: What is business analytics?

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Business analytics (BA) is an abstraction and generalization of many activities occurring in organizations. Technically, business analytics is a compound noun and one expects its meaning is anchored in the concept of both a business and the concept of analytics. At some level of generalization, business analytics is the application of analytics to business problems. Business is a relatively recent concept from the 16th century referring to commercial activity. The word analytics has an ancient origin and derives from the Greek word *analyĺ„tiks*. The concept of analysis has its roots in logic, mathematics and science. Aristotle explored analytics in various forms in the context of problem solving, deductive logic and the syllogism.

The word analytics has been modified by many words including business, data, marketing, big data, predictive and prescriptive to create compound nouns. The fundamental concepts of analysis, fact-based, and logical problem-solving link these varied compound nouns, including business analytics, together. Nelson (2017) defines analytics as "the scientific process or discipline of fact-based problem-solving". Davenport and Harris (2007, p. 7) define analytics as "extensive use of data, statistical and quantitative analysis, exploratory and predictive models, and fact-based management to drive decisions and actions. The analytics may be input for human decisions or drive fully automated decisions". Analytics refers to quantitative and statistical analysis and manipulation of data to derive meaning. Analytics is a broad umbrella term that includes business analytics and data analytics. Analytics is the progenitor concept for the compound word phrase "business analytics". This discussion examines the boundaries of the term business analytics, especially in the context of supporting decision making.

Business analytics has roots in 1) Scientific Management, especially the ideas of Taylor, Gantt, and the Gilbreths, 2) the Western Electric Hawthorne studies of Mayo and Roethlisberger, and 3) in Operations Research, including the work of Dantzig, Koopmans, von Neumann and many others. Management Science and Decision Sciences are sometimes considered as synonyms for Operations Research. The tools from these past efforts to increase scientific analysis in decision making are still in use.

Specific examples of analyses that can be classified as business analytics are discussed by many sources. Banks and other businesses use analytics to classify and segment customers based on credit risk, usage and other characteristics and then an algorithm matches customer characteristics with appropriate product offerings. An airlines manager who is considering investing in a new route uses analytics to predict future travel demand for the destination. Managers prepare revenue forecasts. Operations analytics might examine product cost, quality control and the throughput of resources in production lines. Machine monitoring and tracking machine failures is common. Optimizing production and work schedules has been ongoing for many years. Score cards and KPIs

are common analytics. Marketing groups use predictive analytics for sales lead scoring. Patient costs and care metrics are monitored in many hospitals. Boulton (2017) explains MyDPS, a decision support app "equipped with machine learning and other analytics tools that funnel recommendations and a daily operational scorecard to workers". He notes "Bechtel has also expanded the analytics efforts to look at staff retention, including trying to anticipate when employees may leave." Route planning is another common use of analytics. Predictive policing and Smart traffic management are also identified as business analytics applications.

Currently, there are many undergraduate and graduate degree programs in Business Analytics. Some well known programs include the MIT Sloan School of Management's Master of Business Analytics and the University of Texas at Austin McCombs School of Business's Master of Science in Business Analytics, The DSSResources.com list of Universities with Masters degrees in analytics and data science (Power, 2012) is a useful starting point. Analytics degree programs help students learn to use quantitative and statistical analysis tools with large data sets and then interpret the findings.

For example, the MIT Sloan Undergraduate Business Analytics major "is a mixture of topics traditionally taught in Operations Research that includes Statistics and Data Analysis. Business Analytics informs the scientific process of using data to make better decisions in business and other domains. By using data analysis, optimization techniques, and modeling tools, students in the field of Business Analytics have the potential to make sense of big data across myriad sectors". See URL http://mitsloan.mit.edu/undergrad/15-2-business-analytics/ .

Various Definitions of Business Analytics

So how many definitions are there for the term business analytics? Entering the search phrase -- define "business analytics" -- in the Google Search Engine returns about 699,000 results. The top five definitions based upon the Google PageRank algorithm are:

1) "Business analytics is comprised of solutions to build analysis models and simulations to create scenarios, understand realities and predict future states." Gartner IT Glossary (https://www.gartner.com/it-glossary/business-analytics)

2) "Business analytics (BA) is the practice of iterative, methodical exploration of an organization's data, with an emphasis on statistical analysis. Business analytics is used by companies committed to data-driven decision-making. BA is used to gain insights that inform business decisions and can be used to automate and optimize business processes." SearchBusinessAnalytics

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(https://searchbusinessanalytics.techtarget.com/definition/business-analytics-BA)

3)"Business analytics (BA) refers to the skills, technologies, practices for continuous iterative exploration and investigation of past business performance to gain insight and drive business planning." Wikipedia
(https://en.wikipedia.org/wiki/Business_analytics)

4) Business Analytics is "the study of data through statistical and operations analysis, the formation of predictive models, application of optimization techniques, and the communication of these results to customers, business partners, and college executives." NGDATA
(https://www.ngdata.com/what-is-business-analytics/)

5) "Business analytics (BA) refers to all the methods and techniques that are used by an organization to measure performance. Business analytics are made up of statistical methods that can be applied to a specific project, process or product." Techopedia
(https://www.techopedia.com/definition/344/business-analytics-ba)

6) "Business Analytics (BA) is the practice and art of bringing quantitative data to bear on decision making" (Shmueli, Bruce, & Patel, 2016, p. 3). "Business analytics typically includes Business Intelligence as well as sophisticated data analysis methods, such as statistical models and data mining algorithms used for exploring data, quantifying and explaining relationships between measurements and predicting new records" (Shmueli et al., p. 4).

So what is in common in these definitions? Methods, techniques, skills, technologies, practices, and solutions to build models. The methods include statistics and optimization. Also a goal of improving and supporting decision making. It is likely that the definition of business analytics varies when referring to an academic program, an academic course, or the application of business analytics in real-world settings. A definition for research purposes needs to be especially well-constructed so that the concept can be operationalized.

A Consensus Definition?

Business analytics (BA) is a systematic, methodical exploration of an organization's data, with an emphasis on statistical and operations analysis tools with a specific data set to develop models and apply optimization techniques. A BA analyst then communicates results to customers, business

partners, and executives. Business analytics can provide evidence for decision making. There are two primary categories of business analytics: 1) routine or routinized business analytics that may be incorporated in decision support and decision automation systems, and 2) non-routine, special study business analytics used by an analyst to prepare recommendations in a non-recurring decision situation.

In general, Business Analytics (BA) is the application of analytics tools and methods to inform and support business decision making.

Based upon multiple sources, there are five discrete types of analytics that are important components of business analytics: 1) descriptive, 2) diagnostic, 3) discovery, 4) predictive, and 5) prescriptive. Descriptive analytics answer the question of what happened and this term is sometimes equated with Business Intelligence. Diagnostic analytics examines causes and why something happened. Often drill down and data analysis help identify dependencies and patterns. Discovery analytics asks a broad question: What can we learn from a data set? Predictive analytics uses data and quantitative analyses to develop forecasts about what might happen. Finally, prescriptive analytics prescribes or recommends actions to take. Descriptive, predictive and prescriptive are the most commonly used. Each analysis type uses various analytic methods. So analysts buy, learn and use tools. Tools are used to perform analyses, but many decisions require a combination of methods and use of multiple tools. When considering analytics, it is important to distinguish between the methods required and the software tools. Vendors and consultants are eager to push their tools and approaches as the "silver bullet" to solving all organizational data problems and realizing all opportunities.

Business analytics uses a wide range of analytics tools to achieve business outcomes. Business analytics differs from the general concept of analytics by requiring business relevance and actionable insights from analyses, and BA is especially focused on performance. What should be the overall goal of business analytics, narrowly improving the performance of a single business or more broadly finding solutions that improve the quality of life in our society, including increasing sustainability?

Defining Business Analytics (BA) has a political dynamic. Many software vendors want their software positioned as a BA tool or as a core BA technology. Industry analysts like Gartner define BA to create a context for their services. Also, academic administrative stakeholders define their BA program so that it is recognized as reputable, or as the best, or as innovative or leading edge. Journals and conferences use the term BA to attract people to read, download and cite articles and papers and attend conferences. Academic researchers want to be the first to understand a "new" phenomenon, to advance our knowledge, and/or to impact teaching or practice. Stakeholders have diverse interests in the definition of a "new" phenomenon. Trying to create an empirically based consensus definition of Business Analytics that is used as a basis for an operational measure in empirical studies related to BA may be unrealistic. Creating a shared understanding of the concept

must recognize that the definition might vary depending upon context and usage. For example, an academic program in business analytics might explain the term in a different way than a vendor explaining their approach to business analytics.

Defining terms is important in science, analysis, and information management. For example, the IBM Knowledge Center (2016) explains the importance of carefully defining terms as part of information governance to "ensure clarity and compatibility among departments, projects, or products". The Purdue OWL (Pepper and Driscoll, 2018) discusses the importance of defining terms in writing to avoid misunderstanding with your audience. In the physical and social sciences, research should begin with definitions so hypotheses can be formulated. Ideally, an intensional, connotative definition is developed that specifies necessary and sufficient conditions for when a term should be used (Cook, 2009). At a minimum it is important to have a nominal, denotative definition that provides the literal or primary meaning for a term.

In Business Analytics practice and instruction, many disciplines including Statistics, Operations Research, Management and Decision Sciences, and Computer Science provide tools and methods for performing data analyses, modeling situations, and supporting decision-making. The presumption has been that using data with quantitative models can generate evidence and results that will influence choices and improve decision quality. For most organizations, achieving these goals efficiently and effectively will not be easy.

Is Business Analytics an emerging discipline, a research area or a field of study? or Is it a subfield of something called data science or management science? It is too soon to answer these questions definitively, but Business Analytics is more than buzz or a faddish technology marketing term.

Power, Heavin, McDermott and Daly (2018) define Business Analytics as "a systematic thinking process that applies qualitative, quantitative, and statistical computational tools and methods to analyse data, gain insights, inform, and support decision-making. Any particular analysis may use a variety of techniques including diagnostic, predictive, prescriptive, and optimisation models. Both business analytics and data analytics are specialised subtypes of analytics. The concepts diagnostic, predictive, and prescriptive analytics refer to types of models, and all three are shared subtypes of both business and data analytics.

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