



analytics driven organisations

Foreword

Data: the new resource to boost the economy in the 21st century

Information is the oil of the internet age. Companies and organisations that are able to commercialise information assets to gain better insights and know how to leverage this in their business processes have a far higher likelihood of outperforming in the market and delivering better outcomes.

Succeeding in the data economy though is a challenge. 60% of Big Data projects will fail to survive beyond the pilot phase. 66% of organisations don't know how to truly get value from Big Data. 90% of Big Data infrastructures and Data Lakes won't provide the needed performance.¹

Yet, success is essential: Infocentric corporations are 20% more profitable and 110% more valued than their peers. In a world where "30% of leaders will be 'amazoned' by new players or incumbents by 2018", staying one step ahead of the competition is an essential advantage.²

This paper explores why organisations need to become analytics driven to succeed in the new data economy; how this is as much, if not more so, a management revolution than a technology revolution, what it takes to truly become an analytics driven competitor and how businesses can start this transformative journey to put data and analytics at the heart of their strategy and at work to differentiate their unique distinctive capabilities and value chains.

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¹ Source: Gartner

² Source: Gartner

Introduction

In the last few years many organisations have witnessed an unprecedented explosion in data volumes in addition to an increasing need for evidence-based decision making not only across a variety of areas within their businesses, including performance management, but also in response to regulatory compliance requirements.

A variety of data sources can now be accessed and analysed integrally to uncover evidence that may underpin decisions that may have been historically made through instincts and intuition; neither was this largely possible ten years ago, nor is a judgment based approach accepted any longer. Indeed, many organisations have transformed the use of their technology from that of an administrative tool to a key strategic critical success factor. Nowadays, retail organisations monitor and assess their online communities in order to spot customer trends via sources such as Twitter, Linked In and YouTube. Manufacturing companies have the possibility of deploying their production facilities with sensors to monitor the status of their productivity and internet companies such as Google monitor the searching behaviour of their visitors to enhance the nature and timing of their advertisements. A combination of structured data (such as output in columns and rows) and unstructured data (such as databases

containing pictures and videos or plain text) is available for organisations all over the world. A number of organisations have already begun turning these data sources into usable information and actionable insights, with demonstrable success. As we enter an era where data equals insights, there are vast possibilities to both gain and sustain a competitive advantage. Indeed a review of the global Standards & Poor's 1000 index composition show that approximately 700 of the companies currently on the Fortune 1000 joined the list within the past decade. That's double the turnover just two decades ago³; becoming an analytics driven organisation is a critical survival factor for organisations in a marketplace that has seen fierce growth in the competitive landscapes.

Organisations such as Amazon, Apple and Google create a novel position for themselves based upon analytics by acting upon insights derived from both structured and unstructured data and therefore can be characterised as 'analytics driven organisations'. Nonetheless most organisations are struggling with historical and intuition based decision making, not least in response to the raft of quantitative data requests from regulatory compliance activities. They are therefore actively in search of an answer on how to develop their organisations through a focus on analytical insights.

This paper will discuss the value to organisations of being analytics driven⁴ and presents readers with a view on characteristics of leading analytics driven organisations; through a comprehensive framework model comprising nine different dimensions.

Section 2 describes a range of reasons as to why organisations need to become analytics driven. Section 3 presents a series of analytics use cases, Section 4 explores how value creation through data requires mastering the analytics value chain and Section 5 presents a comprehensive framework model that defines nine key dimensions that are required to be implemented in order for organisations to become analytics driven. This paper then concludes with Section 6, an indication as to how organisations can begin their analytics journeys and guidance as to how to assess an organisation's analytics maturity.

³ Source: Forrester research.

⁴ Definition: By analytics driven, we mean organisations that combine the extensive use of: Data, statistical and quantitative analysis, Explanatory and predictive models, and fact-based management to drive decisions and actions.

Why should organisations be analytics driven?

Universally the answer is quite simple; being analytics driven opens up a whole new world of opportunities for organisations to create value and achieve a competitive advantage through not only understanding trends and characteristics of customers but also identifying factors of differentiation from their competitors.

As it is almost impossible for organisations to differentiate themselves through their products alone, business processes are one of the last remaining focal areas of differentiation; through the use of analytics, organisations are uncovering and tackling all corners within their businesses where value can be derived. The previous decade has seen an explosion in the number of companies in search of the 'killer app' through opening up an online channel for customer orders, for example, revenues and organisational reputations have been significantly increased for many organisations. However, in striving for the 'killer app' organisations tend to generally focus on only one area that yields the greatest competitive advantage. Through the use of analytics on an industrial scale though, across a variety business areas, a number of organisations (including Amazon and Capital One) have achieved field domination as they have effectively created a series of "killer apps" across their business.

Researchers have created a set of objective measurements which illustrate that analytics driven organisations outperform organisations that act largely on intuition⁵. Based on these studies it is arguable that analytics driven organisations are more likely to be financially successful than intuition driven organisations, for example, through having:

- ▶ an evidential basis for more accurate and faster decision making,
- ▶ a more efficient basis for auditing (reducing costs where manual audits had been previously performed),
- ▶ a more accurate means of prediction of future demand (including prediction of inventory stock for example),
- ▶ a more efficient base for optimising asset utilisation,
- ▶ a quantitative basis for enhanced performance management (for example, identifying characteristics of successful and least successful employees),
- ▶ a sound basis for improving product quality consistency,
- ▶ the identification of additional revenue channels (Opportunity Spotting), and
- ▶ the identification of potential points of revenue leakage (including fraud that may be occurring internally and / or externally).

While the Return On Investment (ROI) on (Big Data) analytics is not always formally calculated as the adoption of Big Data analytics is still evolving, global quantitative evidence is strong: Gartner demonstrated that Infocentric corporations are globally 20% more profitable and 110% more valued than their peers.

The next section illustrates use cases which underline different value creation examples for organisations who act on analytic insights.

The use of analytics can be categorised per the following spectrum as illustrated overleaf in Figure 1:

- ▶ **Descriptive:** What happened? What is happening now? What could happen?
- ▶ **Diagnostic:** How and why did it happen?
- ▶ **Predictive:** What will happen next? How certain can we be of this?
- ▶ **Prescriptive:** What is the best that can happen? What shall we do? Next best action?

This paper advocates that analytical effort should be strategically focused to specific objectives in order to reap the numerous benefits from the analytically generated outputs. Organisations should be clear in where they create value with analytics. Having well defined objectives and targets that are focused on specific areas will help to: improve data capture processes and the technical fit of analytical models, as does the involvement of relevant stakeholders and communication of a clear strategic vision i.e.: 'Where do we want to create value with analytics?' Without these clear goals, the creation of value based on analytics will remain a series of siloed and ad-hoc activities.

The following section discusses four main business domains, illustrated in Figure 2, where organisations transform themselves by putting analytics at work: Business reinvention, Operational excellence, Customer experience and Trust and compliance.

⁵ E.Brynjolfsson, L.M. Hitt and H. Kim, April 22, 2011. "Strength in numbers: How does data driven decision-making affect firm performance?" Social Science Research Network.

Figure 1: Data analytics application spectrum

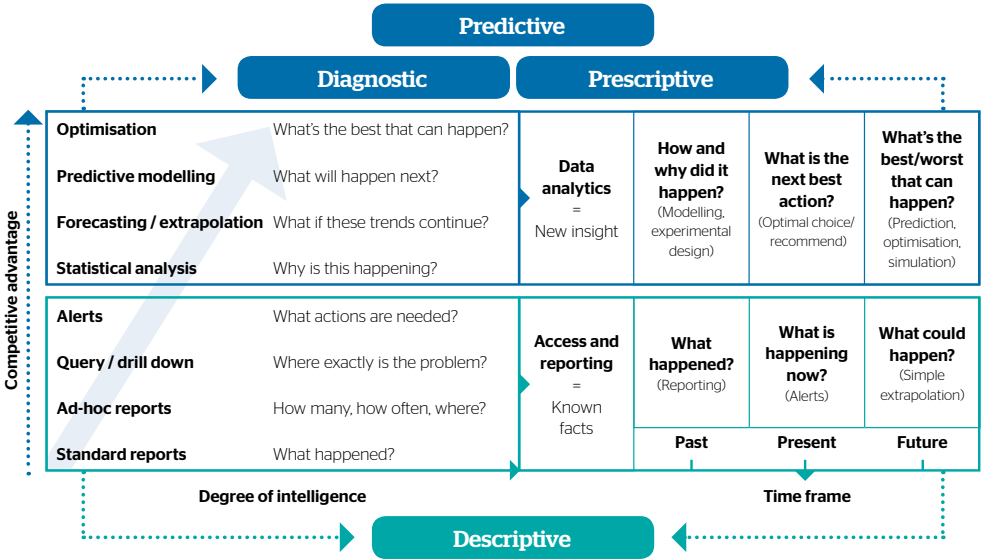
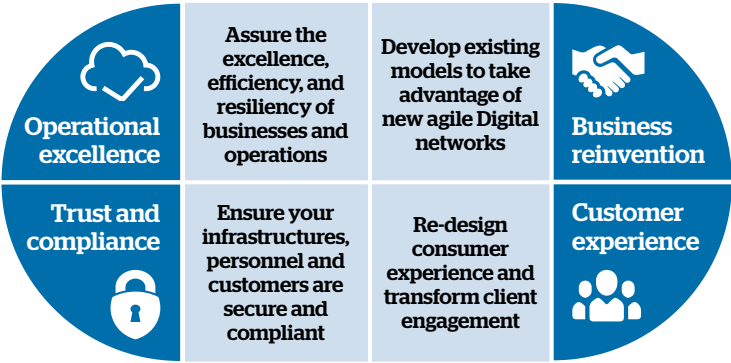


Figure 2: Four main domains where organisations transform themselves by putting analytics at work



Business reinvention

As stated, organisations need to focus their analytical efforts on specific objectives and business areas. In general organisations should decide if their analytical efforts are focused on *Business reinvention*, *Operational excellence*, *Customer experience* or *Trust and compliance*. Targets focused on reinventing the business have a higher impact on how the organisation operates than other objectives, and thus require for example a different level of dedication of employees and management. Business reinvention is created when analytical insights are used to create new products and services based on analytics. Organisations operating in a fiercely competitive environment, for example, develop many entirely new opportunities to create value and thus create a competitive advantage. Some organisations even take a step further; they alter their fundamental business models based on analytics and create a blue ocean for themselves.

An example of a business reinvention based on analytics is the John Deere case. Traditionally John Deere was a tractor manufacturer, but nowadays integrates predictive analytics, weather forecasts and supply and demand analytics within their tractors to optimally manage harvests. These services are even provided without buying a tractor at John Deere. Thus next to creating new services, John Deere also transformed their overall business model based on analytics.

Another business reinvention example is the creation of new products and services with the use of analytics in the People You Might Know (PYMK)⁶ section of Linked In. Based on a multi-factor Big Data approach Linked In members are offered new opportunities to link with other members who they might know. The notifications that PYMK sent have received 30% more clicks than other Linked In notifications and due to this extra feature, Linked In has generated a significant number of new customers.

Operational excellence

Organisations who focus their analytical efforts on operational excellence use analytics to improve operations, financial and asset management, and resource management and development. Objectives that strive to improve the operations include targets that aim to improve: the prediction of product fatalities, energy

management, business process management, prediction of delays, supply chain management, costs associated with IT, and operational assets. Organisations that focus on improving financial and asset management with analytics have targets such as: improving fraud detection, predicting non-payment, predicting loan defaults, and improvement of billing and revenue management.

Examples of such operation enhancing value through analytics are the analytics use cases at large European retailers. Through the use of predictive analytics, these organisations are better able to predict demand and supply, which allows them to optimise their supply chains in terms of logistics. This results in less waste and less lost sales. Some of these firms even take it a step further; they integrate the predictive demand models into existing processes which enables them to automate the replenishment processes. This results in more accurate forecasting and higher productivity. Furthermore organisations use the demand and supply predictions and insights to dynamically optimise their product prices which in turn enables them to maximise profits.

Customer experience

Organisations that enhance their existing customer value focus their analytical efforts on better targeting of customers and optimising existing products and services that are offered to the customer. To do this analytics are focused on getting a broader view of the customers, used to improve: (1) direct marketing, (2) predicting retention (and cancellations) of customers, (3) personalised offers, (4) the propensity to buy, (5) targeting idle customers, (6) selecting the right marketing channels, (7) setting the right price, and (8) selecting the right promotions.

Areas where existing products and services may be optimised through the use of analytics are: (1) web testing, (2) enhancing product introduction performance, and (3) enhancing customer service.

An example of creating value by focusing analytics on the customer experience is Wal-Mart; they have raised the rate of completed transactions by more than 10% with the usage of a self-teaching semantic search tool. Online shoppers were able to find the products they wanted more effectively and offerings are tailored to online shopping behaviours.⁷

Trust and compliance

Organisations that focus their analytical efforts towards trust and compliance activities use analytics to not only identify and minimise existing and potential areas for cost leakage but also better target their loss reduction efforts. To do this analytics are focused on: (1) fraud management, which includes prevention, detection, investigation and recovery of revenue leakage (waste and abuse), 2) surveillance – risk analysis including credit risk (and debt collection), 3) information security and threat management, for example, security log file analysis, cyber-attacks, data leakage, threat signal analysis and 4) regulatory compliance such as anti-money laundering (AML), enterprise content management (classification of information types in order to assign access privileges), records management and knowledge management.

It is widely reported that global banking firms, for example, create value by focusing analytics on trust and compliance activities: one of these banking firms used analytics to predict which checks are fraudulent, which enabled them to decrease fraud loss by 20% in one year. Another global bank used analytics to develop an information security strategy by identifying root causes of historical losses and predicting likely future losses. This strategic road map, entirely based on analytics, was used to develop and justify their information security strategy budget of £100M.

Another example of an organisation where analytics is central to their trust and compliance initiatives is the Passport and Identity Services of a major European government, through the development of a comprehensive analytics framework that incorporated analytics techniques for the identification and prediction of characteristics of internal and external fraud (such as neural networks for pattern recognition and link analysis). They were able to significantly build and transform their counter fraud and intelligence strategy not only for a potential resultant gain in fraud reduction of tens of millions of pounds but also reputational benefit with more sophisticated controls that help to prevent fraudulent online applications.

⁶ Davenport, T.H., 2014. "Big data at work". Boston, Massachusetts: Harvard Business Review Press.

⁷ Laney, D. 2012. "Big Data Strategy Components: IT Essentials." October 15, ID G00238944. Chicago: Gartner.

Example analytics use cases by business domain

In reference to Table 1, several specific uses cases, categorised by business application domain, are summarised where analytics have been employed to transform the business or enhance existing business value. Keep in mind this is just a succinct list of a few use cases (out of a study of 214 use cases) in which value has been demonstrated through the adoption of an analytics driven approach.

Table 1: Examples of analytics use cases

Business Domain	Use Case
Business reinvention	▶ A leading communication organisation completely reinvented their business by leveraging customer movement information. They complement customer movement information with the customers' backgrounds and activities in specific areas and monetise on these enriched insights by selling them to other parties such as shopping malls, stadium owners and billboard firms.
	▶ An international healthcare organisation created new business by selling predictive models of which clients are most at risk for future medical expenditures to insurers and helping insurers with proactively reducing client healthcare expenditures based on these insights. Models are created by combining information of client's health with client's demographics, claims with medical prescriptions. This new business is formed into a separate organisation with annual revenues of \$25 billion per year.
	▶ A leading foodservices provider transformed the restaurant business by delivering real-time trends on food terms, menu items, ingredients to restaurants and suppliers. They combine data from online foodservice providers and restaurant reviews websites with a database of food terms and menu items which helps restaurants to change their menu based on increases or decreases in demand for certain ingredients by geography and restaurant type.
Operational excellence	▶ A leading aviation company saves tens of millions of dollars by improving their efficiency of ground personnel scheduling and throughput of aircrafts based on better predicting aviation delays and airspace performance. These savings are based on acting upon new predictive models comprised of a combination of insights of radar network data, publicly available data on weather, flight schedules, and other factors.
	▶ An energy provider in the USA enables a step-change in financial management by using predictive analytics on clients demographics, history and paying behaviour to predict future non-payment and act upon the results by pre-empting charge offs and decreasing service disconnects. The results led to a 700% increase in net savings.
	▶ An international logistics provider dramatically lowered their operating costs by using insights that allow fuelling optimisation, and by identifying the optimal location at which a driver should stop for fuel. They place sensors in all their trucks and containers to monitor location, driving behaviour, fuel levels and whether a container is loaded or empty and combine this data with the fuel prices along the way. This helps them to decide the optimal location for truckers to stop and lower the cost of fuelling.
Customer experience	▶ A leading entertainment service provider dramatically improved their customer experience by improving movie recommendations to its customers through better predicting the demand for watching movies. They crowd sourced prediction models of user demands for watching movies which resulted in a combined prediction model that is much more accurate in predicting the demand for watching movies.
	▶ A leading beauty products provider redefined their customer experience by creating real-time actionable insights out of tracking 1700 Facebook fans, 15 million likes and 41000 twitter followers via sentiment analyses. Actionable consumer comments are proactively routed to a communication centre for the most appropriate handling, resulting in higher brand awareness and better leveraging loyalty via direct communication with the customer.
	▶ An analytics driven casino uses real-time analytics on loyalty cards and customers' behaviour to improve the customer experience. The insights are used to set prices for slots and hotel rooms and design the optimal traffic flow through the casinos. When customers lose too much money, the systems are able to send a message to the customer's machine; 'looks like you're having a tough day at the slots. It might be a good time to visit the buffet. Here's a \$20 coupon for use in the next hour.'
Trust and compliance	▶ A global industrial biotechnology solution provider uses cutting-edge analytics to prevent the loss of data. They created an analytics system to monitor, detect and block abnormalities in the use of all types of sensitive data in their organisation. The insights resulted in a huge reduction in the risk of leaking highly confidential information and highly valuable IP.
	▶ An international insurance company improved their success rate in pursuing fraudulent claims from 50% to 88% and improved claim investigation time drastically by using Big Data analytics. They created predictive analytics on years of historical claims and coverage data and used text mining to highlight missing facts, inconsistencies and changes in stories. With these insights they are able to target individuals with low propensity for claim fraud and save \$12 million.
	▶ During the Olympic games in London, the IT service provider gets over 200 IT security events per second which are handled through real-time data analytics. Out of 201 million events correlated events were filtered based on analytics and eventually the organisation acted on 90 critical incidents. Due to these insights the organisation had zero downtime and zero business effect.

Analytics transformation stories

The possible uses of Big Data analytics are nearly infinite and can cover thousands of use cases. Just to demonstrate the breadth of possibilities, this section describes three detailed truly transformative use cases, in order to highlight that the adoption of an analytics driven approach creates numerous value opportunities for organisations:

Drilling to a whole new level

One of the world's most profitable copper mines invests in heavy duty machines such as crushers to excavate valuable materials including metal and ore. Its achievement in becoming one of the most profitable mines in the world is heavily dependent upon analytics.

One example is centred on providing proactive maintenance for the crushers; crushers are vital to the mining industry but their spare parts are difficult to supply, order and produce. In addition, if a crusher is unexpectedly out of order, their maintenance units have a long wait on the delivery of spare parts, which has an obvious severe impact on the revenue of the copper mine. Therefore it is critical for the organisation to develop a capability that predicts the failures of spare parts. Crushers are provided with highly sensitive sensors that measure the speed of drilling, amount of vibration in the crusher and other parameters such as the amount of pressure on the crusher's elements. Each day each crusher's measurements (data) are loaded into an analytics platform. Maintenance workers and analysts (in other geographical areas in the world) analyse these measurements to predict the probability of failure and report back (using action based reports) to the maintenance units that are near the crushers. In this manner the organisation is able to proactively adjust maintenance intervals and effectively supply relevant machine parts.

Actively listening to the customers

A large health insurance organisation targets its analytical efforts towards improving customer health care experience by innovatively assessing the satisfaction of their customers; they combine analytics on structured customer data with analytics on unstructured voice recordings data in order to analyse customer satisfaction and attrition. In order to do so, they created a tool for turning voice recording files into text that could be analysed, with the use of Natural Language Processing (NLP). Within the created text, they are now able to distinguish words that suggest customers are happy from words that suggest customers are unhappy. In order to do so they gave much attention to their technology strategy. Nowadays, with the right technology in place and the right data strategy the insurance organisation is able to make interventions more directly based on these analytics.

In addition to the use of voice recording files in combination with other customer information, the organisation knew they had created a unique position in their market. They created unique actionable insights, models and tools for analysing the data they created. Furthermore they had envisioned that if these insights, tools and technology were combined with data (such as electronic medical records) of other relevant health care providers, they could even further help people live healthier lives. Thus they created a business for selling data, insights and software to health care companies. The annual revenues are currently over \$25 billion.

Predicting future purchases

A large American cable and broadband organisation serves around 6 million customers. Their mission is to be a trusted provider of communications and entertainment in America. In order to be so, the organisation is targeting its analytics efforts on better understanding the needs and wills of the customer. They are also making efforts in predicting the propensity of customers to buy new or additional services and products. In this manner they are able to personalise their offerings to customers, create new value and create a better customer experience for their customers.

In order to get a better customer understanding and create a model to predict the propensity of customers to buy other services, the organisation collects and analyses data of their customer base. They check historical offers made by the customer stamped with date, time, location and channel information (along with the success of these offers) with date and time stamped customer lifecycle events e.g. they look at refunds, payments, bills, disputes, and complaints. To enhance their understanding of the customers this type of data is then combined with unstructured data from call logs and transcripts and sentiment analysis (to determine whether comments are positive or negative) is used on social media posts of customers. Next to getting the right data, the organisation uses the right technology to collect, store and structure the data in such a way that they can build predictive models for the propensity of customers to buy other services. By using predictive models on the customer base they are able to triple response rates on direct mailings. Predictive models for demand for communications products such as home TV, internet, and phone services achieve a 50% annual return on investment.

Mastering the analytics value chain

Based on the use cases which are highlighted in this paper one can conclude that being analytics driven enables business transformations and value creation. The reality however can sometimes be slightly different.

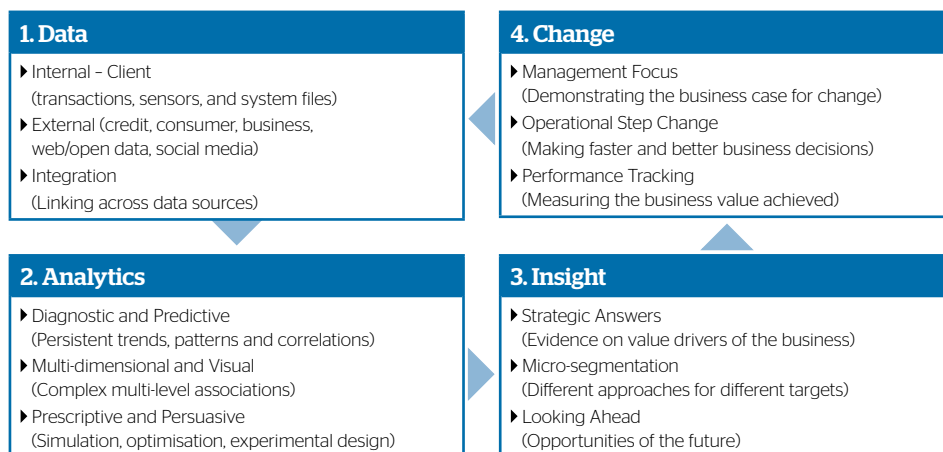
Studies⁸ have shown variability in the business results obtained by organisations that have launched analytics initiatives and invested in dedicated analytics hardware, software and personnel. Some organisations are able to capture massive amounts of different data behind the context of what drives value in their business, but still are unable to fully exploit these insights into business value. Others even use the relevant analytics techniques to come up with new valuable insights; however they struggle to convert these insights into enterprise-wide actions. Some stakeholders are not fully aligned for example and various business executives still hold on to their intuition.

In order to fully unlock the entire spectrum of business value that analytics can offer, organisations need to master all the elements of the analytics value chain which is illustrated in the figure below.

The organisation must get a handle on (1) creating a shared enterprise-wide vision where analytics could improve performance and value dramatically, (2) which data sources need to be acquired in order to create valuable insights, (3) how to get access to these data sources, (4) how to integrate these data sources and tools into an existing technology architecture, (5) how these data sources are to be analysed, (6) whom within the organisation has the capability to model the data into a constant flow of actionable business intelligence, (7) creating an environment where decision makers are challenged to make use of this business intelligence, and (8) how to support the business innovations and changes based upon the resulting business intelligence.

Organisations that have the ambition to become more analytics driven should look further than just having the right targets, people, data and technology. The remainder of this paper will therefore focus on giving readers a comprehensive yet practical view on what it takes to become more analytics driven.

Figure 3: The analytics value chain



⁸ Enterprises Struggling to Derive Maximum Value from Big Data: http://wikibon.org/wiki/v/Enterprises_Struggling_to_Derive_Maximum_Value_from_Big_Data

Becoming analytics driven

This section presents a comprehensive framework that describes the key characteristics of leading analytics driven organisations; essentially, 9 key components representing challenges that organisations must address in order to succeed at effectively adopting and running an analytics driven approach that underpins their business. This framework is illustrated in Figure 4. Each of the 9 key challenges depicted in Figure 4 are described in further detail as follows.

The Right Leadership

A fundamental basis of a truly analytics driven organisation is strong **(1) analytical leadership**.

Analytics driven success begins and ends with analytical leadership. Without strong *analytical leadership* analytical efforts will not gain the direction and organisation-wide support that is required in order for analytics to be put at the heart of the organisation; strategic analytics goals must be fully devised, set out and communicated clearly with all relevant stakeholders. Leading analytics driven organisations formalise the analytics roles at strategic level with the emergence of Chief Data Analytics Officers (CDOs/CAOs). Furthermore analytics leaders understand and advocate the value of analytics enterprise-wide which helps to reinforce the importance of analytics. To profit from analytical insights at an enterprise level, analytics is seen as a key element for creating business value. Therefore it is imperative that the analytics voice is represented at a senior strategic level by a CDO or CAO (for example) who has the mandate to build up the analytics capability enterprise-wide. Additionally a strong voice helps when acting on analytical insights that are not directly in line with traditional decision making.

The analytics leader is responsible for building up the analytics capability. Analytics leaders (1) build up and share the analytics mission, vision and strategy, (2) hire, invest and manage the bona fide analytical talents, (3) ensure analytical talents are able to use the right tools for analysing a wide variety of data sources, (4) ensure that high impact analytics opportunities are identified and explored first, (5) align incentives and awards towards analytics performance, and (6) build up and operate the analytics governance structure. To be able to effectively operate on these responsibilities analytics leaders must possess several skills; analytics leaders are strong stakeholders who effectively manage different points of view in turbulent politic waters. Second, they are excellent, persuasive and visionary speakers and effectively communicate the analytics vision. Third, being visionary and persuasive is not enough. Analytics leaders are also able to communicate effectively from different points of view: deep technological, analytics and business orientated analytics. Fourth, analytics leaders are characterised by their willingness to experiment and their openness for change. Fifth, analytics leaders are able to recognise high impact analytical projects and steer analytics investments towards business priorities. And finally, analytics leaders are data savvy people who have extensive and deep knowledge of different methods and tools for data analysis, quantitative or statistical modelling and reporting; they are recognised and respected experts within the analytics field.

Figure 4: The 9 key challenges that need to be addressed to create and sustain a truly analytics driven organisation



The Right Strategy

Having strong analytics leadership is a pre-requisite in creating an analytics driven organisation, but this alone is not enough. Organisations need to have a clear strategy on where they will be putting analytics at work. Next to effective leadership, organisations need to see analytics as core value creators. Therefore they need to develop an analytics strategy that includes **(2) analytics strategy, vision and business targets**. The analytics strategy nonetheless will only be effective when accompanied by a clear and shared analytics vision and when analytical effort is targeted towards specific business issues and/or opportunities.

As analytics are based on a growing number of available data sources, an increasing number of variables can be included in analytical models and thus it is possible to measure various events and their consequences more accurately. Managers in analytics driven organisations are therefore experiencing a revolution in the way they manage their business. More and more decisions are fact-based and leading analytics driven organisations are clear in their organisational intent with analytics. As analytics can be very much viewed as a competitive differentiator, leading analytics driven organisations are able to describe how analytics shape their business performance and focus their intent on specific business areas via specific strategies.

Strategies for extracting business value out of analytics are based on (1) enhancing existing value (analytics improving operational efficiency, improving the customer experience), and (2) reinventing business value (providing insights to develop new products and services, and providing guidance in transforming business models). Leading enterprises are even able to pursue multiple strategies simultaneously or sequentially.

Knowing how analytics drives business strategies is not enough. Analytics leaders complement their organisational intent, with a transparent and shared vision. All internal stakeholders (e.g. management in all departments) and external stakeholders (e.g. partners, suppliers and customers) are informed and contribute towards creating this analytics driven vision. Each stakeholder has a clear understanding of how actions (based on analytics insights) will substitute, extend or transform products and services. Clear roadmaps are shared as to how to become analytics driven and initiatives to help communicate the vision.

Next to a shared vision, analytics leaders will also provide a strategy that is transparent in demonstrating how analytics improve the business use cases. Each case is toolled with well-defined business KPIs and metrics to assess and monitor the performance of analytics driven use cases. Communicating results on these analytics driven use cases will further help to gain buy-in and alignment of all relevant stakeholders.

A well-defined strategy and vision that illustrate how analytics drives business performance also aids leading analytics driven organisations in funding new business cases. Enterprise-wide funding systems seek to assess whether new opportunities will complement their strategy. This also facilitates the prioritisation of high impact business cases.

The Right Culture (Mindset)

Next to the right leadership and strategy it is imperative that analytics driven organisations have an **(3) analytical culture** and mindset. Managers and employees need to develop a belief that by making decisions based on facts they have a valuable means of validating their intuition, and in instances where intuition is challenged by the evidence, there is an improved basis for decision-making. There has to be a supportive culture on quantitative approaches and fact based management, otherwise employees will remain with the status quo of decision making based on intuition and comfort.

To further propel the analytics capability, leading analytics driven organisations put much effort in fostering an analytics empowering organisational culture. Employees tend to be analytics minded, from an organisational view; and the organisational structure is characterised by non-bureaucratic decision making, decision making that is based on facts. The organisation demands enterprise-wide collaboration.

Analytics minded employees in analytics driven organisations have a consistent methodological approach that is characterised by a desire to underpin decisions with facts and analytics. Employees and leaders act upon rationality rather than intuition. Furthermore, employees have the tendency to be impatient with a status quo that is built on intuition and 'gut feel'. Employees search for the truth based on information, and challenge traditional decision making by their leaders in pursuit of demonstrable improvements to be made from an evidential basis.

Top analytics driven leaders have established a non-bureaucratic organisational structure and have a firm belief in the fact that great ideas can come from anyone. Transparency in information sharing is one of the top priorities in these organisations and employees are empowered to share and develop their ideas based on data analytics. These organisations have adopted a meritocratic way of working; employees are rewarded based on their analytics inputs. Remuneration and company policies are based on analytical performance, providing a continued basis of incentivisation.

Next to the above elements, analytics drive strategic, tactical and day to day decisions in mature analytics driven organisations, and hierarchical employee structures tend not to be a barrier for communication and/or progress; employees at all levels are invited to be part of the decision making through the use of self service applications (for example, data scientists are encouraged to communicate their ideas to the C-Suite).

Leading analytics driven organisations create an analytics driven environment where the usage of data is facilitated for employees coupled with enterprise-wide accessibility to on-demand training in the usage of data analytics tools and approaches. Multi-department analytical collaboration is fuelled by analytics communities based on interests. Furthermore, these organisations learn by doing, and incorporate a mindset where they encourage research and development, and for example, recognise that some experiments lead to early failures with new ideas but are required to be explored in order to be eliminated.

At last leading analytics driven organisations and its employees have an outside-in mindset. The organisational focus changes from solely improving operational efficiency with analytics, towards also improving customer experience and the development of better suited business models.

The Right Capability and Governance

The next step in creating an analytics driven organisation is to make sure the organisation has effective **(4) analytics organisational governance** and an enterprise wide analytics **operating model** that underpins the analytics driven organisation; analytics resource allocation is governed strategically, analytical effort is governed towards business priorities and best practices are centrally collected and shared enterprise-wide.

Mature analytics driven organisations recognise the need to align analytics leadership, strategy and culture enterprise-wide, and therefore govern their analytics efforts effectively. Rather than having just a siloed perspective, every employee knows where to find analytical talent within their organisation and analytical talents are seen as strategic assets within the organisations. The analytics capability is managed at a strategic level.

Leading analytics driven organisations assign analytics talents to key business opportunities and issues that are centrally coordinated. To effectively coordinate and allocate analytical resources, they have implemented sophisticated resource planning systems. Another important aspect to note regarding governance is that leading analytics driven organisations have implemented systems to (1) be fully aware of strategic high value analytics opportunities, and (2) allocate funding properly towards strategic projects. Next to this, leading analytics driven organisations have a strong belief in the idea that cross functional and multi-department collaboration will create better insights. Therefore these types of collaboration are promoted by the usage of enterprise-wide community/collaboration tools from a governance perspective.

Complementary to the strategic governance aspects, analytics driven organisations are governing analytics projects in an agile manner. Analytics project prioritisation and allocation of analytics capabilities is proactively adapted towards the most recent demands of both

business and IT. Business analysts work alongside technical experts and data scientists and govern their projects through 'scrum method like' meetings and committees (for example, steering/innovation committees).

Elaborating on the agile method of allocating analytics capabilities and the trends of centralising analytics activities it is notable that many leading analytics driven organisations structure their analytics capabilities via a Centre of Excellence (CoE). Although this method helps to align analytical efforts, one could argue that a CoE creates distance between, for example, higher management and operational employees. In sum analytics leaders have centralised most analytics activities and put effort in being agile and open for change, which could be organised via a CoE.

At last, analytics driven organisations place analytics at the heart of their organisations as they base their decisions (strategic, tactical and operational) on data analytics. In order to further facilitate decision making based on analytics, analytics driven organisations align their incentive structure with analytics driven behaviours.

“Organisations should target their investments in data analytics at their distinctive value chain capabilities, along with processes that serve their customers in ways that are differentiated from their competitors and create a unique formula for business success.”

The Right Skills and Competencies

By placing effort in analytical leadership, strategy, culture and governance/operating model, the analytics function will exist at the core of the organisation; however, a right balance of **(5) analytics skills and competencies** is essential in order for this core to operate effectively.

Leading analytics organisations perceive their analytical skills and competencies as key sources for competitive advantage. The analytical skills and competencies set of a prosperous analytics player consists of several elements: a balanced amount of analytics skills and competencies, well trained and educated analytics employees, a level of 'up-skilling' of purely technical employees with business skills, formalised analytical roles and an empowering environment for future possibilities and growth in analytics. Additionally, the up-skilling of employees of a commercial background with technical skills also provides an effective balancing component of the analytics skills and competencies capability.

The right analytical talent, typically called a 'data scientist', is hard to find. The typical data scientists of an analytics driven organisation need and possess a combination of 'domain and soft skills', 'data engineering skills', 'data analytics skills' and 'communication of insights into action skills'. So how do analytics driven organisations find these rare combinations? These organisations put a lot of effort (time and money) in finding them and have a solid sourcing plan in place. They are fully aware that most analysts do not have all the desired skills and competencies. Analytics leaders focus to find analytical talents who are business oriented and excel on 'domain and soft skills' and 'communication skills'. If some of the data engineering and analytics skills are less present, analytical leaders put effort in developing these skills, and in sometimes pairing individuals and creating teams to provide a combined skill set. Another method which is used regularly is creating cross functional teams to add data engineering and analytics skills. Next to this, the analytics skills and competencies needed depend on the use cases and the organisational environment. Sometimes more data engineering skills are needed but fundamentally their effort must be translated and visualised so that business can act upon these insights.

Leading analytics driven organisations value their analytical talents as an important (if not the most important) factor for creating and sustaining a competitive advantage. Therefore they have strategies in place to retain their analytical talents. To retain their analytics capability they create an empowering analytics atmosphere. They (1) formalise analytics roles within the organisations, (2) enable the discussion of analytics at enterprise level via an analytics community, (3) provide well developed and needs-based training courses which are easily accessible, (4) partner up with technological vendors and academic institutions to keep track of the latest developments, and have an experienced mentor for guidance in their analytical quest, and (5) provide well suited development paths for their analytical talents. An all too critical yet often ignored success factor for the retention of analytics talent is a well-defined career path with metrics that are relative for peer comparisons and adequately adapted for these individuals (e.g. if the standard metrics for career progression in an organisation are centred upon number of sales, they need to be adapted for technical analytics staff accordingly e.g. number of successful innovative projects delivered etc.). Otherwise, technical analytics staff with skills that are essential for projects to be executed and delivered feel 'left behind' and under valued in comparison to their peers.

The Right Data

Next to creating the right analytics driven environment, organisations must also know how to fuel this environment with the right data. Otherwise, there is a danger that by not fully including in the analysis at the right level of granularity data elements/sources that could be crucial to the understanding of the context of the business environment, and what drives its performance, organisations could well fall short of achieving their business outcomes by not generating sufficient analytical insight that allow fact based management of the intended targets for analytics as stated in their strategy. Therefore analytics driven organisations have a **(6) data strategy** in place. These organisations have extensive knowledge of all data sources that are around, and know which data sources are both relevant and accessible per use case and have plans in place to incorporate value adding data sources to their existing use cases.

Organisations that understand the value of analytics can pinpoint high impact opportunities for analytical deployments, and have strong analytical leadership that supports analytical efforts which are well on their way to ensuring that the organisation is analytics driven but still has steps to take. Leading analytics driven organisation have developed a scope that determines which data sources are needed to complement their analytics strategy and targets.

Firstly, leading organisations are well aware of the data output of all business processes in their organisations. Secondly, they know which data sources exist next to the data output of all business processes. Leading analytics driven organisations know which unstructured, structured and fast moving data sources are complementing their findings and the internal data output they already use. They include internal data sources (financial performance data, ERP, PLM, CRM, GPS data etc.) and external data sources (like social media, video, voice and plain text, sector studies) in their analytical efforts. Thirdly, leading organisations put formalised effort in constantly collecting unique bits of information which could provide them with unique insights and competitive advantage. They have formulated a plan on how to collect new data sources and take into account the origin of the data (e.g. is the data freely accessible or does the data need to be acquired, is it third party data or open access?). Analytics driven organisations not only recognise the potential value of data; they also capitalise on data, by combining data of a variety of data sources into usable information.

Overall, a strong analytics leader is the backbone of an effective data strategy: they can be seen as an architect who has a clear vision of the building blocks needed to build a dream house, knowing which building blocks are available and makes effective plans to get access to building blocks that are unavailable at present.

Knowing which data sources exist is one part of the data strategy puzzle. Another step is to effectively allocate data sources to specific use cases. Analytics leaders are competent in answering the question of which data sources can provide better insights per use case.

The Right Technology

Long gone are the days of having a data management and analysis capability only centred upon a range of standard data management software and/or basic relational database systems; having the right technology goes hand in hand with the right data in any analytics capability. Therefore analytics driven organisations have implemented an **(7) analytics technology strategy**. These organisations know how to choose the appropriate technology stack that supports their chosen business targets / use cases and data strategy, are able to combine different technologies to process usable outcomes and process data insights, and have both a vision, for emerging technologies, and a plan in place to integrate new technological possibilities with existing ones.

In order to exploit data from various data sources; analytics leaders have an analytics technology strategy in place which gives them guidance on which technology should be used in acquiring, processing, managing, analysing, modelling and visualising all the relevant types of data sources as per their business targets/ use cases and data strategy.

They build up a hybrid ecosystem of usable integrated IT infrastructural systems and workflow management systems to (1) acquire and store data, (2) transform and manage data, (3) model and analyse data and (4) present and score data. In most analytics driven organisations these ecosystems coexist next to their traditional technology structure. They have invested in scalable and agile discovery environments that allow them to explore and test new analytics approaches before putting them into production. As each use case typically differs in data inputs, the technologies required for processing can vary significantly and therefore the ability to engage and manage an ecosystem of diverse partners is important (for

example, storing and dynamically analysing a vast amount of unstructured data from web and social media requires a different technology stack than that required for the capture and analysis of high volume and velocity such as telecommunications network signals or IT infrastructure systems logs).

Next to these hybrid ecosystems, analytics driven organisations also have technology in place to scale up quickly. Analytics leaders are familiar with the usage of public, hybrid and private cloud and the usage of parallel computing systems (like Hadoop and/or no SQL data stores) or in memory distributed computing environments (such as Spark, H2O or SAP Hana) to store, distribute and compute large amounts of data. As these technologies are supplied with various programming languages that work well with Big Data (e.g. JavaScript, Python, Ruby, Scala, etc...), analytics leaders also build up their technology competency in using these programming languages.

In addition to processing data into insights, analytics leaders are well aware that processing data is just one part of making analytics work. The other part is visualising and communicating the analytics outcome. Within their technology ecosystems they also have different technological tools in place to visualise their analytic outcomes. The most mature analytics leaders even are able to visualise real-time analytics by using high performance computing technologies.

As mentioned earlier, great ideas come from anyone. Therefore the usage of technology is democratised and consumable enterprise-wide in mature analytics driven organisations. Employees are provided with technologies that match their needs and that they are capable of using.

In order to improve usability of technology, mature analytics driven organisations improve and/or adapt their technologies by using a small iterative approach on implementing new technology to existing technology. In mature analytics driven organisations business people, technologists and end users work together when implementing new functions to existing technologies.

The Right Processes and Performance Management

Establishing an effective analytics environment that is fit for purpose requires the development of an **(8) analytics performance and risk management framework** to ensure sustainability and adaptability for continuous improvement where required. Analytics driven organisations have standards and policies in place to track performance of analytics usage in all phases of the analytics lifecycle; through a range of carefully defined metrics they can assess accuracy and effectiveness at periodic intervals and identify areas of improvement as well as opportunities for enhancement. Therefore, performance and risk considerations regarding data usage across each of the steps of the analytics lifecycle are evaluated and reported regularly: (1) acquire and store data, (2) transform and manage data, (3) model and analyse data and (4) present and score data.

Effective analytics performance management begins with the data itself; garbage in garbage out. Leading analytics driven organisations have created standardised ways of collecting and cleansing data, maintaining the technological infrastructure, setting accessibility policies (and securing privacy), and securing intellectual property rights. They have data cleansing tools and policies in place in order to cleanse and remove data that is incorrect, incomplete, corrupt or out of date. Just having the tools

“Finding, developing, managing and deploying data analysts and data literate business decision makers is one of the most critical aspects in order to become an analytics driven organisation and even more vital than having the right data and the right technology.”

to cleanse is not enough; all analytics employees are fully aware and responsible for cleansing data that is prepared for analysis. Furthermore, mature analytics driven organisations manage their information lifecycle. Policies and standards are in place to classify and store information, and systems are implemented to provide a risk rating of information so that high risk information can be treated with due care. They have policies in place to standardise and unify data and store it as master data within their data management systems. While standardising the different types of data input, mature analytics driven organisation put effort in classifying highly important/risky/impactful data, in order to be able to further mitigate against the risks accompanied with the usage of potentially sensitive and classified data.

The next step is analysing the data sets. To keep track of the performance of these analyses, mature analytics driven organisation regularly question if the models used provide the best fit. The organisations keep track of model decay, for example, and analysts regularly check if they understand the meta data used for their models, particularly if any underlying biases exist or if any of the model parameters are required to be re-calibrated due to changes in the underlying distributions of the data over time. Otherwise, when the underlying assumptions of the models are wrong or outdated, decision making will be incorrectly guided with potentially disastrous consequences. Therefore mature analytics driven organisations monitor the accuracy of model based decisions and first test their models in a test area (a sandbox), after which they test the model on a subset of their population (a sample) and thereafter the model is deployed in a production environment.

When organisations have reliance in the models the models are implemented in automated fashion in their daily decision making processes, which enables them to make faster and more accurate decisions. This also enables them to reduce operating risks and continuously improve performance e.g. when the outcomes of the models are below SMART (Specific, Measurable, Actionable, Relevant, Time bounded) formulated thresholds, managers and/or employees are automatically notified and are able to act upon these exceptions.

Mature analytics driven organisations have logged and documented their analytics deployments and use cases (for storing, distributing, modelling, analysing and visualising) in enter-

prise-wide available systems to capture best practices and to ensure repeatability. Along with strong governance to ensure that the deployments are not inaccurately modified, this transparency enables employees enterprise-wide to check and reuse key analytics models, and share best practices for data analytics, resulting in an improvement in the performance of analytics modelling.

The Right Rules

Through the storage of data sets and aggregation, a range of security challenges and considerations exist for any organisation performing analytics. Information security is therefore one of the key enablers in becoming analytics driven, and requires organisations to proactively incorporate **(9) analytics security and compliance** policies and standards in their analytics capability and processes. As security threats are increasing in volume and sophistication alongside the increased use of analytics, formalised and robust measures are required to incorporate information security.

Analytics driven organisations instinctively recognise some of the security challenges that are created through aggregating data sets; data becomes richer and more valuable and creates new Intellectual Property in some instances. The increase in value of combined information may also be relevant to an organisation's competitors. Hackers could get access to a wide variety of valuable data and change and/or delete critical content, employees with malicious intent could alternate data input and thus potentially corrupt decision making based on analytics. Further, even employees of cloud service providers could have malicious intent and manipulate data. Thus the existence, processing and use of more data and information is accompanied with an increase in the risks to an organisation's operations and reputation.

A key building block of any information security management system is having a good handle on (1) what data is being held, (2) how data is standardised, unified, cleansed and classified before storing and distributing, (3) how data is encrypted and anonymised (4) where data is being held, (5) who has access to the data (and who is responsible and accountable for the data being held), and (6) what value each particular type of data holds. Another consideration is the analytics applications themselves and their security features and strengths; can an organisation be confident that the analytics applications themselves are as secure as they need

to be? One final factor is the emergence of the Internet of Things (IoT) and the idea of capturing data from a variety of sources within an organisation and its operations. IoT devices are rarely designed and built with security foremost in mind and could increase the level of insecurities. There is also the very real problem of how to patch or update devices that are controlling plant or other safety or mission critical systems which are required to be operational all of the time!

As leading analytics organisations know, none of these issues are insurmountable; but they require some careful thought and consideration. Most importantly security (and compliance) issues need to be thought about from the outset of such programmes and not seen as a tick in the box exercise shortly before a system goes live! Indeed, there is a real possibility that an analytics driven organisation may actually reduce its security risk for the simple reason that security management and performance is a problem that lends itself well to analytics. Many organisations have deployed sensors and monitoring systems and log data is often stored somewhere for any post-incident event analysis. Most mature organisations even proactively identify risks and threats in real-time and apply the same principles of analytics to the security function itself. Thus analytics driven leaders constantly diagnose and monitor their organisation's security health and compare their analytics practice with industry best practices and standards (e.g. ISO, NIST, Cobit) or with similar mature analytics driven organisations.

Additionally, the distribution and usage of various sources of data triggers the need for compliance policies for data usage. Customer data is used in analytics and therefore privacy is critical. The whitepaper which is currently being published by Atos Consulting⁹ concludes this implicates that analytics driven organisations have numerous policies and methods in place to (1) address compliance areas defined by e.g. ISO 27002, (2) ask customer approval of data usage for analytics and distribution to third parties, (3) allow customers to update personal information, (4) distribute output only to authorised personnel, (5) collect and retain customers' data only for the purpose notified to the customers, (6) restrict access to system configurations, (7) regularly audit the protection of vulnerable data, (8) regularly audit the Treat Customer Fairly promise, and (9) regularly audit the usage of data in regulated industries.

⁹ Brandon, H (2015). Big Data Analytics and Privacy and Data protection.

The analytics journey

This chapter provides an indication as to how organisations can begin their analytics journey and concludes with guidance as to how an organisation's analytics maturity can be assessed, which may be useful in tracking how an organisation's progress is evolving over time and in benchmarking against peers.

How an organisation should start its analytics journey

In most industries analytics as a discipline already exists within a number of organisations' core capabilities. Table 2 gives an overview of common targets with analytics in several industries e.g. financial service providers try to do everything in their power to mitigate the risks of customers that don't pay off their loans, debt or mortgages. Retailers strive to optimise customer offerings and marketing. Transportation firms are heavily dependent on their supply chain. Thus organisations should start with improving the analytics capability in business areas where analytics already exist.

Through the use of business enhancing analytics existing business processes are not changed directly, and cultural clashes are unlikely to appear. The picture below highlights the most important steps to take when starting the analytics journey with a pilot. When the pilot is a success, the organisation should deploy the model in an operational and scalable environment. The next step is to build up more use cases in the existing business and eventually evolve to a more mature analytics driven organisation by using analytics to create new products and services.

Table 2: Organisations should start with improving the analytics capability in business areas where analytics already exist

Industry	Example analytical applications
Financial services	Fraud detection, credit scoring, claim optimisation, customer profitability, customer retention.
Retail	Inventory management, demand forecasting, customer marketing and offering management, price optimisation, customer loyalty.
Manufacturing	Preventative maintenance, inventory management, supply chain optimisation, new service/product development, product quality consistency.
Logistics	Optimisation of: supply chain, planning, routing. Improvement of employees safety, yield management.
Health care and insurance	Predicting drug effects, predicting loss ratio of insurance claims, personalised treatment for patients, predicting hospital patients readmission likelihood and costs.
Agricultural firms	Yield and crop management, analysis of the health of animal stock.
Telecoms and utilities	Real-time offerings, churn risk and prevention, fraud management, billing and revenue management, prediction of system failures, network value optimisation.
Services	Channel management optimisation, call centre management, new service development.
Government	Fraud detection, crime prevention, crowd management, predicting voting behaviours, optimisation of response to global issues.

Figure 5: The start of an analytical journey



Analytics Maturity

Becoming an analytics driven leading organisation is not something which organisations accomplish overnight. To become analytics driven, organisations must know where they are in their journey and know how to improve their business to become analytics driven. Therefore it is important that organisations assess their analytics maturity in a formal manner under a maturity framework.

Based on our research, experience, and discussion with agencies such as Gartner, we suggest organisations should assess their maturity on the capability dimensions described below, distinguishing 5 levels of analytics maturity (Level 1: Data - Starting, Level 2: Data - Evolving, Level 3: Information - Established, Level 4: Knowledge - Advanced, Level 5: Wisdom - Leading). Figure 6 below highlights each level of maturity including its characteristics. Organisations at the "Data - Starting" level mostly act upon their instincts and management expertise. Analytics is not seen as a core value and analytics functions are not formalised. Data quality challenges present significant issues and senior management requests for information fall to local teams to manually collate the data.

Organisations that are at the "Data - Evolving" level of their journey use some historical data to underpin some decisions within data savvy departments. Analytics are not performed in a structured manner and analytics effort is duplicated without notice. Strategic decisions are still based upon intuition. Data quality is a common excuse that is used for not accepting analytical outputs.

Organisations at the "Information - Established" level use analytics within departments to underpin decisions and to alternate decisions based on future prognoses. Decisions are still more operational and cross department cooperation is still not common ground. Data champions and accountability exist and some efficiencies have been gained through intelligently working with data, but there is much key person / analytical process risk.

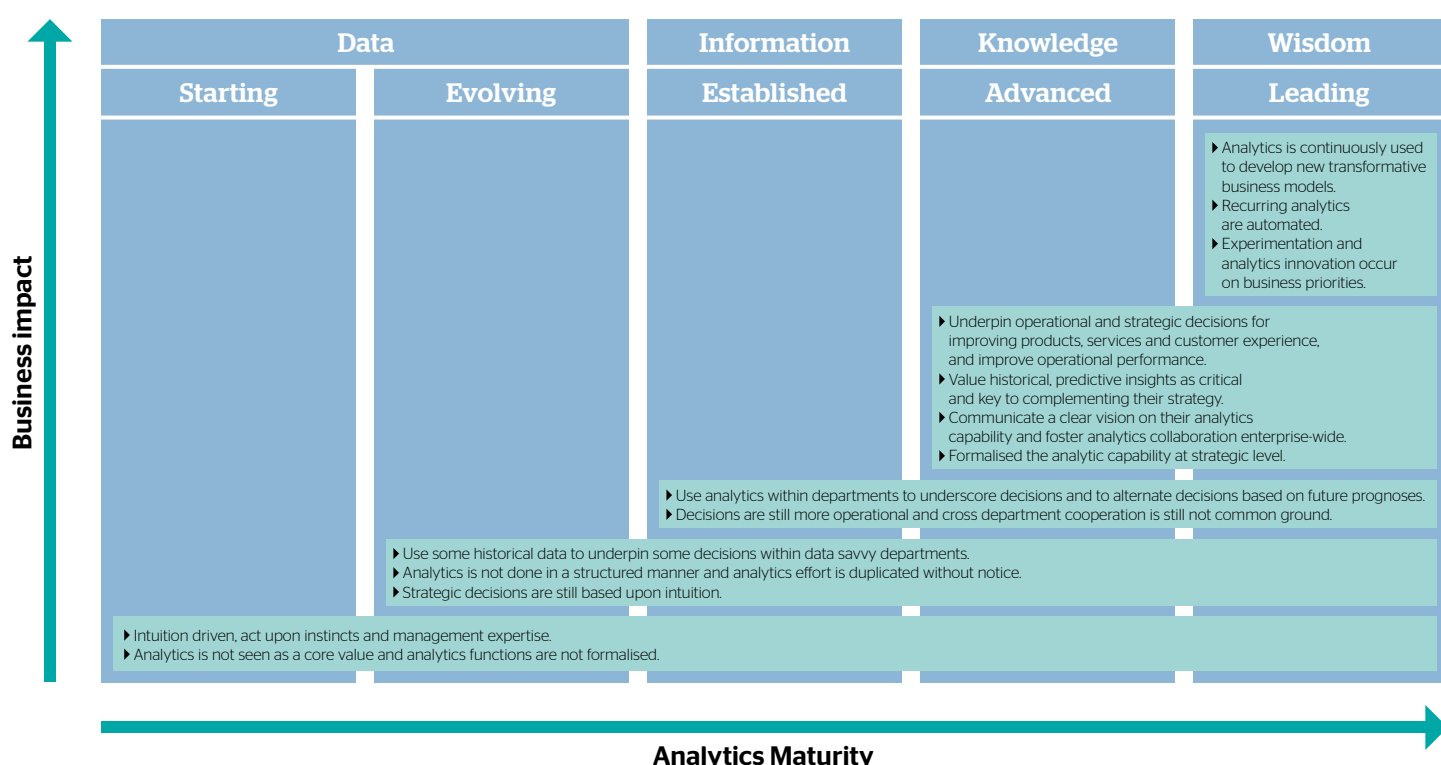
Analytics driven organisations that arrive at the "Knowledge - Advanced" level value historical, predictive insights (derived from a variety of data sources) as critical and key to complementing their strategy. They underpin operational and strategic decisions for improving products, services and customer experience, and improve operational performance. Next to

this, these organisations communicate a clear vision on their analytics capability, foster analytics collaboration enterprise-wide, and formalise their analytics capability at a strategic level. Detailed frameworks exist for people, processes, governance and technology aspects supporting analytics.

Organisations at the "Wisdom - Leading" level dominate their industry. Analytics (predictive or otherwise) is not only used to enhance their business, but also continuously used to develop new transformative business models. Recurring analytics are automated so that experimentation and analytics innovation can occur on business priorities, or unclassified risks and opportunities. Live external factors are taken into account in analytics, such as political instability in a foreign region, leading to decision tree based SWOT recommendations to leadership. The business truly understands the value of analytics and a trusted partnership exists between business and IT.

To know more about the Atos Consulting offering in Big Data and ask for a personalised assessment, please visit: <http://atos.net/en-us/home/we-do/big-data.html>.

Figure 6: Analytics Maturity



Colophon

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Nicolas Mallison is the Atos Consulting lead partner for analytics in the Global Digital Transformation Consulting practice and is a recognised leader and authority in the field of data analytics with over 18 years of experience in this field. He has presented at numerous conferences, webinars and to the press on the use of data mining and predictive analytics for a variety of business issues and all industry sectors; from pattern recognition, artificial intelligence, fraud detection, text mining to optimal financial risk management. He has developed innovative approaches that are used nationally and globally to support optimal decision making across numerous different business processes, through his design, build and implementation of advanced data driven risk management solutions across a wide variety of sectors, many have involved significant amounts of data (for example, 50+ heterogeneous data sources with over 100 million records). He has led a number of global teams in significant high profile and sensitive assignments.

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