip in a four-seat Embraer Phenom 100.

While enjoying a few hours of private-flyer status for a party of four at bargain rates may sound fun, the company is deadly serious about making every flight made by its 20-strong fleet pay.

Keith Rabin, the company's president and chief financial officer, comes from a business consulting background and is determined to maximise the company's revenue.

Graphs and bar charts loom large in Mr Rabin's working day. They usually arrive on 60-inch wall-mounted screens connected to Apple TV boxes that are streaming digital signals around JetSuite's offices.

The various bits of information Mr Rabin sees are generated by a data dashboard from Seattle-based Tableau, a data analysis software provider.

Originally, this discipline – also known as business intelligence – was the domain of sprawling specialist companies whose products had to be managed by dedicated staff.

But the rise of online software available on subscription has meant that smaller, more user-friendly programs can put dashboards containing simple visual indicators of complex data feeds in front of a wider audience.

> 'We didn't hire more IT people for the dashboards, we asked more of the software'

JetSuite has an IT office with three staff and Mr Rabin says the move to easy-to-use subscription software meant "we didn't hire more IT people to get the dashboards working. Instead, we asked more of the software".

The way in which a dashboard represents information is largely up to the user. Most offer the option of traffic lights – red, amber and green – to show quickly where critical action may be necessary.

For Mr Rabin the graphs and bar charts are "the way we like it", but this is a personal choice.

The big idea is to get away from bewildering data sets buried in spreadsheets and allow users to have an instant view of where the business is heading.

JetSuite's goal is to maximise the utilisation of its aircraft. That means giving different management teams an accurate data snapshot of their own line of work.

Mr Rabin is concerned with the revenue-earning flight hours each aircraft clocks up during a day. Tableau can also generate a picture of each plane's prospective revenue as charters and informal online bookings flow in and are assimilated by the software behind the dashboard.

However, for the dashboard really to deliver the goods, it has be extended across the whole company and used differently within each operating division, even though JetSuite has just 170 employees.

"We need a different dashboard for each group," says Mr Rabin. "One dashboard for the entire company is fool's gold."

Mr Rabin's vision might make the chief executives of much larger businesses think hard about the wisdom of having all their crucial data flowing into one presentational screen.

"I want each manager to talk to his team about what they want to see on their dashboard," Mr Rabin says.

He does not think of himself as "an IT person" but nonetheless he enthuses about how simple the dashboard is compared with Excel spreadsheets.

"It's a much more drag-and-drop style than Excel. You can throw data around and visualise it in different ways. The clarity really is beautiful."

He says the JetSuite ethos is "operational awareness", but stresses that many factors, such as the conversion rate of phone queries to charter deals, feed into whether the jets will find passengers for "empty legs".

"The dashboard won't increase profitable flying hours by itself, but it can give each employee the data that will make them more effective in their day-to-day job."

The company plans to add longer-range jets to its fleet and this ambition means IT tools must mirror the needs of busy staff.

"Our managers don't want to spend weeks creating a report out of software products; they need to be able to go to the dashboard and see what they need immediately."

Bank sees opportunities in assessing supply chain risk

Management

Knowing where the hazards lie is important, says *Jessica Twentyman*

As the world watches the unfolding political situation in Ukraine with unease, some company executives will be concerned about the impact the turbulence in the region may have on their own businesses and supply chains.

According to the European Commission, the EU accounts for about a third of Ukraine's external trade, with the country's primary exports to the bloc listed as iron, steel, mining and agricultural products, and machinery.

Exposure to risk in areas where political tensions are likely to ebb and flow can seem hard to judge. But what if concerned bosses could rely on information and analysis to help them gain a deeper understanding of their exposure to supply-chain risk?

That is the puzzle that Royal Bank of Scotland is aiming to solve for corporate customers and a hefty dose of big data analytics is part of the picture.

Alan Grogan, chief analytics officer in the bank's Customer Solutions Group, reckons that RBS is well placed to advise corporate customers in this way.

He says: "We're putting analytics at the heart of all decision making – and our analytic capability, I believe, is market-leading in global terms." Whether the bank's corporate customers will be prepared to put their trust in the bank is debatable. In late February, RBS reported a £8.2bn loss for the 2013 financial year, marking a sixth successive year of losses.

That prompted Ross McEwan, RBS chief executive, to describe RBS as, "the least trusted bank in the least trusted sector in the marketplace".

At the same time, however, Mr McEwan stressed that he was keen to refocus RBS on UK retail and business customers, so new corporate banking services, based on big data, could play a role in rebuilding its relationship with clients.

The bank has invested in its infrastructure in order to assess risk across its business customers' supply chains. A new data warehouse contains a vast wealth of information about its corporate customers, says Mr Grogan.

About 45 per cent of the UK's large corporates bank with RBS, he says, and it is the biggest lender to small and medium-sized enterprises in the country.

RBS branches process some 400 transactions a minute on behalf of corporate customers and more than £7bn worth of electronic payments each business day.

Much of the data generated by these activities end up in the data warehouse, first trialled last year and based on technology from Microsoft and Hewlett-Packard. RBS mixes the internal data with a wide variety of external information.

Mr Grogan prefers not to name its partners, but says that they are data providers such as Experian, Dun & Bradstreet, Bureau van Dijk, Standard & Poor's and Fitch. There are also open government data from sources including the Office of National Statistics and the Bank of England.

By using various analytic techniques, Mr Grogan and his team can explore the likely impact on business customers of price rises and currency exchange rates, for example.

And by linking transactions between companies, they are building a huge map of the interdependencies that exist between companies of all sizes.

"We're using predictive analytics to give corporate customers insight into supply chain risk that they've never had or even considered," Mr Grogan says.

For example, the core currencies used by UK manufacturers in their supply chains can be monitored. How cross-currency interdependencies increase or decrease supply-chain risk can also be examined.

The insights Mr Grogan and his team are able to gain from this kind of analysis, he says, is then passed to the relationship managers who work with corporate customers on a day-to-day basis.

As world economies become increasingly interdependent, supply chain risk really matters to companies, Mr Grogan says, pointing to the impact on businesses all over the world of the 2011 tsunami in Japan, when many large automotive companies experienced a drop in production because they were not able to source the microchips they needed for satellite navigation and other in-car electronic systems.

But it is not all downside, he says. "There are risks to businesses, but there are opportunities, too. With the right level of visibility into the end-to-end supply chain and enough warning of potential problems, companies facing an issue can make arrangements to source from elsewhere.

"For RBS, this is about putting to good use our insight into emerging economic trends in order to make UK businesses more competitive."

Risk insight: Alan Grogan of RBS

Contributors »

Richard Waters
West Coast editor

Paul Taylor
US business technology and telecoms correspondent

Sarah Mishkin
San Francisco correspondent

Jane Bird, Michael Dempsey

Stephen Pritchard, Paul Solman, Jessica Twentyman
Freelance FT technology correspondents

Andrew Baxter
Commissioning editor

Adam Jezard
Editorial production

Elizabeth Durno
Sub-editor

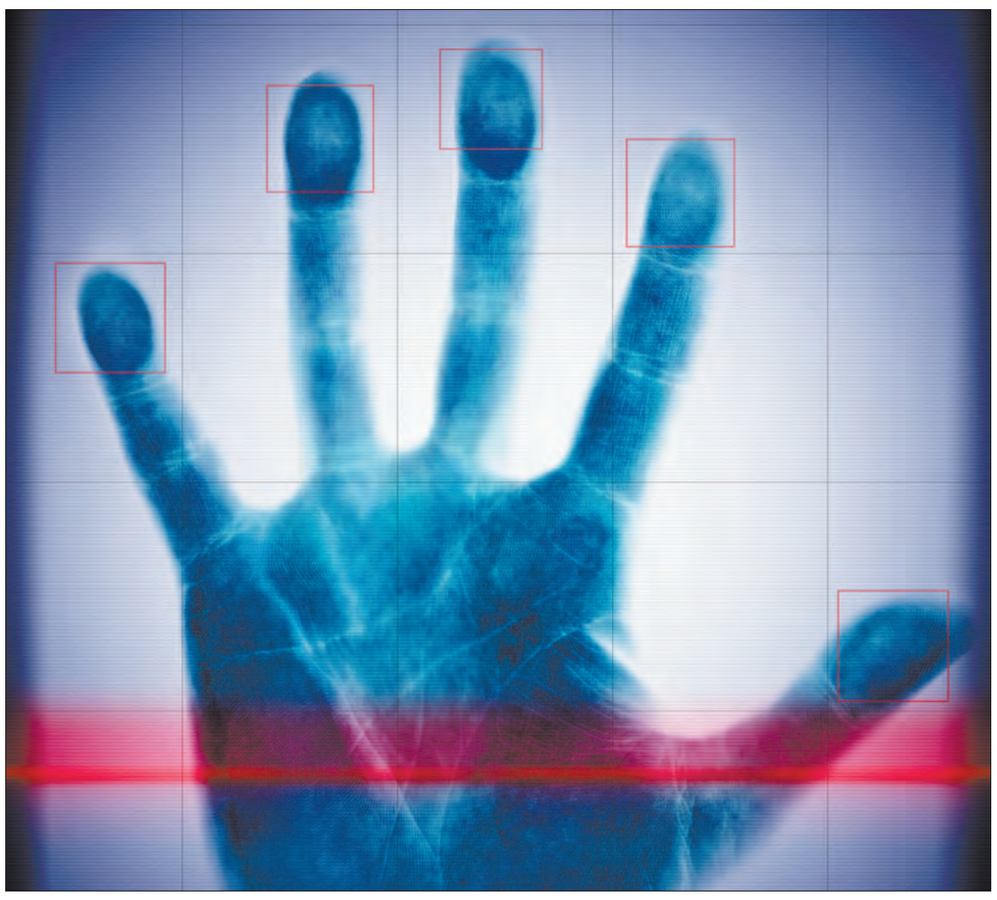
Andy Mears
Picture editor

Steven Bird
Designer

Oivind Hovland
Cover illustration

Moral and legal points weigh on information use

Privacy Deciding what is proper use and what is not presents a problem, says *Stephen Pritchard*



Hands up: the spread of biometric data is particularly challenging Dreamstime

Data collection poses moral and legal issues for companies, but it is a field with as many grey areas as firm rules. Take video surveillance in a bank to deter criminals. Using video images, perhaps with facial recognition software, might be acceptable to detect fraud. But using that same information for marketing purposes is less acceptable and may be illegal.

"You would be allowed to scan faces to check against a bank robber database as that is protecting your assets," says Carsten Casper, research vice-president at industry analysts Gartner. "Doing that for customer services purposes would be a step too far."

Deciding what is appropriate and what is not is a growing challenge. New data types are stretching existing definitions of consent; powerful data analysis and data mining tools bring their own risks, as otherwise anodyne or even anonymised data can lead to the identification of individuals as technology brings data sets together.

Scott Gnau, president of Teradata Labs, which provides data storage platforms, says: "This issue has existed within data warehouses and business intelligence tools for some time. It might be OK to know my age, for demographic purposes, but not to give out my name and age; someone might misuse that."

This has led organisations to use tokenisation of data – substituting random values for personal data, such as social security numbers – and pseudonymisation – where data are separated from personal details.

But such steps are not foolproof, and may not amount to a legal defence in the event of data loss. The European Commission only recently amended its proposed data protection regulation to allow companies to use pseudonymised data.

Privacy groups remain concerned that data mining and analysis could unravel such anonymity, either deliberately or by allowing a malicious party to combine stolen data sets, or even public domain data, to identify individuals. If such data are no longer obscured, companies could lose their legal basis for holding them.

This process works in the other direction too: if companies obtain specific data sets with the subjects' consent, or promise anonymity, the business can be on shaky legal ground when it starts to analyse or manipulate the data.

"There are many occasions where aggregated data are far more than the individual components," says Peter Cochrane, a consultant and former at chief of technology at BT.

He adds: "These data sets may be legitimate or legal, but their aggregation may not be."

A further challenge comes from the emergence of new types of data, some of which hold very private information. In the US and Europe, lawmakers and privacy advocates are becoming concerned about the spread of biometric data, and especially its use by private organisations.

A desire to control the use of such information has led the US Department of Commerce to draft a code of practice with data users. Although voluntary, firms that sign up to the code of practice and break it will leave themselves open to legal action as well as reputational damage, says Miriam Wugmeister of US law firm Morrison & Foerster.

US states are also drafting their own laws to control collection and use of biometric data. The validity of such consent will depend on how data are collected. "Biometrics used for security is all good, but if that information is gathered passively maybe its use for customer services isn't appropriate," says John Skipper, a data privacy expert at PA Consulting Group.

> 'You can't provide privacy unless your security controls are transparent'

Courts might also question consent if, for example, an employee is made to agree to biometric data collection or lose their jobs. For the public, "opt outs need to be very easy to exercise", says Ms Wugmeister.

Even relatively mundane information can expose complex legal issues. Companies might record car number plates to automate car park access, or protect petrol stations against non-payers. But there maybe no justification to combine that information with loyalty card or payment card data, and use it for marketing purposes.

Smartphone use also poses difficulties as retailers are using phone signals to locate shoppers within stores, to model footfall patterns. As long as this information is anonymous, it should be legal. But if companies tie that information to individuals, the privacy and legal risks are very real.

As a result, businesses need to be clear about what data they are collecting, and why. "You can't provide privacy unless your security controls are transparent," says Eddie Schwartz, a vice-president at Verizon, the telecommunications company.

"You have to be a 'crystal box', showing your controls and oversight, and providing evidence for them."

Data security Six steps to help ensure you keep your company defences up

To misquote Oscar Wilde, "to suffer a cyber attack is unfortunate, but to lose data looks like carelessness".

The damage caused by data leakage can be considerable. Under proposed EU data protection laws, it could cost a company 5 per cent of its worldwide turnover.

Here is a checklist of the key reasons for data losses and how to prevent them.

1. Make sure data are identified and classified. A business cannot protect what it cannot see. Ask what information is being held, where, why, how important it is, and what its leakage would mean.

Governments are good at creating data classes, from "confidential" to "top secret", but this is time-consuming.

Etienne Greeff, chief executive of information security company SecureData, says: "Rather than try to complete a full data classification exercise, start by identifying what is important to you."

2. Discard data you do not use. Too many companies hoard data. Holding too much creates regulatory, legal and privacy risks. Duplicate copies of data make it hard to see who is using what.

Companies should collect less and throw more away.

"Go on a data diet," suggests Stephen Bonner, partner in information security at KPMG, the professional services firm. "Identify data you no longer need, and slim down."

3. Control who has access to data and monitor it. The more people who handle data, the greater the risks. Data protection laws set out basic requirements for handling sensitive personal information, but they do not cover other, equally vital types of data, such as financial files or intellectual property.

"Once you've identified the [data] assets, you can put in place controls to limit access," says Sol Cates, chief technology officer at security vendor Vormetric.

Sensitive data should be stored in as few places as possible and the number of users with access restricted.

Some regulations, such as for payment cards, even legislate for this.

4. Encryption is vital. Assume data will leak or be stolen, so switch defences to ensure sensitive data are of no value in the wrong hands.

Such information should be encrypted at every stage, including in back-up systems.

Art Gilliland, senior vice-president of enterprise security at HP, says that enterprises typically spend more than 80 per cent of their security budgets on the perimeter, which is of little use when the data are outside.

5. Secure privileged user accounts and check who has access to encryption keys. Administrator accounts are often targeted by those planning to steal data, so limit privileged user access to those who need it. This also applies to encryption keys.

Brian Lowans, principal research director at Gartner, says: "Does any organisation have direct access to your data or encryption keys? If so, you're increasing the risk."

6. Have a data breach plan ready. No company can prevent every data loss, so a plan to deal with the consequences is essential.

Mitigation will reduce reputational damage and can reduce regulatory fines.

Plans should include workers' education. KPMG's Mr Bonner says staff who are aware of the risks are more loyal, and more motivated to protect data.

Stephen Pritchard

Big data sparks cultural changes

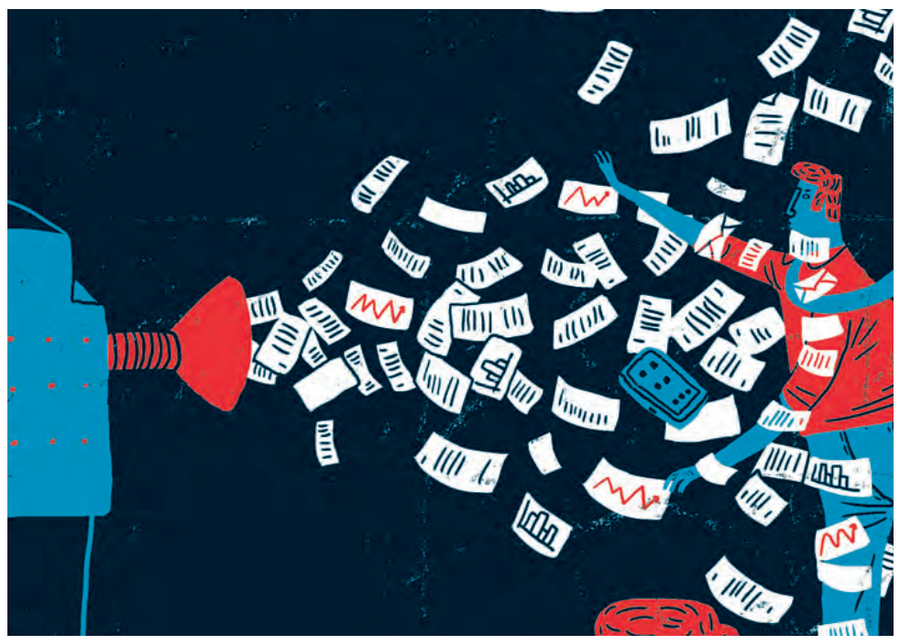
Continued from Page 1

at Work. He adds: "It takes a lot of autonomy out of the job [for drivers]. UPS people say that change management is the biggest issue."

As often happens with technologies that promise sweeping changes to the way business works, the benefits are easy to comprehend in the abstract but take longer to achieve in practice.

Business processes have to adapt to accommodate new approaches. Yawning skills gaps must be bridged. Above all, corporate cultures and personal working styles have to be overhauled – starting at the top.

Managers accustomed to making gut decisions have to learn the humility that comes from being led by the data.



All of this points to the inevitable disappointment that lies ahead for many chief executives who have demanded big data strategies. "While big data is at the top of many companies' agendas, few of them are getting value out of it today," says Travis Pearson, a partner at consulting firm Bain. "The expectations are very high, so there will inevitably be disappointments."

Big data's teething troubles can be identified in a number of areas, starting with business processes. Becoming a data-driven company means bringing a new scientific method to decision-making.

"Maybe Google began that way, but everyone else has been through a revolution," says Hugh Williams, who worked at Microsoft and eBay, as each sought to adopt data-driven management in parts of their operations. "The big internet companies have done that: now it has to happen in other companies."

Driving this approach to management is constant experimentation, as ideas are tested and retested before being widely used.

"You build out a framework where you can run tens or hundreds of experiments," says Mr Williams, now head of research and development at Pivotal, which builds technology platforms for companies using cloud computing.

Making use of the results of these tests – or of the other signals sent out by data – represents another challenge, as companies learn to adapt their decision-making processes.

That is particularly true of real-time sentiment analysis, which many companies undertake by studying social media, says Mr Davenport. The perceptions move all the time, leaving many executives paralysed as they watch shifts in mood without knowing how to react in a fast and effective way.

> 'To be told by a relatively junior person that your belief is not right is a big change'

Then there is culture. It is not only UPS truck drivers who have to get used to the idea of giving up some autonomy, so their company can reap the rewards of the big data age. Senior business executives are also facing changes that many are likely to find unsettling.

Managers accustomed to taking decisions based on instinctive responses to situations are about to have their beliefs challenged.

"You have to be open to the idea that the answers are in the data," says Mr Williams. This represents a big shift in how managers view their role. "People are used to having an idea, building a process and getting it done," Mr Williams says. "To be told by a relatively junior person that's not right is a big change."

For workers in many industries, the result is likely to be disorienting.

Precision agriculture, for instance, is bringing a scientific rigour to farming by using GPS to guide tractors more accurately or coming up with more precise methods for fertilising and irrigating fields.

In the process, automation is making deeper inroads into human labour and decision making. "What is the farmer's role then?" asks Mr Davenport. "We're facing that issue in a lot of industries."

The next hurdle is the skills gap. The lack of data scientists has been widely noted. When it comes to the problems that stand in the way of companies benefiting from the data they are collecting, the talent shortage is "the biggest gap, and the hardest to close", says Mr Pearson.

Yet educational institutions have been moving fast to deal with the problem. More than 100 specialised courses for data scientists have been started by US universities and other institutions, says Mr Davenport.

In addition, companies that offer massive open online courses have raced to fill the gap. Coursera, for one, has begun a data science "curriculum", packaging a number of courses together to give online students a grasp of the range of subjects they need to master.

Finally there is the technology. "Most companies hold the data in 10 places," says Mr Williams at Pivotal. "That fragmentation leaves them well short of achieving the ideal: a data "lake" for all their information, organised and tagged in a coherent way to make it available to managers across the organisation for their particular needs."

There is more to this than a difficult technology transition. Storing data in a single location amounts to a sea-change in how data are viewed in a company.

No longer just seen by individual business mangers for their own immediate needs, it becomes a true long-term asset of the business, says Mr Williams.

"People are only just working out how to store and manage the data," says Peter Levine, a partner at Silicon Valley venture capital firm Andreessen Horowitz, whose investments include data-storage company Actifio.

The technology companies that will emerge to help businesses make full use of all the information "haven't been built yet", he says.

Retailers adopt virtual currency

Bitcoin Businesses say lower transaction costs justify the risks, writes *Maija Palmer*

Bitcoin has rarely been out of the headlines in the past few months, generally for negative reasons. For many, the experimental digital "currency" is associated with Silk Road, the secretive website that used it for trading drugs and weapons. Or with the recent bankruptcy of Mt Gox, one of the leading Bitcoin exchanges, which says it has lost funds worth more than $500m to hackers.

But, despite the headlines, a growing number of businesses have started accepting the currency as a means of payment. Coinmap.org, a website that lists retailers that accept Bitcoin, has more than 3,400 companies on its database. SpendBitcoins, another currency directory, has nearly 6,000.

Some of these are small operations such as Klesh Custom Guitars, a Pennsylvania-based guitar repair shop, whose owner, Shane Klesh, says he decided to accept Bitcoin mainly for ideological reasons. "I believe in the currency and don't have much trust in the American dollar," he says.

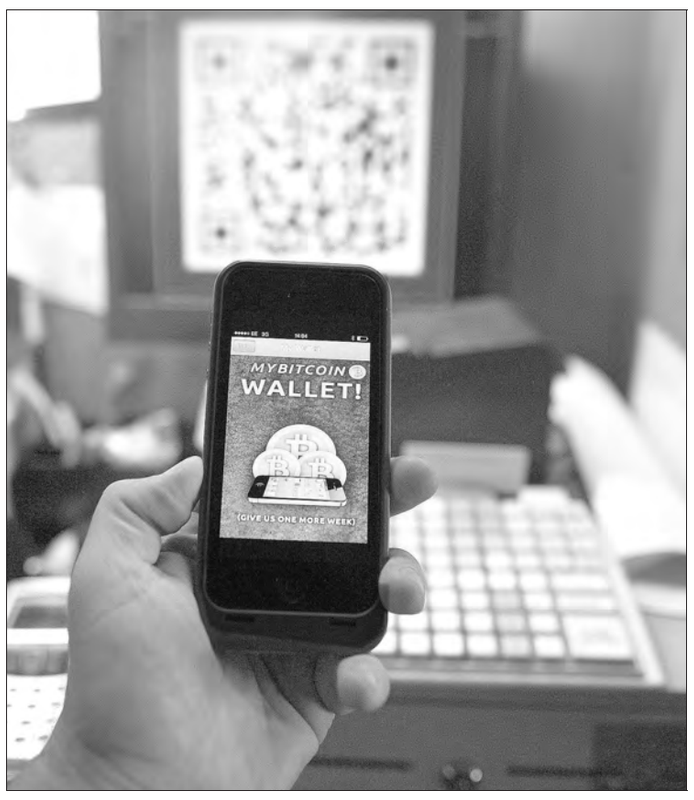
Larger businesses have also started adopting the currency. Overstock, the stock market-listed US discount online shopping company, started accepting Bitcoin in January and by March it had sold $1m in products to more than 3,400 Bitcoin customers.

Jonathan Johnson, executive vice-chairman of Overstock.com, says: "We figured in the first year we would have $3m-$5m in Bitcoin transactions, but now we think it is going to be closer to $10m-$15m. Most of these customers are new to Overstock and are spending about twice as much as our regular customers. I can't think of a bad thing about it."

Gyft, the US-based digital gift card platform, has taken Bitcoin since last May and says it has seen transactions grow fivefold in that time. On a peak day, Gyft says it can process "well over 1,000" Bitcoin transactions.

The key reason that merchants like Bitcoin is simple: it reduces transaction costs.

Bitcoin payments do not go through a bank or credit card provider. They are made directly, computer to computer, rather like cash.



Easy payments: Bitcoin wallets can be accessed by mobile users anywhere Bloomberg

> 'If someone finds a hack into the security protocol, that will be the end of the currency'

"Credit card companies charge 3 per cent just to handle a simple payment. Bitcoin is worth it just from a cost savings point of view," says Vinny Lingham, chief executive of Gyft.

There is also less risk that a credit card company will suddenly take back the money from a transaction that has been declared fraudulent.

"We are very careful with checking and we still lose 0.2 per cent of our sales to fraud," says Overstock's Mr Johnson. "For other businesses it can be 1 per cent. But because Bitcoin is like cash, we don't get chargebacks."

Also, Bitcoin transactions do not require the customer to hand over much personal data, such as credit card numbers. "That is a benefit, because no one wants to be the next Target," Mr Johnson says, referring to the hacking of up to 110m personal records at the US retailer last year.

There are risks. The value of Bitcoin can fluctuate wildly. This year it hit a peak of $1,100 per Bitcoin and then halved in value overnight, after China announced it was banning the currency. Most retailers who accept Bitcoin will exchange them into another currency at the end of each day, to avoid getting caught out by a potential drop in value. A number of exchanges exist where companies can do this daily cash conversion.

"We use BitPay to shield us from fluctuations and we cash out daily," says Mr Lingham at Gyft. Overstock uses a similar service called Coinbase. Cashing out nightly also eliminates the risk that an exchange could fail in the way Mt Gox did, losing users' Bitcoins.

Governments worldwide have yet to clarify their stance on the "currency". Some, such as China's, have banned Bitcoin transactions, while others are looking merely to regulate it.

Questions remain over whether Bitcoin should be regarded as a currency or as a commodity, so the tax implications of holding and trading Bitcoins are yet to be clarified, a factor that businesses should bear in mind.

Shai Heffetz, who makes or "mines" his own Bitcoins – slang for creating Bitcoins using complex software over a long period of time – is considering whether InterTrader, the spread betting business of which he is managing director, should start trading them. He says regulation of Bitcoin exchanges by US authorities would bring more transparency and security into the system.

"The risk will never be zero, just as regulators don't stop banks from failing. But regulation would eliminate criminal figures from the Bitcoin scene, bring in risk assessments, checks on capital adequacy, and so on," says Mr Heffetz.

The biggest risk is that the currency, which exists only in electronic form, could develop a serious security flaw that undermines it completely.

"If someone finds a hack into the security protocol tomorrow, that will be the end of the currency," says Mr Heffetz. "Because the currency is not backed by any government, it enjoys none of the protections usually given to bank-based payments. If your Bitcoins are stolen, you are out of luck."

Professional hackers have been trying to break the currency for years without success, but while a catastrophic breach may seem unlikely, it cannot be ruled out.

Mr Heffetz admits he is not sure Bitcoin will survive. "I don't think virtual currencies are going to disappear. But, specifically, will we be using Bitcoin? It would be foolish to try to predict that."

Frustration with online sales spurs innovation

Payment systems

Secure gateways make it easier for customers to buy, says *Sarah Mishkin*

The ability to accept customers' payments is central to any business, yet it can be fraught, especially when it comes to online payments.

As Silicon Valley investors would say, that makes payments processing an area ripe for disruption, a point that entrepreneurs have noted.

Stripe, which processes online payments, was recently valued at near $2bn. Alipay, the Alibaba-run service that dominates the Chinese market, is trying to make inroads into the US market, and eBay has been overhauling PayPal so it can better function on mobile phones.

Companies from Google to Visa and AT&T are trying to create digital wallets to let consumers pay in shops with a wave of their phone.

That innovation creates opportunities to win over customers, as well as a significant amount of confusion. Shane Happach, chief commercial officer at payment services group WorldPay, says: "We're having to collaborate to help our [companies] answer questions internally, such as: 'Why would we make changes to this infrastructure?'"

The possibilities for payments range from sleek ways to accept online credit card payments, to enabling customers in restaurants to settle their bill with a tap of a smartphone button.

There is even a start-up, PayNearMe, working to let customers in convenience stores pay cash to settle bills they usually pay by cheque or wire transfer.

Among the reasons to update online payment systems is to make it easier for customers to complete orders and to expand the number of consumers able to buy from a website.

"Most internet users can't transact with a US website because they don't have a credit card that works on US sites," says Patrick Collison, one of the two brothers who founded Stripe. "Or if you're on a mobile device, as many people now are, it's awkward and convoluted to go through a legacy checkout [system]."

Stripe's services integrate the capability of accepting payments in one of the 139 currencies its system can process into various sites and apps. They are shaking up a market PayPal has long dominated.

Stripe's growth has helped spur PayPal, to innovate. Last September, it paid about $800m for Braintree, a company that helps online businesses accept payments.

Braintree's chief executive, Bill Ready, says that the concept of providing "great customer service" is improving, including at PayPal, whose recently appointed president, David Marcus, led "a complete rebuild" of PayPal's operations. Braintree itself offers services that cut down the number of times smartphone shoppers have to input card data, a frustration for many given most phones' small keyboards.

Offline, too, there has been significant innovation, although such changes have been slow to catch on.

In February, MasterCard and Visa both backed a technology known as "host card emulation", which will make it easier for consumers to store card data in apps on smartphones and pay in stores at special terminals using near-field communication, or NFC, technology. PayPal is also developing features that will let consumers pay in shops via the PayPal smartphone app.

Shoppers have been slow to adapt to using mobile wallets. A more successful offline innovation has been trying to find ways for retailers to improve collection of data on customer behaviour.

Companies such as Apple are developing technology that will let retailers track customers' in-store behaviour, either to push special offers or gather better data.

However, there is more that could be done in this area. As Kebbie Sebastian, head of London-based Penser Consulting, says: "There's nothing for [retailers] that has helped them understand who comes in and keep customers engaged and track what they're buying."

Complete rebuild: David Marcus

Multi-drive back-ups come into their own when the cloud bursts

ExecTech
PAUL TAYLOR

A few weeks ago I received an urgent "tech support" call from my son Adam, who runs an online pet supplies start-up, PetShopBowl.co.uk.

The company, which has embraced cloud computing, uses Bigcommerce, a cloud-based package, to run its online store.

However, the company's employees had been saving locally generated files, such as spreadsheets, pricing information, promotion materials and product images, on a network-attached storage (NAS) device backed up to the NAS vendor's own cloud service, or so Adam and his partner, Alexandra Tamasan, thought.

When the single drive in the ageing NAS crashed, they assumed they would be able to recover the latest version of the files from the cloud-based back-up service. But it turned out the hard-drive vendor had shut the cloud back-up service some time ago. Hence the call to me.

Fortunately, the data on the NAS, which runs a version of the Linux operating system, were still there, although the NAS's Windows-based file manager could not "see" the files because it was corrupted.

Ms Tamasan eventually accessed and copied the files using a Linux system rescue disk.

For small businesses, such as my son's, that do not have an information technology department, there are important lessons.

First, while it makes sense to use a cloud-based – in addition to a local – back-up, do not rely on free or cheap cloud storage systems that may not be around when you most need them.

Dummy run: be prepared for databases to crash Getty

Second, whichever cloud-based back-up (or storage) service you choose, make sure to check it regularly to verify it is still in operation and doing what you want it to do.

Third, when you choose a NAS device, pick one that has at least two drives and some form of data redundancy built into it.

Multi-drive NAS devices are typically configured as Raid (redundant array of inexpensive – or independent – disks) systems that distribute the data across the drives in one of a number of ways, referred to as Raid levels.

Historically, Raid systems, which can be used to protect data or speed up data access, or both, have been difficult to set up. But the software supplied with most multi-drive NAS devices these days makes the task much easier, particularly if you choose to implement a more basic Raid level.

For example, Raid 1, which is available on most business-ready NAS systems, involves a process called mirroring. Data are written identically to two or more drives, thereby producing a "mirrored set" of files. I have been testing one of Seagate's NAS systems, the Business Storage 2-Bay NAS, which costs about $300 and is the lowest-priced model in Seagate's business-centric NAS line-up, making it suitable for small and medium-sized businesses.

This two-drive system, which includes a dual-core processor and 512Mb of dynamic random-access memory, supports basic Raid 1 disk mirroring and can be configured with 4, 6 or 8Tb of storage capacity using standard hard drives.

Seagate also has models that support more sophisticated Raid levels for companies that need additional safeguards, such as parity checking, which ensures data have been transmitted regularly.

I found setting up the Seagate Business NAS to be straightforward. Like most users, I chose to install Seagate's NAS Discovery app, which automates the process of locating the NAS once it is connected to a network, and the BlackArmor 2011 program, which automatically backs up PCs on the network. The NAS also provides Time Machine back-up support for Mac computers.

Usefully, it comes with a universal storage module slot on the front of the device for a Seagate back-up Plus portable drive that can copy data from the NAS with one touch, allowing users to make an additional back-up or take data with them.

Seagate also enables users to access remotely files stored on the NAS using its Seagate Global Access service, which provides iOS or Android apps for smartphone users, as well as Windows and Mac desktop apps. Overall, I found the service, which allows users to upload and download files to and from the NAS, worked well

Seagate's NAS also includes most of the other features associated with NAS devices, such as the ability to function as a print or media server, but it lacks some of the latest bells and whistles, such as integrated WiFi, and is slower than some other NAS devices.

If, however, you are looking for a solidly built NAS for home office or small business use, the Seagate Business Storage 2-Bay NAS is a good choice at a bargain price.

For extra peace of mind, if you add a business-ready cloud storage service, such as Dropbox or Carbonite, or switch to a cloud-based productivity suite, such as Google Apps for Business – as PetShopBowl.co.uk has now done – you should sleep better at night.

On FT.com »

Video interview
MetLife's Gary Hoberman talks to Paul Taylor about start-up culture and innovation
ft.com/metlife