The Actuary in Data Science

Ashleigh Theophanides
The Actuary in Data Science
“Data scientists use the ability to find and interpret rich data sources; manage large amounts of data despite hardware, software, and bandwidth constraints; merge data sources; ensure consistency of datasets; create visualizations to aid in understanding data; build mathematical models using the data; and present and communicate the data insights/findings.”

WHAT IS ANALYTICS?
Making smarter decisions that drive strategy and improve performance

Analytics is the practice of capturing, managing and analysing data to drive business strategy and performance. It includes a range of approaches and solutions, from looking backward to evaluating what happened in the past, to forward-looking scenario planning and predictive modelling.
WHAT IS ANALYTICS?

The whole Analytics pyramid sits on top of an important support structure

Analytics combines Data Management, Business Intelligence, Performance Management and Advanced Analytics techniques. It makes extensive use of data, statistical and quantitative analysis, explanatory and predictive modelling, and fact-based management to drive integrated decision-making. It sits on top of a support structure, comprised of People & Organisation, Process & Data, and Technology, which can execute the Analytics Strategy of an organisation.

Advanced Analytics applies data mining, pattern matching, data visualisation, and predictive modelling tools to produce analyses and algorithms that enable businesses to make better decisions. Advanced Analytics answer the questions: why is this happening? what if trends continue? what will happen next? what is the best outcome? With regards to customer, pricing, supply chain, logistics and workforce Analytics.

Performance Management is an umbrella term that describes the methodologies, metrics, processes, and analytical applications used to monitor and manage business performance and risk. Examples include:
- Budgeting, planning and forecasting
- Profitability modelling and optimisation
- Scorecard applications
- Financial reporting and consolidation

Business Intelligence is querying, reporting, online analytical processing, and “alerts” that can answer the questions: what happened; how many, how often, and where; where exactly is the problem; and what actions are needed.

Data Management is the development and execution of architectures, policies, practices, and procedures that properly manage the collection, quality, standardisation, integration, and aggregation of data across the enterprise. Data management includes:
- Data Governance
- Data Architecture, Analysis and Design
- Data Security Management
- Data Quality Management
- Reference and Master Data Management
- Data Warehousing and Business Intelligence Management
Insight Driven Organisation (IDO)
WHAT IS AN IDO?
It takes a lot more than just technology or data to become truly insight-driven.

INSIGHT-DRIVEN ORGANISATION
An Insight-Driven Organisation (IDO) is one which embeds analysis, data, and reasoning into the decision-making process. An IDO sees analytics as a core capability embedded across the organisation – from strategic planners through line workers – providing insight at the point of action and supporting decision-making at the right place and the right time.

In addition, through asking the right questions and through the application of more advanced analytical and machine learning techniques, decision-making processes can be made more efficient, focusing human input on what they do best – interpreting, evaluating hypotheses and actions within situational context and taking control of actions, rather than collecting and analysing data.

When humans rely on their own experiences and knowledge, augmented by a stream of analytics-driven insights, the impact on value can be exponential.

> Automate and Monitor
> Real-time Event Monitoring
> Proactive Recommendations
> Automated Response/Exception Handling

> Interpret and React
> Evaluate Actions/Response in Context
> Inquiry and Challenge
> Situational Override/Control

Data-based insights feed human decision making.
BARRIERS TO ANALYTICS ADOPTION

Being overly platform-focused vs. insight focused, ignoring change management and failing to check blind spots are key barriers to successful analytics adoption and becoming an IDO.

Cultural Change
The bigger and older the organization, the more difficult it is to drive a cultural change or analytics transformation.

Inaccurate Metrics, Expectations, Models
Overly simplistic models, overconfident analysts, and lack of clarity on outcomes with inaccurate assumptions have led to incorrect results.

Analytics Skills Shortages
Talent is a critical hurdle in analytics adoption. The skills gap might delay some of the analytics implementation and integration.

Data
Confidence in data is low due to inconsistent definitions and differing answers to the same question. There is reluctance to share data and inability to get timely access to it.

Poor Implementation
Analytics is developed in silos and data is duplicated across the organisation. It lacks implementation vision and/or strategy for enterprise-wide integration.

Blind Spots
Privacy concerns, unintended usage, fraud, and theft concerns are real and must be monitored. Companies must manage this risk like any other risk.
WHY BECOME AN IDO?
An insight-driven organisation embeds analytics, data, and reasoning into its decision-making process. It sweeps analytics out of lonely isolation in silos to become a company’s central strength.

STAY AHEAD OF THE COMPETITION
The application of analytics and its importance is anticipated to increase in the coming years, and as a result, many organizations are on an analytics journey right now, with some blazing the trail and others just setting foot on the path. Analytics and data-driven insights become a source of competitive advantage when it enables better decision making throughout the organisation. The increased availability of rich data sets, and the sophistication of analytical tools, provides an opportunity to exploit the valuable insight that was previously not accessible.

CREATE MORE CENTRALISED COORDINATION FOR ANALYTICS
Analytics is managed by a variety of executive roles within companies, and a wide range of functions benefit from the capability. More structure around coordination and alignment—though not necessarily full centralization—is needed to realise the opportunity and benefits of a company’s data throughout the organisation. Think about a small “analytics center of excellence” if you’re not ready to fully centralise the capability.

DOES ANALYTICS IMPROVE COMPETITIVE POSITIONING?
84 percent of respondents reported that analytics improved their organisation’s competitive positioning.

BENEFITS TO BECOMING AN IDO:
Executives in an IDO can make smarter decisions than their peers in traditional instinct-driven organisations. In response to their questions, executives in an IDO receive timely intelligence. Opportunities and risks are highlighted by insights derived from data that is well-managed, secure, and accessible. As a result, decision-making, itself, becomes more open and collaborative.

**Improve the speed of decision-making** – e.g., improve customer experience by responding real-time while they are shopping online, or assess transaction risks in real-time.

**Decrease the cost of decision-making** – e.g., connect the shop floor to the ‘top floor’ with business intelligence and data visualization to build preventative approaches for equipment maintenance.

**Make better decisions** – e.g., combine data from inside and outside your organisation to add richness and granularity to better understand your customers or business performance.

**Become more innovative** – e.g., provide location-based services to maintenance managers using connected devices, equipment and other physical assets in the ‘Internet of Things’.
Analytics Trends
1. Defined use cases inform analytics investments
2. Analytics success hinges on building the right capabilities
3. Privacy and security becomes a front office function
4. Artificial intelligence gets practical
5. Behavioural economics delivers analytic insight
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Balancing risk and reward

The Maturity Barrier

Businesses are struggling to justify the business benefits of moving up the analytics maturity ladder.

Linking investments to impacts

Organizations need the capability to clearly connect their analytics investments to specific business outcomes.

Balancing risk and reward

Organizations have begun to question the wisdom of making ongoing investments in data and technology. This is a mistake.
ANALYTICS MATURITY ASSESSMENT
Provides an approach to categorise and evaluate key aspects of Analytics maturity in an organisation

A scoring system is derived from a series of interviews with stakeholders from across the organisation. The exercise is conducted using 5 dimensions: strategy, people, process, technology and data. Additionally, these scores can be cross-referenced against the components of the Analytics pyramid: Data Management, Business Intelligence, Performance Management and Advanced Analytics.

<table>
<thead>
<tr>
<th>Stage 1: Limited</th>
<th>Stage 2: Developing</th>
<th>Stage 3: Defined</th>
<th>Stage 4: Advanced</th>
<th>Stage 5: Leading</th>
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<tbody>
<tr>
<td>Business reporting</td>
<td>Ad-hoc exploration</td>
<td>Complex Analysis</td>
<td>Integrated insight</td>
<td>Insight driven business</td>
</tr>
<tr>
<td>Sales reporting</td>
<td>&quot;Slice and dice&quot; functionality</td>
<td>Predictive models</td>
<td>Next best action</td>
<td>Real-time decisioning</td>
</tr>
</tbody>
</table>

- **Strategy**: The degree to which Analytics is integral to strategy development, decision-making, and execution.
- **People**: The extent to which there is a critical mass of personnel recruited, trained and incentivised to apply analytic techniques.
- **Process**: The level to which Analytics and analytic approaches are embedded in core business processes.
- **Technology**: The sophistication and proliferation of Analytics tools and technologies.
- **Data**: The richness, availability, quality and governance of data across business functions.

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<thead>
<tr>
<th>Data</th>
<th>Information</th>
<th>Prediction</th>
<th>Insight</th>
<th>Innovation</th>
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18 April 2018
Are strategic decisions made in your company supported by data analytics?

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Some of the time</th>
<th>Mostly</th>
<th>All the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>11%</td>
<td>4%</td>
<td>30%</td>
<td>38%</td>
</tr>
<tr>
<td>Future</td>
<td>4%</td>
<td>42%</td>
<td>30%</td>
<td>29%</td>
</tr>
</tbody>
</table>

Distribution of Future Usage of Data Analytics to make strategic decisions

<table>
<thead>
<tr>
<th>Current usage of Data Analytics to Make Strategic Decisions</th>
<th>% of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all*</td>
<td>0%</td>
</tr>
<tr>
<td>Some of the time</td>
<td>100%</td>
</tr>
<tr>
<td>Mostly</td>
<td></td>
</tr>
<tr>
<td>All the time</td>
<td></td>
</tr>
</tbody>
</table>

TREND 1: DEFINED USE CASES INFORM ANALYTICS INVESTMENTS

18 April 2018
What is the greatest barrier to doing more advanced analytics?

- Shortage of staff with the appropriate skillset: 37%
- Lack of perceived need from management: 22%
- Lack of system infrastructure that...
- Insufficient data exists to perform analytics on: 13%
- Data is segregated: 5%
- Cost of hardware and software is prohibitive: 5%

Greatest Barrier by Current Usage of Data Analytics to Make Strategic Decisions

- Not at all: 4% 8% 8% 6%
- Some of the time: 9% 17% 24% 14%
- Mostly: 22% 35% 40% 53%
- All the time: 39% 27% 8% 19%

TREND 1: DEFINED USE CASES INFORM ANALYTICS INVESTMENTS

18 April 2018
Benefits of Data Analytics

- Improved value to customers and business partners: 34%
- Greater insights into data: 26%
- Enhanced financial performance: 18%
- Identification of risks and ability to respond: 14%
- Sales and product opportunities: 10%

TREND 1: DEFINED USE CASES INFORM ANALYTICS INVESTMENTS

18 April 2018
TREND 1: DEFINED USE CASES INFORM ANALYTICS INVESTMENTS

The Most Important Benefit by Industry

Benefits of Data Analytics
- Life Assurance / Pensions
- General Insurance / Health Care
- Non-Insurance

Distribution of the Most Important Benefit by Job Level

- Analyst: 9% Sales and product opportunities, 23% Identification of risks and ability to respond, 14% Enhanced financial performance, 22% Greater insights into data, 14% Improved value to customers and business partners
- Manager: 9% Sales and product opportunities, 9% Identification of risks and ability to respond, 16% Enhanced financial performance, 38% Greater insights into data, 29% Improved value to customers and business partners
- Senior Manager: 11% Sales and product opportunities, 9% Identification of risks and ability to respond, 20% Enhanced financial performance, 23% Greater insights into data, 37% Improved value to customers and business partners
- Executive: 17% Sales and product opportunities, 4% Identification of risks and ability to respond, 4% Enhanced financial performance, 9% Greater insights into data, 43% Improved value to customers and business partners
1. Defined use cases inform analytics investments
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TREND 2: ANALYTICS SUCCESS HINGES ON BUILDING THE RIGHT CAPABILITIES

Leadership
• Transformation-savvy executive sponsors.
• **Do not** appoint a sponsor who runs a cost centre.

Operating model
• Centralize scattered talent into a hub or centre of excellence.
• Empower analytics capability to lead and champion analytics.

Talent and capability development
Demonstrating a willingness to challenge business norms.

Culture and change management
Co-create internally with the business to build “purple teams” and externally with partners to fast track returns and avoid years of investment.
### Roles Performed by Respondents

<table>
<thead>
<tr>
<th>Role</th>
<th>Life Assurance / Pensions</th>
<th>General Insurance / Health Care</th>
<th>Non-Insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Intelligence</td>
<td>35%</td>
<td>47%</td>
<td>62%</td>
</tr>
<tr>
<td>Management Reporting</td>
<td>44%</td>
<td>47%</td>
<td>40%</td>
</tr>
<tr>
<td>Predictive Modelling</td>
<td>24%</td>
<td>47%</td>
<td>43%</td>
</tr>
<tr>
<td>Risk Management</td>
<td>33%</td>
<td>47%</td>
<td>32%</td>
</tr>
<tr>
<td>Programming / Development</td>
<td>31%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>Pricing</td>
<td>31%</td>
<td>39%</td>
<td>29%</td>
</tr>
<tr>
<td>Business Development</td>
<td>35%</td>
<td>29%</td>
<td>33%</td>
</tr>
<tr>
<td>Product Development</td>
<td>34%</td>
<td>26%</td>
<td>25%</td>
</tr>
<tr>
<td>Other</td>
<td>24%</td>
<td>22%</td>
<td>40%</td>
</tr>
<tr>
<td>Reserving</td>
<td>29%</td>
<td>32%</td>
<td>14%</td>
</tr>
<tr>
<td>Operational Modelling</td>
<td>19%</td>
<td>20%</td>
<td>29%</td>
</tr>
<tr>
<td>Marketing</td>
<td>13%</td>
<td>20%</td>
<td>29%</td>
</tr>
<tr>
<td>Telematics</td>
<td>1%</td>
<td>6%</td>
<td>3%</td>
</tr>
</tbody>
</table>

### Familiarity by Individuals Performing Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>% of Individuals Performing the Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictive Modelling</td>
<td>63%</td>
</tr>
<tr>
<td>Programming / Development</td>
<td>58%</td>
</tr>
<tr>
<td>Telematics</td>
<td>57%</td>
</tr>
<tr>
<td>Business Intelligence</td>
<td>52%</td>
</tr>
<tr>
<td>Operational Modelling</td>
<td>45%</td>
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<td>Pricing</td>
<td>42%</td>
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<td>Reserving</td>
<td>35%</td>
</tr>
<tr>
<td>Other</td>
<td>26%</td>
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**TREND 2: ANALYTICS SUCCESS HINGES ON BUILDING THE RIGHT CAPABILITIES**

Institute and Faculty of Actuaries

18 April 2018
1. Defined use cases inform analytics investments
2. Analytics success hinges on building the right capabilities
3. Privacy and security becomes a front office function
4. Artificial intelligence gets practical
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TREND 3: PRIVACY AND SECURITY BECOMES A FRONT OFFICE FUNCTION

Law vs Ethics
90% - would sever their relationship with companies that use data unethically.

Paying the Price
Leading organizations have set up nerve centres to monitor shifting consumer sentiment on a global basis.

A Business Imperative
Privacy and security will become a front office function rather than a compliance issue.
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In Search of Meaning
Think of AI as an umbrella term that encompasses multiple capabilities.

Real-world Applications
AI and cognitive technologies are starting to create value, when focused on more defined and practical tasks.

Defining the Benefits
As advanced analytics capabilities evolve, the competitive advantage they offer expands apace.
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Behavioural economics will play a key role for organizations interested in tailoring communications to their customers’ mind-set, or iterating rapidly to understand the best timing and type of intervention.

The way in which organizations design their offers or present choices has a meaningful impact on a transaction’s ultimate outcome. In fact, it is often possible to see major behavioural responses by making only small architectural alterations.

It is imperative to adopt strong governance practices around the way in which behavioural economics are used and applied.
Analytics Use Cases
## Domain Areas

<table>
<thead>
<tr>
<th>Domain Definition</th>
<th>Sample Sub-Components</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer Analytics</strong></td>
<td>Marketing, Sales force, Customer Service</td>
</tr>
<tr>
<td><strong>Supply-chain Analytics</strong></td>
<td>Supply Chain Efficiency, Inventory Productivity, Planning and Forecasting</td>
</tr>
<tr>
<td><strong>Financial Analytics</strong></td>
<td>Reporting &amp; Valuation, Revenue Leakage, Working Capital</td>
</tr>
<tr>
<td><strong>Workforce Analytics</strong></td>
<td>Talent Acquisition, Talent Retention</td>
</tr>
<tr>
<td><strong>Risk Analytics</strong></td>
<td>Enterprise Risk Management, Compliance, Risk Management and Reporting</td>
</tr>
<tr>
<td><strong>Cross-Functional / Other</strong></td>
<td>Risk Based Performance Management, Anti-Corruption</td>
</tr>
</tbody>
</table>

Customer Analytics is the use of Analytics to enhance the customer lifecycle, sales and pricing processes, and overall customer experience.

Supply Chain Analytics is the use of Analytics to provide insights across the organizational value chain.

Finance Analytics is the use of Analytics to measure, control, and optimize financial management processes.

Workforce Analytics is the use of Analytics to enhance and optimize workforce processes and intelligence.

Risk Analytics is the use of Analytics to measure, monitor and mitigate enterprise risk.

Analytics pertaining to cross-functional and hybrid solutions that offer multi-dimensional benefits.
WIDENING OUR PLAYING FIELD

Data Science opens up a world of new opportunities for actuaries outside the “classic” fields of practice.
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