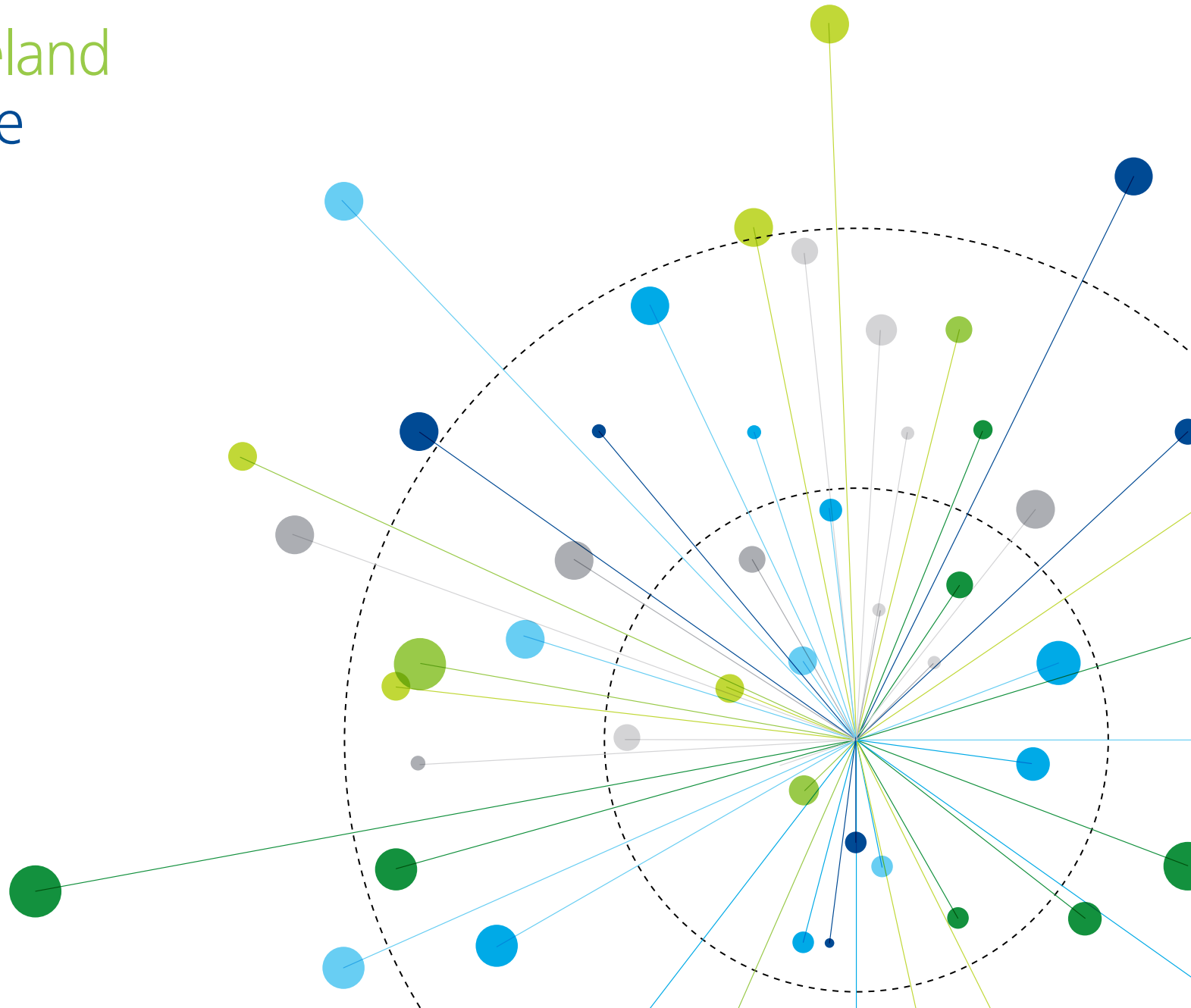




Data Science Ireland Solutions & Case Studies

2016



What we do

Deloitte Data Science is designed to be a one-stop-shop for your organisation's data needs. Our expertise range from advising you on how to setup a data analytics team in-house, to developing and delivering cutting-edge analytics solutions based on tried-and-tested science.

We bring a big-picture approach, combining deep sectoral knowledge from across Deloitte with broad functional capabilities and a high degree of technical sophistication. Teaming together experienced business analysts, machine learning aficionados, agile programmers, big-data technologists and innovative designers has already led to interesting outcomes.

To date we have provided advisory analytics services, data-driven strategy reviews, end-to-end analytics-based software solutions, interactive C-suite visualisations and reporting capabilities to the public sector and some of the largest private sector organisations in the world.

Deloitte Data Science.
Disruption Ahead.

Our Services



Advisory Analytics

Starting on an analytics journey or managing an efficient and responsive insight-driven organisation have common characteristics. They both require a holistic approach to deliver on current priorities and support future capabilities. Our experts will work with you in developing a considered methodology to building and managing your analytics capabilities from a strategy, people, process, data and technology perspective. For example, under consideration will be the most suitable Analytics Target Operating Model (ATOM) Design for your organisation.



Analytics Solutions

Developing actionable insights requires the use of data-driven tools and techniques. We develop customised end-to-end solutions using both proprietary and open-source technologies, leveraging Deloitte's industry and functional expertise from across the organisation. We are comfortable in picking a technology stack that best suits your data needs and in developing solutions that are flexible and extendible. Whether it's Excel or Hadoop, we know how to get your data in, and insights out.

A strong component of our solution includes the use of Analytics Design and Data Visualisation techniques. Our dedicated designers can be leveraged to review your existing tools or design new analytics tools from a user perspective. Our emphasis is on conveying complex data-driven concepts and ideas that not only cater to C-suite executives, but also your most valuable clients.



Advanced Analytics

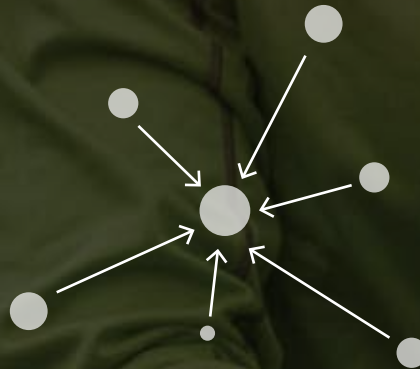
It's the use of standard and advanced machine learning, data mining and AI techniques that give you that predictive and prescriptive edge over your competitors. Our engineers and PhDs feel at home with R and Python, Regression Trees and Neural Networks. We are experts at developing proprietary solutions to meet your specific challenges. We can combine our skills in algorithmic development with our analytics solutions capabilities to deliver next-generation solutions that can not only leverage data from across your organisation but apply scalable machine learning techniques to it, combining all the benefits that you can derive from your data into a single solution.

Our Methodology



Listen

No matter what services you are looking for, we always initiate discussions by listening to your business problems and understanding your data landscape.



Leverage

Combined with our know-how, Deloitte's best in class methodologies from across our ecosystem are brought to bear on problem solving and solution development to meet your strategic needs.



Deliver

Whether its advisory analytics or the development of big data solutions, a strong collaborative approach, with a focus on value-for-money in the short and long terms, is at the core of our engagement approach.

Listen. It's all about you

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 organization.

At Deloitte Data Science, we understand the importance of listening to your business challenges and understanding your data landscape before we offer any advice or delve into developing solutions.

Challenging Thoughts

Business Challenge articulation is of fundamental importance in our approach. Without context, its becomes hard to develop relevant content. And without meaningful content it becomes hard to articulate actionable insights. We build our understanding of your issues by developing layers – like a cake. Our Business and Data Layers help us focus on the key questions to address from every conceivable angle.



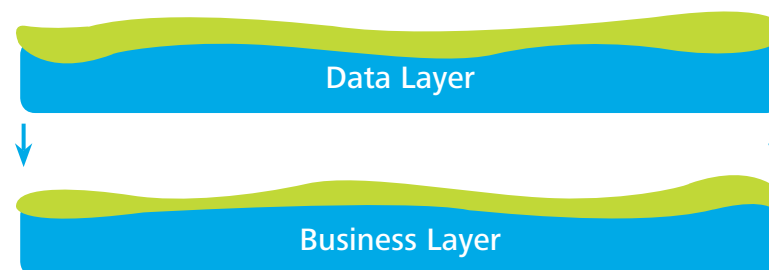
Data Cake

Business Layer

- Business Challenge Articulation

Data Layer

- Data Discovery
- Client Structured Data / External Structured Data
- Client Unstructured Data / External Unstructured Data



Deloitte
Greenhouse
Challenge

Read more
on page 8

Tasks

- Internal workshops
- Deloitte Greenhouse sessions
- Internal data landscape review

Outputs

- Clear business challenge articulation – how analytics vision supports corporate goals
- Business challenge-based prioritisation of initiatives
- Overview of associated technical challenges
- Statement of Work document

Leverage. Best-In-Class Methodologies

The increased availability of rich data sets, and the sophistication of analytical tools, provides an opportunity to exploit valuable insights that were previously not accessible.

Deloitte's Insight-Driven Organisation (IDO) Methodology focuses on considering analytics with a larger lens than just technology. This holistic approach helps us develop a range of data analytics services that align with every aspect of an organisations needs.

Thoughts to Insights

Deloitte has developed best-in-class methodologies that can be customised and deployed to speed-up the analysis and development of fundamental building blocks of People, Process, Data, and Technology. As an example, we are able to leverage Deloitte's proprietary library of machine learning and data mining algorithms and customize them for your requirements. 'Productising' these algorithms is a fast and efficient way to actionable insights.



Data Cake

Technology Layer

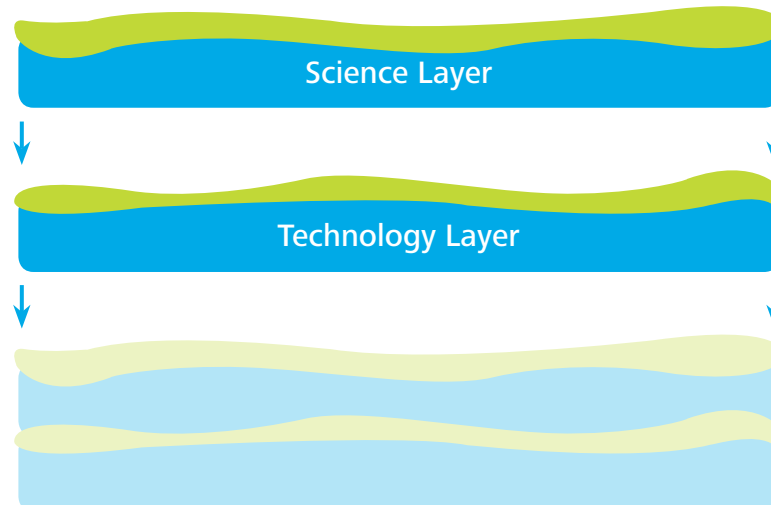
- Solution Planning / Technology Stack considerations

Science Layer

- Productised Data Science Algorithms – identified to help solve recurring, high-value business challenges

Supported by:

- Deloitte's proprietary library of machine learning & data mining algorithms & expertise in open source technologies



Tasks

- Use the agreed upon business challenges to inform data strategy
- Use the agreed upon business challenges to inform technology strategy
- Develop the Statement-of-Work into a Proof-of-Concept
- Review and reassess

Outputs

- Initial Actionable Insights Playbook
- Technical Proof-of-Concept Deliverable
- Reassessed Statement of Work document

Deliver. Actionable Insights

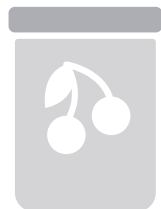
Whether its advisory analytics or the development of big data solutions, simply delivering a data strategy review or a new algorithm is not enough. Through a strong collaborative approach, we help clients interpret the results, focusing on value-for-money in the short and long terms.

We don't just deliver and walk away. Through our agile service model, we communicate, advocate, actively engage and mobilise our client's to become data believers and analytics enabled.

Insights to Actions

Getting results is all well and good. But, the results then need to be interpreted and understood. Our Decision Layer focuses not only on delivery but also on interpreting the results that are obtained from a business perspective and understanding what they mean to various parts of the organisation.

We ensure what we have delivered can be managed, maintained and extended when required.



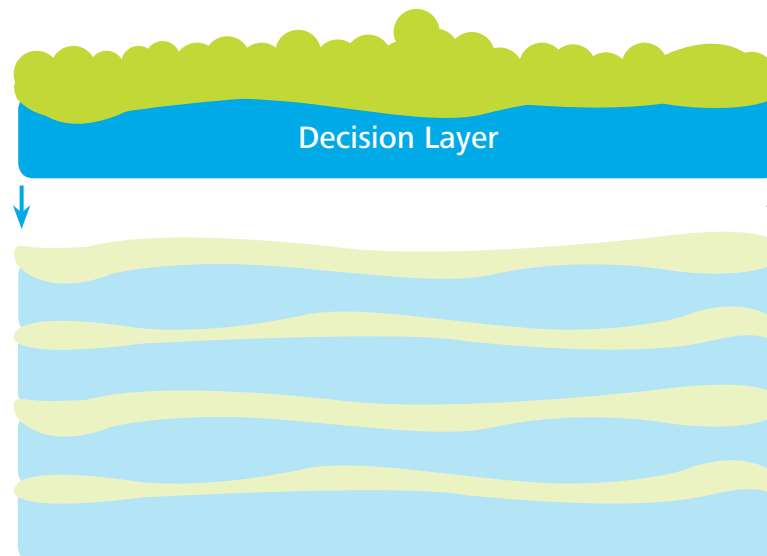
Data Cake

Decision Layer

- Directed Functional Actions & Decisions based on Analytical Outcomes

Supported by:

- Customer User Interface / APIs to client systems
- New Visualisation Approaches / Standard Visualisation Tools
- Deployment Plan (incl. Pilot Launch), Associated Training, Ongoing Support



Tasks

- Agile Development of agreed tools and techniques.
- Deployment of agreed tools and techniques
- Quality Assurance of all tasks

Outputs

- Final Actionable Insights Playbook
- Onsite Code Deployment
- Ongoing Data Management
- Deliver User Training
- Ongoing Support & Maintenance Training

Bake it!

Bring your own data to one of our interactive and immersive Greenhouse sessions where we will work with you to tease out those business challenges that can be solved through a data-driven approach.



Our Solutions

We enable our clients to become data-centric and insight-driven. Our solutions leverage the skillsets of experienced business analysts, machine learning aficionados, agile programmers, big-data technologists and innovative designers.

Our clients include the public sector and some of the largest private sector organisations in the world.

Risk Analytics



The Challenge

Calculating the risk factor associated with a particular trip can lead to tailored insurance products. However, this is not an easy proposition. Data from several sources needs to be combined to give a holistic view of the various factors that could cause accidents. The tool also needs to be interactive and instantaneous. Above all, the final product needs to be user-friendly.

Data

A dataset of over a 100,000 crashes in Ireland was collected for analysis. We depended on several publicly available data sources for this information:

- Road Safety Authority of Ireland traffic accident data
- Road Safety Authority of Ireland road volume survey data
- National Roads Authority traffic volume data

The data needed was collated and harmonised before analysis.

Analysis

Deloitte's Analytics team, with domain-expertise from Deloitte Actuarial & Insurance Solutions Team, developed TRIP (Trip Risk Investigation and Profiling), a tool to analyse the risk associated with driving on specific routes. Using Google Maps API, we were able to develop an interactive interface that instantaneously gave us visual feedback. Layered on top were statistics derived from the various data sources and a Severity Score that was calculated on-the-fly for each route highlighted.

Value Delivered

- Given any two points on a road, our tool was able to display the relevant statistics, along with a Severity Score, for that stretch of the road
- The results provided a level of personalisation and accuracy that was not possible previously
- We paid special attention to the user interface and the display of relevant information, making it intuitive and interactive

"The TRIP tool can give our clients the ability to not only calculate risk scores for specific routes, but also to visually interpret the results for themselves."

Richard Southern
Director, Analytics
Deloitte

Personalised route generation



On-the-fly Risk Analysis
using publicly available data

Colour coded Risk and
Severity Scores

Data Portal



The Challenge

Insurance Ireland represents 95% of the domestic Irish market and more than 80% of Ireland's international life insurance market. One of its tasks is to provide up-to-date market information to its members. Their existing market intelligence process relied heavily on manual effort from both Insurance Ireland and their members, which was primarily a spreadsheet collation activity.

Deloitte took on the challenge to automate the existing process, enable data comparisons and add a layer of security, while aiming for a rich, user friendly experience. The tool also needed to be highly responsive across various devices and screen sizes.

Data

- The data included sensitive life, non-life and international insurance metrics that could be uploaded by the 50+ member companies
- There was no limit to the data that could be uploaded by individual member companies
- The data could only be displayed once all company members had uploaded their data. This was to ensure anonymity and not lead to incomplete intermittent views of individual company's data

Analysis

Deloitte's Analytics team developed a fully responsive, secure, browser-based, end-to-end solution that exceeded the clients requirements. The portal combined industry, analytics, digital design and technology development expertise from across Deloitte Ireland. Its core features include a self-help data upload portal, an interactive and personalised data visualisation component and commentary on market performance for any given period.

Value Delivered

- The portal significantly reduced the laborious manual effort that was involved producing market information on a regular basis
- Instead of manual collation, spreadsheet templates securely uploaded anonymised, company specific data via the portal
- Data will be automatically error checked and transformed for comparison and calculations via the pre-defined processes

"The Market Intelligence Portal is a game changer for the industry. We are the first industry association to create this type of solution and we have already had interest from our counterparts in Europe who would like to see a demo of the portal."

Kevin Thompson
CEO of Insurance Ireland



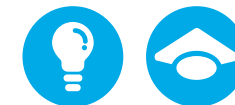
Secure backend infrastructure, encrypted data transfer and authenticated user access

Responsive web design for multiple devices

Secure and reliable proprietary data sharing across industry

Personalised tables and dashboards

AML Analytics



The Challenge

As part of a multi-million euro upgrade, a leading financial institution took on the task of enhancing and automating their Anti Money Laundering (AML) Management Information (MI) reporting. Driven by the need to automate and increase process efficiencies, the challenge within the organisation was to establish a centralised AML data warehouse that would allow automated MI reports generation, along with drill-down interactive reporting.

Deloitte Analytics was engaged to help develop an interactive, intuitive and informative data analysis and visualisation tool that would meet regulatory requirements while streamlining their internal MI reporting process. A review of the existing metrics to standardise them across the business units was also of interest.

Data

In addition to significant amounts of data, there were considerable data manipulation and aggregation requirements for this project. The emphasis was on automating data handling for data received from third-party vendors, systems and business units with a view to developing a centralised data warehouse. The warehouse needed to inform three key areas:

- Activity Monitoring
- Customer Due Diligence
- Payments Screening

Analysis

We leveraged our existing partnership with Tableau to deliver a dashboards front end that was highly interactive and intuitive. With Tableau, we are able to generate detailed reports by various internal categories, product types and divisions. Several customised metrics can be adjusted on-the-fly to get specific scenario-specific insights.

The reports are targeted at several stakeholders, including:

- Money Laundering Risk Officers
- Court Risk Committee
- Select Heads of Business

Value Delivered

- The tool plays a key role in supporting regulatory requirements
- The reporting process is significantly enhanced through the implementation of automated regular MI reporting, historical trend analysis and development of specific MI & risk-appetite metrics

“Deloitte Analytics has been supporting us in developing a holistic Financial Crime MI platform to enable the dynamic identification and management of Financial Crime risk. The team’s expertise, creativity and technical ability is extremely impressive and has facilitated the design and development of a very strong solution.”

Head of AML/CFT



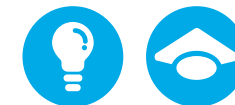
Interactive and Intuitive
Data Visualisation

Data collated from multiple
sources

Interactive, intuitive and
informative data analysis
and visualisation tool

Multiple data views

Census Tool



The Challenge

Publicly available datasets are a huge source of complementary information. In Ireland alone, thousands of publicly available datasets, ranging from detailed surveys on public attitudes towards An Garda Síochána to activities in acute public hospitals, are freely available for analysis.

One of the challenges of open data is that it's often available in formats such as pdfs or csv files that require further manipulation before it can be digested by the general public. The Data Science Team took on this challenge. The aim was to develop a user-friendly tool to ingest, analyse and visualise Central Statistics Office's (CSO) Irish Census data.

Data

- The CSO's Irish Census Survey results were used. It provides data for the country as a whole and covers topics such as age, marital status, living arrangements, ethnic or cultural background, Irish language and housing etc.
- In total over 700 demographic-economic characteristics were available for analysis

Analysis

- We developed the Census Tool, an online tool that is used to segment and analyse CSO census data in a user friendly manner
- The tool allows the user to cluster the electoral districts in the country into any number of clusters, based on the demographic variables that they are interested in
- Branch networks and other landmarks can be overlaid on the displayed maps, and demographic statistics for branch catchment areas can be determined

Value Delivered

- The Census Tool is a great example of how to make large amounts of data approachable
- The user can interact directly with the data, i.e. build custom clusters and heatmaps for areas and characteristics relevant to their business



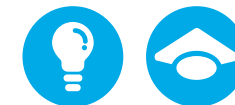
Publicly available data

View Population Segments
and Heatmaps

Statistical analysis for
individual areas

A user-friendly tool to
ingest, analyse and visualise
Central Statistics Office's
(CSO) Irish Census data.

Audit Analytics



The Challenge

Audit quality is the number one priority for Deloitte's Audit Practice. In support of this, Deloitte are investing in innovating audit processes to set new standards for audit excellence. Led by Deloitte's audit experts, we developed a fund audit solution which leverages market leading technology and data analytics in the execution of fund audits. The result is D.NAV, a tool that will assist in raising audit quality for fund audits.

Data

D.NAV applies intelligent logic to large quantities of fund data. The main source of data for D.NAV is obtained directly from the fund administrator and is consistent with the data that auditors would have historically obtained when performing a traditional fund audit. We enrich the administrator data with market data relating to foreign exchange rates, interest rates and performance benchmarks.

Analysis

D.NAV is a web-based tool that supports the performance of a wide range of audit tests including the analysis of share class divergence, recalculation of performance fees and other NAV based expenses, distributions testing and share capital testing. It provides interactive and intuitive data visualisation, allowing for greater interrogation of fund data and deeper understanding of fund performance throughout a given period.

Value Delivered

D.NAV enables the auditor to instantaneously analyse large and complex data sets to a precise level and in a fully controlled and consistent manner. This allows for greater coverage across the entire period under review with high quality exception based reporting built in which allows for an enhanced risk-based approach. D.NAV assists Deloitte in performing fund audits in an efficient and effective way.

"Our analytics team understood the challenges that we were seeking to overcome and delivered solutions that went far beyond our expectations. What impressed me most was their ability and desire to look beyond the challenges to identify further opportunities for our people and our clients."

Brian Jackson
Partner, Audit
Deloitte



Instantaneously analyse and visualise complex data

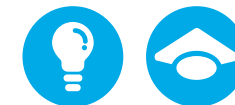
Browser based solution for easy roll out

Reduction in human error by automating manual tasks

Leveraging market-leading technology and data analytics in the execution of fund audits.



Workforce Analytics



The Challenge

A financial institute came to Deloitte Ireland's Analytics Group with a problem. They were looking to streamline operations across a vast network of office spaces and customer-facing branches. They intuitively knew that some locations were underperforming while there were others that were outperforming their peers. However, instead of gut-feeling or superficial number-crunching, the client wanted to embrace an in-depth data-driven approach to understanding the underlying forces that were leading to this variance in performance across their networks.

Data

Deloitte proposed a data-driven approach that not only relied on the organisation's internal data but also focused on open data available from government bodies and other organisations. Adding openly available socio-economic and demographic data to the institutes internal transaction volumes, staffing levels and roles & responsibilities, to name just a few sources, was an important factor in the overall success of the underlying algorithms to develop actionable insights.

The richness of the publicly available data alone was such that we undertook the analysis of over 700 demographic, social and lifestyle population characteristics to gain meaningful insights for our analysis.

Analysis

Deloitte's Outlet Optimisation Process (OOP) is a methodology which leverages Deloitte's experience and expertise in data-driven workforce analytics for customer-facing businesses. The process involves three key steps which when implemented lead to improved data-driven business-wide decision making.

We utilised OOP to define the micro-markets around each branch. Markets were then segmented into peer-groups using the defined micro-markets segments and ranked on their performance and staffing levels. Several factors such as branch location, location to the nearest regional commercial centre and proximity to other branches were used as indicators to rank branch performances.

Value Delivered

The financial institute that came to Deloitte Ireland's Analytics Group with a problem ended up with an in-depth data-driven approach to understanding the underlying forces that were leading to variance in performances across their networks. The resulting actionable insights gave them an undisputed basis for making informed decisions and influencing strategy.

Implementing these insights would translate into €6M in operational savings corresponding to an overall operation efficiency of 12% across the organisation as a whole.

Investment Analytics



The Challenge

A multinational financial services company had an Excel-based process for portfolio optimisation, but it was unsatisfactory for a number of reasons:

- It wasn't scalable. There was limited scope for analysing a larger number of assets because the current system was already hitting computational limits.
- It was also very time consuming. From start to finish, a typical rebalancing process could take about a week.

Deloitte had two main tasks:

- Implement their existing grid-search portfolio rebalancing procedure in R
- Provide an alternative solution in R based on Modern Portfolio Theory

Furthermore, the solution needed to have a user-friendly interface:

- Users should be able to set parameters in a text file
- Users should not need to interact with the underlying R code

Data

The data consisted of thousands of Monte Carlo simulations of asset prices for a number of different assets. For each asset, and for each Monte Carlo simulation, we were given forty years of pricing data. Data and calculations were spread across ~10 Excel files, with very little documentation or proper version control.

Analysis

We developed a tool :

- That could crunch through billions of floating point operations quickly, and without overwhelming the resources of the client's IT hardware
- Where the underlying development time was low, i.e. one that was well supported by visualisation and analytics libraries
- That was easy to update and maintain

Value Delivered

- We went from a full week of effort to a few minutes of preparation to calculate the optimal portfolio.
- The tool itself was roughly x100 faster to compute.
- Our approach uniformly enhanced return for given risk. The increase translated to approximately one percentage point over the previous portfolio return, a percentage that amounted to a potential additional return of several million for the same level of risk.
- Much more information was available than ever before – in a shorter period of time, the client got more accurate results, with more insights on more parts of the investment.



Procurement Analytics



The Challenge

A leading Irish General Insurer sought assistance in identifying opportunities to reduce their non-staff cost base as part of a drive to achieve improved profitability.

Deloitte were engaged to:

- Develop an organisation-wide view of external expenditure
- Benchmark spend against domestic and international peers
- Identify and prioritise cost reduction opportunities
- Develop high level implementation plans and cost benefit analysis for prioritised solutions

Data

Based on an extract from the insurer's financial systems a Database consisting of all financial transactions for the previous financial year was created. The data included spend categories by department, invoice numbers, purchase order numbers, vendors, amount spent per vendor and PO process compliance status. Other examples of data included were the spend projections for the current financial year.

Analysis

- A method called 'Spend Cube' analysis was created in Tableau to give a three dimensional view of spend data
- This allowed spend to be viewed from a high level by department to a more granular level by invoice

- Metrics such as supplier fragmentation and PO compliancy rate were assessed
- Following the data analysis, interviews were held with business owners to better understand some of the spend and flesh out potential savings opportunities

Value Delivered

- Cost savings of €2.0-€2.5m were identified, validated and signed-off by category owners, based a detailed analysis of all cost categories
- A long list of saving opportunities were reviewed with business and revised based on business appetite
- Cost benefit analysis and implementation plans were then created and agreed for implementation, ensuring that our data-driven analysis directly led to strategic changes within the organisation



Finance Analytics



The Challenge

Our client's C-suite executives required improved access to financial analysis that was mobile enabled and provided greater insight to financial performance than was historically available. Our client required access to slice and dice information, and view trending over time. Existing management information was spreadsheet based, lacked visualisation with extensive use of tables and numbers, and was largely historical. Deloitte was engaged by the Head of Performance Management to lead the design, development, and implementation of visual, mobile-enabled dashboards using Tableau.

Data

Several years of the company's financial data (Hyperion Financial Management)

Analysis

A multi-disciplinary Deloitte team worked with the client's finance and IT departments to support the following activities:

- Design dashboards using best practice data visualisation techniques;
- Extract, transform, and load data using Microsoft SQL Server 2012 into Tableau;
- Develop dashboards for use on an iPad;
- Publish dashboards to Tableau Online; and
- Assist with functional testing and data validation.

The dashboard suite and data source were published to the cloud, which facilitated secure access and viewing of the dashboard suite on both tablet and pc at any time.

Value Delivered

Deloitte implemented a number of highly visual interactive dashboards with the following characteristics:

- *Multi-dimensional* – Enabled users to slice and dice data by time, scenario, and business unit across the most important KPIs;
- *User-friendly* – Facilitated intuitive navigation from group-level to business unit level;
- *Leading-edge* – Made extensive use of advanced functionality such as Top N filters, parameters, combinations of sets, and data blending;
- *Highly visual* – Enabled users to find answers in seconds instead of hours by showing trends of trading performance
- *Mobile-enabled* – Provided insight on the go, using the Tableau Mobile App for iPad; and
- *Predictive* – Leveraged Tableau's statistical forecasting capabilities.

"Working with Deloitte Analytics, we delivered a suite of mobile dashboards that leverage leading practices, processes and technologies to help the CFO improve strategy execution"

Katie Burns

Director, Finance

Transformation Deloitte

Team Players



David Dalton
Partner



Richard Southern, PhD
Director



Cormac Hennessy
Senior Manager



Colin Melody, PhD
Senior Manager



Michael Bridges, PhD
Senior Manager



Prag Sharma, PhD
Senior Manager

A team consisting of:
PhDs in Astrophysics
PhDs in Mechanical Engineering
PhDs in Computer Vision & Pattern Recognition
PhDs in Computational Biophysics
MBA Graduates
Business Analytics MSc Graduates
Economics, Politics & International Relations Graduates
Civil & Environmental Engineering Graduates
Statisticians & Mathematicians
Computer Scientists & Software Engineers
Designers
&
Entrepreneurs

But who are also:

Bakers

Hikers

Bikers

Surfers

Golfers

Tag Rugby Players

Video Gamers

Cricket Enthusiasts

Painters

Camogie Players

Ultimate Frisbee Players

&

Triathletes

Andrés Suárez Cetrulo

Lisa McDonnell

John Delaney

Neil Brett

Leo Kavanagh

Kate Salley

Maria Leacy

Sutaraj Dutta

Susan O'Carroll

Conor Moloney

Cathal Leahy

June Foley

Michelle McCarthy

Oshobugie Idogho

Damien Cominskey





Mission Statement

"An environment that enables the delivery of customised, innovation focused experiences that enable our clients to achieve breakthrough moments in address their core business challenges."

Customer Experience Workshops

Deloitte Analytics works with our clients to understand their needs in a unique environment.

Contact:

Richard Southern

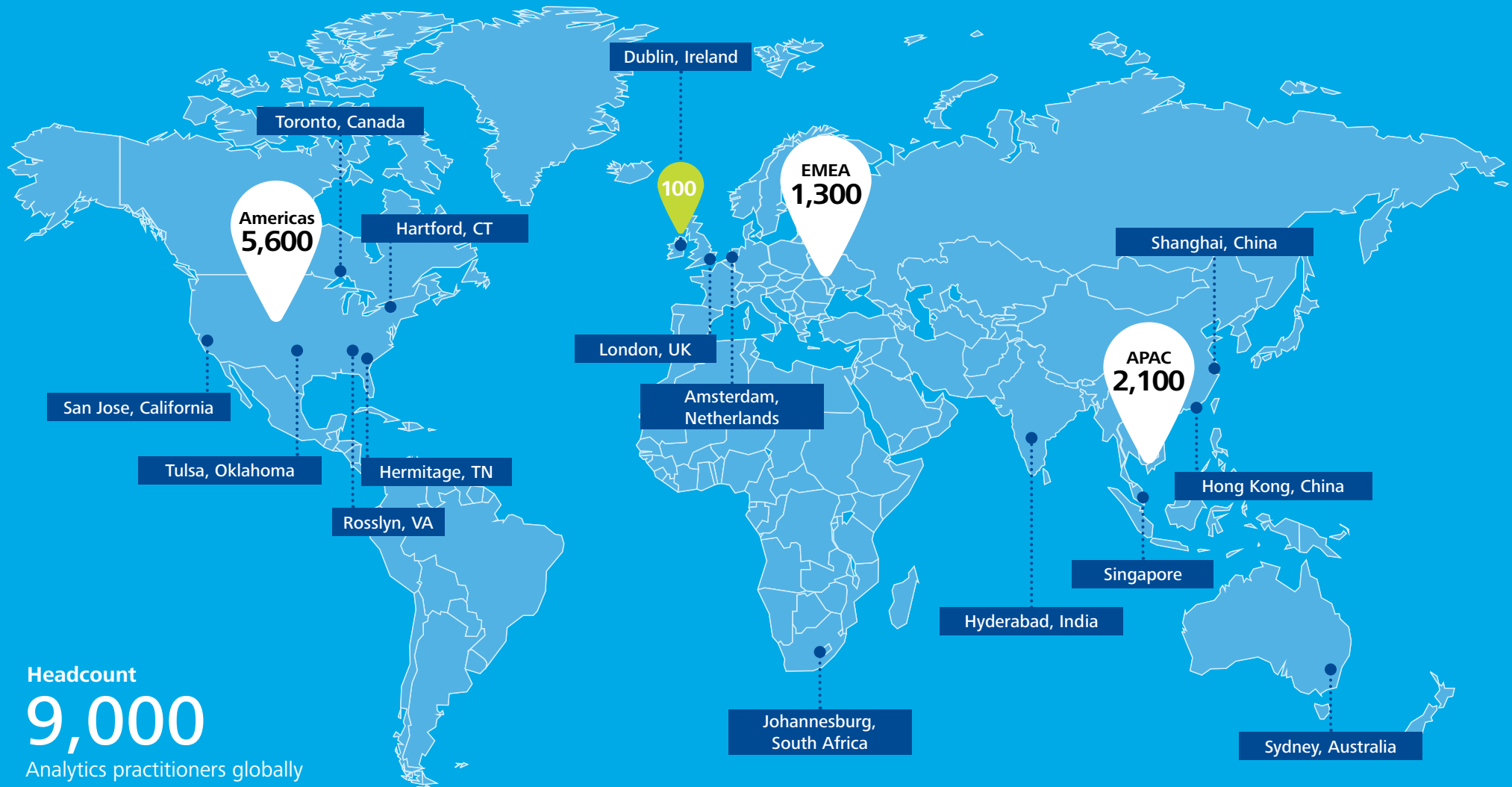
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