Harnessing the power of data & analytics using Cloud and AI

Gerard Verweij, PwC US
Data and analytics helps fuel business growth by providing insight on customers, optimizing media strategies and customizing brand stories.

Data helps increase speed to insight (by liberating data and mashing it) and reducing time to action (because it’s always on).

Data and technology present enterprises with new opportunities every day

The world of data and analytics is dynamic with data proliferation and advances in technology presenting new opportunities every day.

We’re using insights from two global PwC surveys to describe how business is responding to the promise of data and analytics, trends and challenges, and what the market is looking for.

20th CEO Survey
20 years in the mind of the CEO… What’s next?

PwC's Global Data and Analytics Survey 2016
Big Decisions™

1400 CEOs across industries and regions in 79 countries

2200+ participants in leadership and functional roles in 50+ countries
We know that CEOs want to drive *growth and productivity*

We also know they want to move more *quickly* and with more *confidence*. And that they want more insight, the ability to innovate, and quicker decision-making as they seek to address these critical needs.
Let’s start with our CEO survey

Our global CEO survey tells us that CEOs are interested in the promise of data and analytics but not yet applying its value to the entire enterprise. Let’s look more closely at what we found.
In PwC’s 2016 CEO20 Public Survey of 5,000+ people in 22 countries, 79% said they believe technology will cause job losses in the next five years.

Yet CEOs still need people. According to our CEO Survey, only 16% plan to drop headcount in the next 12 months – and only ¼ say that’s because of technology.

Conversely, 52% plan to hire more employees.

Clearly, CEOs see the value of marrying technology with human capabilities. The skills they consider most important can stimulate innovation and can’t be replicated by machine.
In 2013, 37% of CEOs worried that lack of trust in business would harm growth.

**This year, that number jumped to 58%.**

Technology has exacerbated the challenge: 69% of CEOs think it’s harder today for businesses to gain – and retain – people’s trust.

And **87% believe social media could negatively affect trust in the next 5 years**

And they say new dangers are emerging as technology proliferates – and old ones are getting worse.

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**But do CEOs trust technology and data?**

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**A trust strategy for the digital age**

Q: In the context of an increasingly digitised world, to what extent do you agree with the following statements?

- It’s more important to run our business in a way that accounts for wider stakeholder expectations: 85%
- It’s harder for business to gain and keep trust: 69%
- It’s more important to have a strong corporate purpose, that’s reflected in our values, culture and behaviours: 93%
- How we manage people’s data will differentiate us: 64%

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*Source: PwC’s 20th CEO Survey. © 2017 PricewaterhouseCoopers LLP. All rights reserved. www.pwc.com/structure*
Every time we use a search engine, surf a website, buy a product or download an app, our personal data is collected through a combination of online tracking tools.

Most of us are too eager to part with our information to speed the online experience.

Huge amounts of personal data are being compiled, a trend that will grow as we embrace breakthroughs like

*Data proliferation presents opportunity and risk*
Where is all this data coming from?

Most CEOs say they collect personal data at the point of transaction (75%) or via third parties (62%).

Just 55% collect data via social media.

Of those, only 13% have systems to monitor social media information on consumer opinions and spending habits.
CEOs say personal data is mostly used to improve customer-facing functions such as customer service, sales and marketing.

And that it’s unlikely to be used to help HR and not used at all for procurement and sourcing.

**It’s clear customer data isn’t reaching key parts of the enterprise.**

Knowing how to apply personal data insight throughout the enterprise will continue to be a challenge for CEOs.
A different view

Our global CEO survey tells us that CEOs are interested in the promise of data and analytics but not yet applying its value to the entire enterprise.

Next we’ll look at leadership decision making, what it’s about and where it fits in enterprise planning with a special focus on Global versus European trends.
Approximately 1/3 of business leaders say they plan to make decisions about new product or services by 2020.

Which one of the following best describes this key strategic decision?

- Developing or launching new products or services
- Investment in IT
- Entering new markets with existing products or services
- Developing Partnerships
- Corporate restructuring or outsourcing
- Entering a new industry or starting a new business
- Change to business operations
- Shrinking existing business

![Bar Chart](chart.png)
They know that improving decision speed and sophistication can maximise return on investment

**Speed**
- Time to answer question
- Time to decide action
- Time to implement and measure

**Sophistication**
- Analytics maturity
- Data breadth and depth
- Decision approach

*PwC’s Decision Sophistication & Speed Matrix (n=# of decisions)*
Many companies are moving already: the landscape is **changing**

Europe is lagging behind Global when making data-driven decisions....

...and data-driven organisations are making these decisions

- Highly data-driven
- Somewhat data-driven
- Rarely data-driven
Companies are ambitious about improving decision speed and sophistication

Orange shows today; blue shows where companies want to be by 2020.
Companies are taking advantage of what machines offer

Machines don't replace human judgment but the right mix of mind and machine can reduce the impact of human bias, yield more accurate answers and de-risk decisions.
Applying analytics to decisions
For each type, what do you need?

Decision Archetypes

<table>
<thead>
<tr>
<th>Speed</th>
<th>Accelerated Agility</th>
<th>Intelligence in the Moment</th>
<th>Cover the Basics</th>
<th>Master the Chess Moves</th>
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<td>High</td>
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<td>Low</td>
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**Accelerated Agility**
- Speedy decisions trump analysis/consensus
- Descriptive reporting with internal data
- Rapid analyse-decide-act feedback loop

**Intelligence in the Moment**
- Data & intuition drive decisions
- Hindsight & foresight with all available data
- Advanced analytics with feedback loop

**Master the Chess Moves**
- Data-driven decisions trump intuition
- Hindsight & foresight with all available data
- Slow consensus driven & analytic decisions

**Cover the Basics**
- Intuition based decisions – little analysis
- Descriptive reporting with internal data
- Low frequency data and model refresh
Data and analytics is a dynamic market

It supports and is increasingly embedded in business performance
Let’s look at the top 7 D&A trends and developments in the market

Data and analytics trends and techniques will continue to disrupt existing value chains, ecosystems and associated profit pools
**Trend 1**

External market forces will propel enterprises to embrace data lakes as foundations for emerging technology strategies.

*Data lakes* seem to be the primary foundation for technology strategy and value
Companies leverage unstructured and structured data to improve interactions, automation and pattern detection

Trend 2

Big Data has become fast and approachable.

Technology costs are plummeting (and reach is increasing).
Trend 3

Variety is replacing volume, veracity or velocity as the main driver for Big Data.

The 4 Vs of data: volume, variety, velocity and veracity

Where can we improve our data to create the most powerful insights?
New tools and technologies are lowering barriers to entry

Trend 4
Self-service data preparation and analytics have gone mainstream.

What’s out

- Traditional approaches to enterprise reporting, analysis and business intelligence (data warehousing, upfront modelling and ETL)
- Manual data preparation

What’s in

- Alteryx
- Trifacta
- Paxata
- Tamr
- and others

The latest generation of tools take the pain away, giving users with reasonable technical skill the ability to rapidly explore, understand and analyse datasets from small to large.
Now you have my trust and permission. Now you don’t

Trend 5

Trust continues to be a challenge in the mind vs machine discussion.

Where do we need a trusted broker of data within ecosystems?
Show me a picture please

**Trend 6**

Visualization is becoming pervasive and critical.

How can we represent insights at a large and small scale to inform actions?
The advances in AI are accelerating, leading to **many commercial uses**.

**Trend 7 - AI, AI, AI and more AI**

AI is getting traction.
AI revenues are estimated at $153bn by 2020\(^1\) and value to industry is estimated at $50 trillion by 2025\(^2\)

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Trend 7

AI enterprise applications will continue to grow, with **deep learning** applications generating maximum revenue

**AI is being led by deep learning**

- Growth in AI enterprise applications is expected to be driven first by North America then Asia Pacific by 2024.
- Deep learning - used in more than half of AI applications - will continue to lead AI applications with revenue promise across industries
- Image analytics and machine learning lead revenue share after deep learning and have huge growth potential

### Market growth: AI enterprise applications

- $11.1 Bn (by 2024)
- $202.4 Mn (2015)

### AI enterprise application revenue by technology (2015)

- Deep Learning: 54%
- Image Analytics: 12%
- Predictive Models: 11%
- Machine Learning: 10%
- NLP: 7%
- Others: 7%
Trend 7

AI investments are growing

$7.6Bn
Total Investment 2011-16
39.87%
Investment CAGR

- Trends indicate increased interest for business process efficiency and insight-generation
- Industry witnessing dips in VC funding, with strategic/tech investors driving major deal activity since 2014
- Machine/deep learning and analytics solution providers raising the most funding - consistent with trend that companies are striving to solve complex problems using pattern recognition enabled by machine learning on top of big data analytics solutions

AI investment, led by machine/deep learning, has seen consistent investment growth

How has the investment in AI changed over the last decade? (Data in Mn)

Which segment of AI has attracted the most amount of investment? (Data in Mn for 2005-16)
**Trend 7 - the challenges of adopting new AI techniques to extract value from data are many**

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<th>Tool vs Solutions</th>
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<td>Smart machine use needs to start with a business problem and be supported with deep domain expertise to create a solution offering rather than a smart machine tool.</td>
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<th>Expecting Magic</th>
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<td>Smart machines are often thought of as automatically (magically) learning without human intervention when they actually require a laborious process of acquiring and cleansing data, labeling, training, and guiding the algorithm.</td>
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<th>Big vs Lean</th>
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<td>Companies will need lean approaches to implementing smart machines by filtering through large amounts of data, piloting smart machine efforts before scaling and developing a test and learn culture.</td>
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<td>Knowledge workers and manual laborers will increasingly be replaced by smart machines. The economy will need to adapt to maintain growth.</td>
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*Source: The Future of Employment: How susceptible are jobs to computerization? By Frey & Osborne, Oxford University, 2013*

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<td>According to some, smart machines could pose an existential threat to humanity taking over from humans. At minimum, risks and ethics of AI need to be addressed.</td>
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PwC used machine learning to help a financial services company increase sales productivity.

We used artificial intelligence to help hospitals minimize the occurrence of missed appointments.

We see data and analytics as a starting point for every business challenge.
PwC developed deep-learning CAD models to classify and detect cancerous growths from CT scans. Oncology was chosen as cancerous growths manifest themselves physically in the body and can be seen in various scans.

**Healthy vs. Cancerous Classification**

of suspected lung nodules

Data size: 2,200 images

**Tumor Detection**

from full lung scans

Data size: 1,000 images

**Tumor Segmentation**

from full brain scans

Data size: 8,000 images

Substantial results can be obtained from small data sets using deep learning, transfer learning (knowledge from previously trained networks), data pre-processing, and data augmentation.
PwC evaluated market entry strategies for a new product offering using a dynamic simulation model that helped establish economic drivers, adoption inhibitors and operational limitations of the ride-sharing market.

**The experience of our clients - dynamic simulation**

**Reviewed literature on choice models**

| A | Analyzed 3 primary business models and recommendations based on target market dynamics |

**Developed dynamic model to encompass dynamics of the choice processes**

| B | Developed dynamic model to encompass dynamics of the choice processes |

**Calibrated simulation model using analogous market and competitor data**

| C | Calibrated simulation model using analogous market and competitor data |

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In closing

- More and more organisations are taking a data-driven approach to making strategic decisions. Are you?
- Data-driven organisations are using machines to de-risk their decisions.
- Executives have great ambition to increase decision speed and sophistication.
- But, everyone expects to fall short of their ambition. What’s your expectation?
- Organisations face many limitations in decision making, but data and the ability to analyse it are the least of their concerns.
Thank you
QUESTIONS?

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