CRASH COURSE IN BUSINESS ANALYTICS

Outline

A. Introduction: A Brief Definition, History, and Development of Business Analytics
B. Course Objectives and Limitations
C. Course Proper:
    a. Analytics Defined
    b. What do Business Analysts Do?
    c. Types of Data Analytics
        i. Descriptive Analytics
        ii. Diagnostic Analytics
        iii. Predictive Analytics
        iv. Prescriptive Analytics
    d. Other related concepts to Business Analytics

INTRODUCTION

Brief Definition, History, and Development of Business Analytics

Business Analytics is not a new thing in the field of enterprise management. The term may sound fairly new and may be thrown around concerning other concepts like software lifecycle, software engineering, data science (because data is part and parcel of it), and the like. Still, every form and kind of enterprise, be it in the health sector, financial, automotive, or retail relies on business analytics even before the advent of data science, big data, AI, machine learning, etc.

So, what is it anyway?

Figure 1: What one can normally see on a business analyst's table – a laptop, graphs and illustrations, and a notepad. The big takeaway here – Business Analytics is a combination of these tools and techniques and the mastery of each.
(Image credit: Harvard Business School Online)

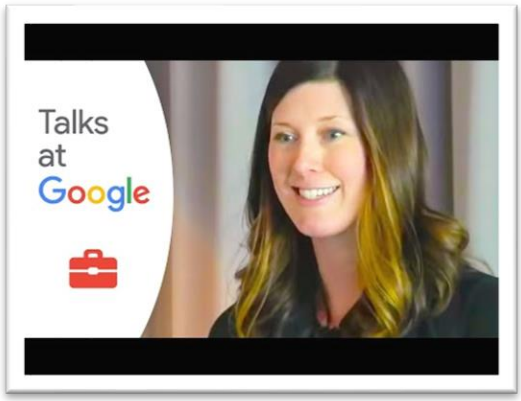
As mentioned, business analytics relies heavily on data. The difference between then and now is how those data are harvested. Whereas before, data was gathered manually – whether, through surveys, telemarketing, manual observation, and inference of the market behavior, data is gathered even before the customer makes a move. This is one of the methods of business analytics we'll discuss later.

Therefore, Business Analytics is the application of tools like statistics (e.g., regression analysis), electronic spreadsheets (yes, electronic, because the purpose of modern business analytics is to promote efficiency and faster processes, so manual spreadsheets won't do), enterprise resource planning programs, plots, graphs, and other illustrations, or any other quantitative tool to compile and process empirical data to see the bigger picture and make enterprise decisions from it. Business Analytics provides managers, CEOs, CFOs, and stakeholders concrete evidence(s) on scenarios affecting their enterprises such as:

- Why are they operating on losses or,
- Why are they ending the fiscal year with gains (that's a good ending, though) or,
- Why are their customers shifting away from their product lines, and what do they need to do to combat the competition, or,
- What do they need to do to stay relevant? What does the data suggest that could be the next big thing? Is the next big thing merely a trend or a fad, like the hoverboard, or a sustainable emerging technology like smart appliances or the Internet-of-Things (IoT)?

Now, it's one thing to crunch data and numbers and present them as is (which is boring and unrelatable), and it's another thing to piece all the data together to create a story from it. This is where the phrase "storytelling from data" comes from, and this is what Business Analytics is all about today.

Business Analytics = Data Harvesting + Utilization of Tools like Tableau, SAP, etc. + Effective Communication and "Storytelling" of the Processed Data



Video 1: "Storytelling with Data" by Cole Nussbaumer Knaflic. Talks at Google YouTube Channel. November 11, 2015.

How Did It Begin and How Did It Evolve?

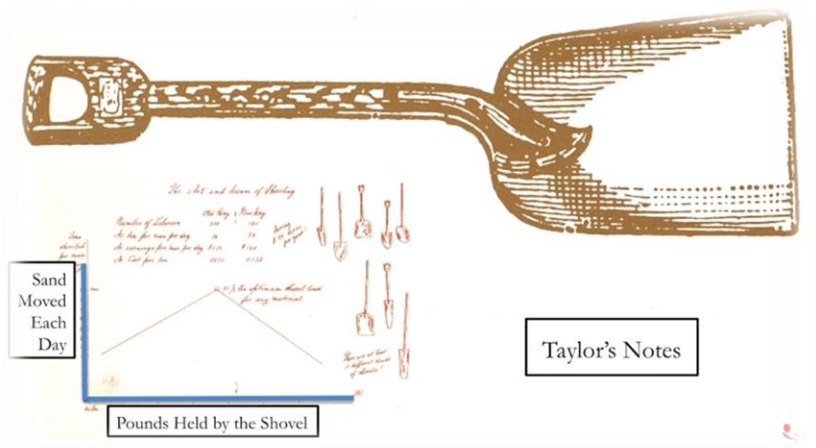


Figure 2: Notes by famed theorist Frederick Taylor proposed the Theory of Scientific Management, which is considered the earliest record of business analytics in play. *Image/screengrab credit from the YouTube Video "Frederick Taylor Scientific Management" from the Organizational Communication Channel, video dated September 2, 2016.*

Although it wasn't called "Business Analytics" back in the day, some business analysis semblance was already taking place during the Industrial Era. When Frederick Taylor proposed his Theory of Scientific Management, which examines the relationship of actions and its time to produce results (known as *Time*

Studies), Henry Ford tried to apply Taylor's principles into his car manufacturing business. This is one of, if not, the earliest record of business analytics in action.

As industries and technologies evolved, so did the processes, methodologies, and tools used in Business Analytics. Even the field itself further evolved into "Business Intelligence and Analytics." The advent of data storage as pioneered by IBM post-World War II was a breakthrough as it allowed the access, retrieval, and review of information. During the 1950s, the concept of a "Business Intelligence System" was put forth by an IBM researcher named Hans Peter Luhn.

He proposed (or should we say, forecasted) that it is possible to automate the steps not only of information access, retrieval, and review but even the steps that precede it, like, retrieving only relevant information and automatically excluding those that are not relevant to the hypothesis or problem at hand. Today, we call this *machine learning,* and because of his ideas being way ahead of his time, Luhn is considered by many as the *Father of Business Intelligence*.

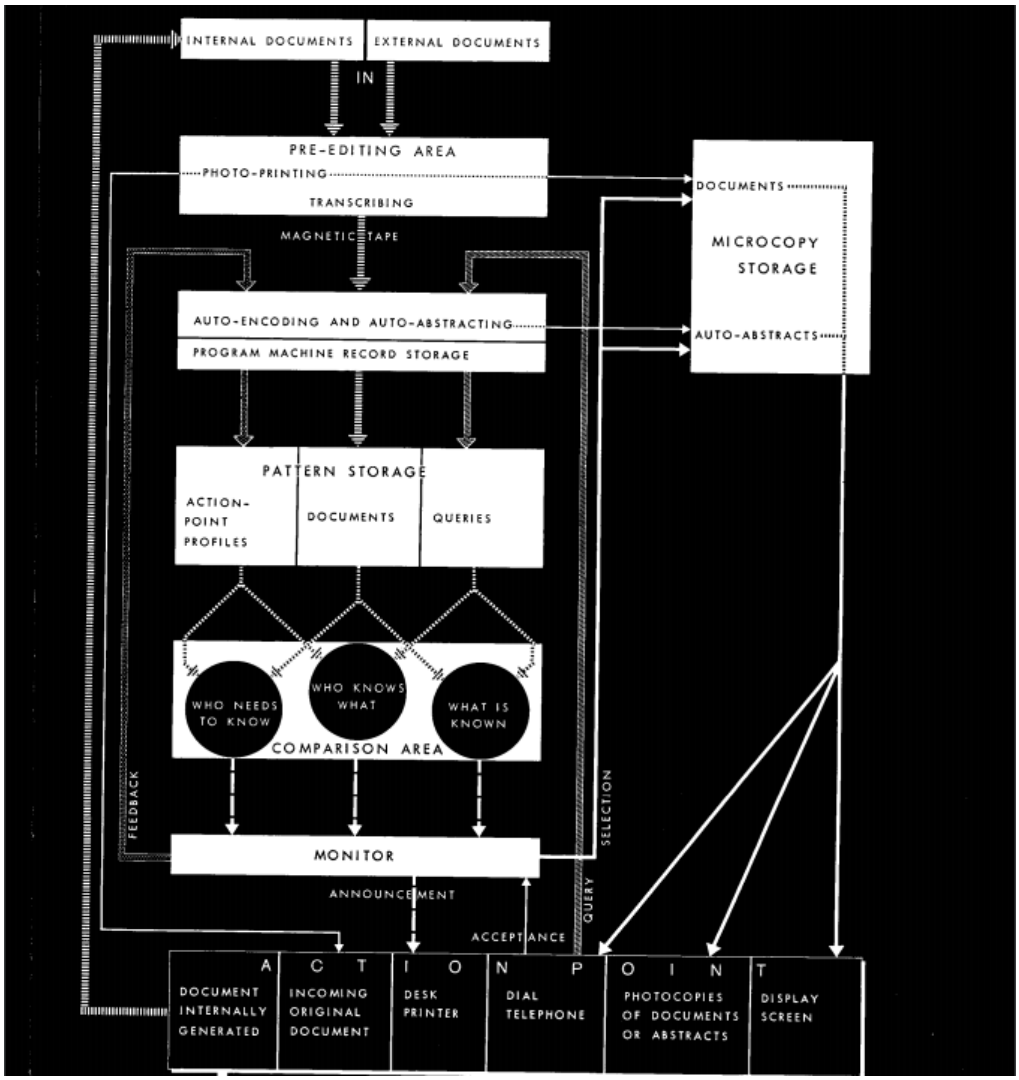


Figure 3: Luhn's diagrammatic scheme of a Business Intelligence System
Image credit from *A Business Intelligence System* by Hans Peter Luhn, IBM Journal, July 1, 1958.

As computer use grew exponentially in the following decades, so did the volume of data. And as the volume of data grew, it was much harder to make sense of it. The volume of data also created an infrastructure problem in terms of data storage. Thus, databases were born, but there was another problem – the databases are isolated and unmapped, so real-time cross-referencing – which is the main objective of data gathering and analysis - was almost impossible.

This paved the way for data warehouses (DW), which, similar to a manufacturing or distribution company, housed all the data in one centralized location that can be accessed by top management and some authorized staff. While solutions kept rising to answer the call of growing data volume, costs were growing as well. Why? Newer data warehousing solutions require more IT infrastructure, such as on-premise storage (hard drives, computers, etc.), inflating cost.

Fast forward to the '90s and the new millennium when IT companies like Microsoft, Google, and Amazon began offering their cloud services like Azure, Google Cloud, and Amazon Web Services (AWS). It was a win-win situation for both IT companies and the enterprises relying on business analytics and intelligence – the IT companies gain a monopoly of the market share. In contrast, enterprises that can't afford to build their data warehouses can opt to utilize such companies' public cloud services, for a relatively lower fee, of course, compared to creating and maintaining an in-house cloud service.

Other public cloud computing companies that might ring a bell are Red Hat, Oracle, China's Tencent and Alibaba, Dell's VMWare, SAP, and of course, the grand-daddy of them all, IBM. If you've heard the terms Iaas (Infrastructure as a Service), SaaS (Software as a Service), and PaaS (Platform as a Service), these are all tech computing services that rely on cloud data.

Figure 4: The Magic Quadrant by Gartner© gauging cloud service providers in terms of their ability to execute and completeness of vision. The quadrants categorize the tech vendors as "leaders," "visionaries," "challengers," and "niche players." Image credit from https://www.zdnet.com/article/the-top-cloud-providers-of-2020-aws-microsoft-azure-google-cloud-hybrid-saas/

While a public cloud service offers the advantage of less cost *(we don't mean inexpensive, but less compared to an in-house cloud service or an on-premise service)* ***and ease of access to data because of more servers, what disadvantage(s) does a cloud service have that might pose a threat or risk to enterprises availing their services?***

OBJECTIVES and LIMITATIONS

Course Objectives

- To grasp a fundamental knowledge of Business Analytics, its history, and development
- To briefly explain the differences between the types of business analytics
- To identify a high-level of how business analytics is being applied in the various enterprises or industries through use cases

Limitations

- As this is only a crash course, the information contained here is limited to only surface information. In-depth explanations and information are not to be expected.
- Related concepts such as Python or R programming, as well as data science and machine learning will not be discussed in this crash course
- The concept and field of Business Analysis is a vast one. This crash course will only focus on the basics, the types of quantitative analysis commonly done by and for enterprises, and real-life industry examples of how these tools and techniques are applied to appreciate the learner or the reader better.

COURSE PROPER

Analytics Defined

Hypothesis formulation, data gathering or collection, processing, and presenting the results in a cohesive manner that answers the hypothesis and provides a clearer and bigger picture of the enterprise scenario in question – these are the steps involved in analytics. And these activities can be applied to any methodological endeavor. Anything that involves a set of processes and with which those processes are expected to produce results can benefit from analytics, even if it is as simple as Frederick Winslow's *Time Studies* (but during the industrial revolution, his studies were considered to be game-changing).

Nowadays, impeccable analytic skills are highly sought after by employers, whether it be a large, multinational enterprise, or a small local one. Although let's face it, smaller businesses only rely on simple analytics and not data or business analytics, but they can certainly greatly benefit from it. On the other hand, large global enterprises realize the benefit of leveraging data and using analytics to execute targeted marketing programs efficiently. They have turned data analytics and business analytics into an essential facet of running a business. Businesses that don't employ any form of business analytics, whether in-house or outsourced, are left behind by their competitors who invest in the cloud infrastructure required to perform business analytics – if they can afford to – or the services of an expert.

What do Business Analysts Do?

Data, especially with the volume of data from companies these days, won't interpret themselves, providing insight for company managers and stakeholders. This is where Business Analysts enter the picture.

So, instead of defining what a business analyst does, let's define what we think makes a business analyst effective instead:

- One that is good in interpreting numbers and statistics (proficiency in statistics is usually a requirement)
- A good communicator – both verbally and non-verbally; one that knows how to leverage tools that are available (like PowerPoint, etc.) to make concise, accurate, and engaging presentations, or a presentation that is not filled with words taken off a book, a module or another presentation, but visually presents diagrams, graphs, or other figures to complement what's being said, one that can verbally communicate what's not seen on the presentation, in other words, a communicator or presenter that does not read off of the presentation, but rather, explains what's shown on the screen and bridges the two medium together
- Programming skills such as Python or R are advantageous but are not usually required, as these can be learned on the job. Some SQL knowledge may come in handy, though.
- They can be either a graduate of a business course or a graduate of an IT course. If they majored in one and minored in the other, then they are at a great advantage, as business analysts need a hybrid knowledge of both the technical and functional aspects of the business, as businesses today rely heavily on technical computing, whether on-premise or via the cloud

In summary, to be an effective and highly in-demand business analyst, more weight is given to being able to understand the client's (or your employer's) business processes, strengths and weaknesses as an enterprise their product offerings, opportunities for growth and dominance, and possible threats like, the merging of companies under one umbrella or conglomerate, or the emergence of new technologies that could make your company's (or your client's offerings) irrelevant in a few years or even less than a year.

More weight is given to the soft skills like communication and data analysis than the hard skills like programming knowledge as new programming languages emerge almost every two to three years (while C and C+ are still around, and so is Java and PHP, you rarely hear them now, do you?). But some SQL knowledge can be advantageous as this is being used in enterprise resource programs like SAP and the like, and SQL has been around the game for quite some time now.

A business analyst is a multi-faceted role and a dynamic one. The skillsets required continually change as the technologies evolve, and so, self-upskilling is always needed to be abreast with the changing technologies and methodologies in data gathering and analysis. With the demands and the dynamism of the role, it is no wonder that it commands a significantly high entry-level salary at $50,000, while experienced analysts earn a median annual amount of $85,000.

Expand the definition of Business Analytics to include popular tools *(Tableau, MS Excel)* ***and programs*** *(like R and Python)* ***used in the field or in practice***

Based on your expanded definition, ponder on the importance of these tools in the field of Business Analytics. Are they essential in the practice of the field? Can one do without these? Are soft skills really enough to be an effective business analyst? If these tools are important, which of these tools or programs are vital to the practice of the filed at present?

Types of Data Analytics

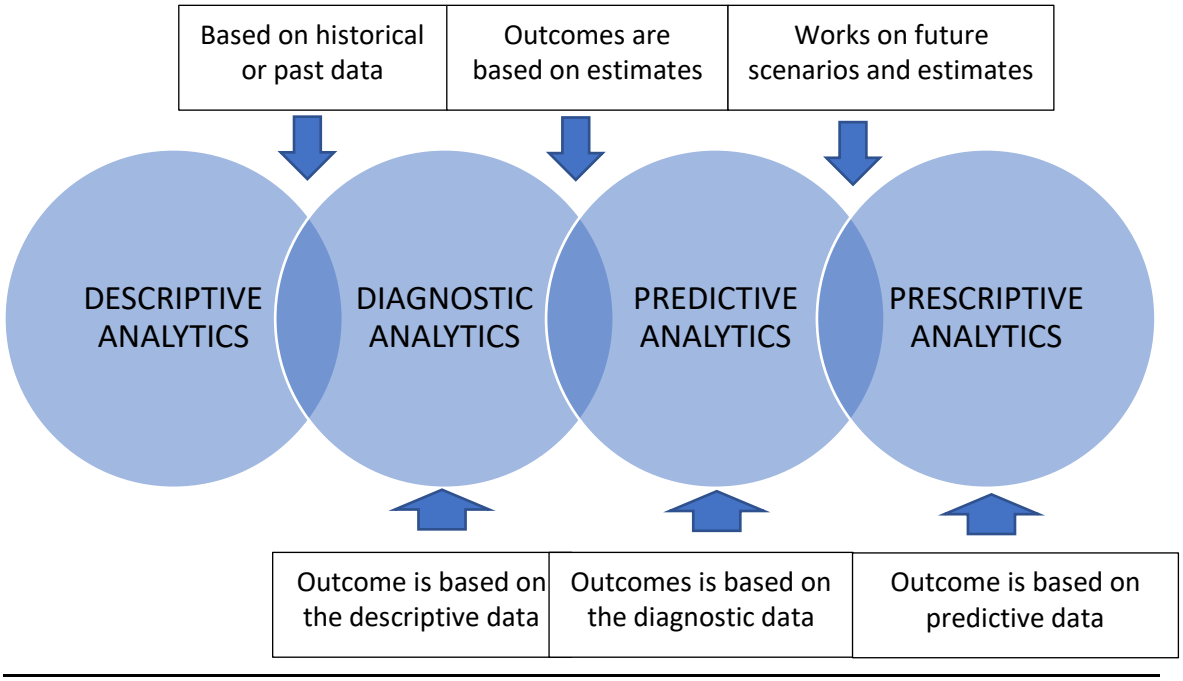


Figure 5: The Four Types of Data Analytics and How Each Relate to Each Other

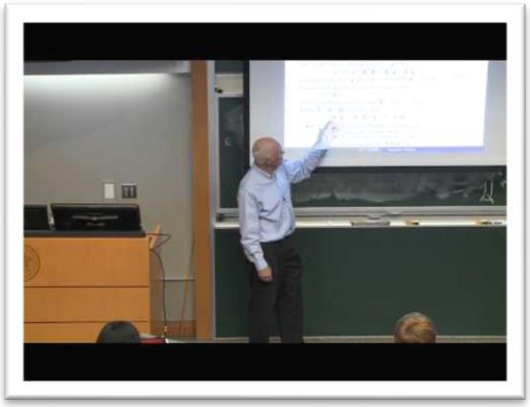
Depending on which source you refer to, you might come across three, four, or five types of data analytics, but for uniformity, sensibility, and consensus, we give you four types of data analytics:

1. Descriptive Analytics

   This is an iteration or an enumeration of data facts and figures, or the "need-to-knows." Data that is aggregated, collected, processed, and presented here is based on history. The value of descriptive analytics aside from it provides information on the basic because it also provides a baseline for a specific point in time. Some of the techniques used for Descriptive Analytics are metrics like KPIs and data mining. Summary statistics are also often used at this stage. An easy way to remember Descriptive Analytics is that it answers the question "what." It's all about facts. That's it.

2. Diagnostic Analytics

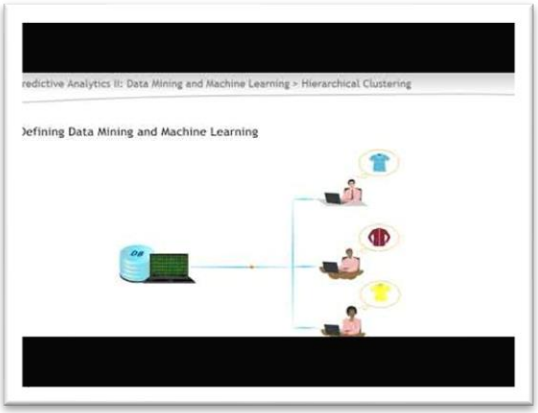
   Outcomes of Diagnostic Analytics attempt to answer the question "why." It should provide information on why the result of the descriptive analysis was as such. Note, though, that unlike with Descriptive Analytics, outcomes of Diagnostic Analytics could be either factual or probable. One commonly used technique here is *Regression Analysis,* a statistical technique that attempts to correlate the relationship of two variables through the mathematical estimation, with the operative word here being "estimation."



Video 2: "Regression Analysis" by Peter Kempthorne. MIT OpenCourseWare YouTube Channel. January 7, 2015.

3. Predictive Analytics

   Predictive Analytics is like the testing phase of any project. It tries to answer the question "if" (so imagine the "if" operator in a flow chart, something like that) or "what will happen next?". This stage plays around future scenarios and tries to predict the outcomes so the enterprise can immediately plan for the next step before the outcome even happens in real life. This is the basis for machine learning.



Video 3: "Machine Learning- Predictive Analytics" by Supply Chain Academy YouTube Channel. May 20, 2019.

4. Prescriptive Analytics

   As the word implies, Prescriptive Analytics attempts to prescribe a set of actions in response to the predictive analyses' outcomes. A great and yet simple example of this is the text autocorrect feature on smartphones. Once it has learned your usual texting patterns, like the way you spell your words (this, right here is predictive analytics or machine learning), it suggests several words on your screen, usually three words that help you speed up your texting. That, right there is prescriptive analytics. A popular upshot of that is the artificial intelligence of AI.

Notice how each step is interrelated as concurred by the diagram above? That's because these "types" of analytics are also – more suitably – called *stages of analytics*; you start with a problem or a hypothesis (which some experts call the first stage of analytics – planning), then you lay out the baseline data (descriptive), then by processing the baseline and the hypothesis, you derive a smart estimate of what

caused the problem, the "why," the "cause" (diagnostic), then you weigh your options by testing your options through simulations (predictive). Whichever option or scenario produces favorable results, it will be part of your recommendations (prescriptive) or implementing rules and regulations (IRR).

Now that we've established that the four types of data analytics are actually <u>stages</u> of analytics, create a flowchart or a diagram of how data is streamlined or processed from one stage to the next to come up with a prescriptive analysis or a solution to a hypothesis

Think of a simple decision-making activity or scenario you've encountered in your life and recall the decision you made. Applying the four stages of data analytics, would you have reached a similar decision this time, based on data?

Other Related Concepts to Business Analytics

Customer Analytics

This is an omnipresent form of business analytics as we leave a digital trace almost everywhere on the web. With credit cards, online shopping, social media, it's easy for an unknowing customer to leave a digital footprint, and for that simple trail be used to analyze our behavior online. Depending on the infrastructure, the company, and the cloud provider, customer analytics can be spontaneous, if necessary, to instantaneously target customers by showing them things or topics that they want to see online. This is how targeted marketing or targeted advertisement works.

Operations Analytics and People Analytics

This is similar to Frederick Winslow's *Time Studies*, except that data - and lots of it – is being dealt with to streamline operations. People analytics can be thought of as the antithesis of customer analytics as it drives analyses targeting the people within an enterprise or the employees. A good example is when a firm or enterprise is cutting costs and has decided to retrench employees, the first ones on the chopping block are the new hires with the justification of "First In, Last Out." But if the decision was based on metrics instead, new hires who have outperformed their counterparts or even their senior colleagues may be spared thanks to factual, quantitative data.

Accounting Analytics

While the term may seem like overkill at first glance because you already have accounting, which is already analytic by nature and even an analysis of the books, accounting analysis correlates the financial with the non-financial aspects of the business, providing a more holistic and cohesive picture, or at the very least, providing a non-numerical explanation as to why is the balance sheet not balanced or why is the fiscal year ending on a loss.

Now that you know some basic concepts on Business Analytics, can you think of use cases involving companies that are from non-technical or non-IT industries like healthcare, public service, aviation, petroleum and the like?

In your opinion, how powerful is data in this day and age?

REFERENCES

1. Gavin, Matt (2019). *Business Analytics: What It Is and Why It Is Important?* Harvard Business School Online.
2. Foote, Keith D. (2019) *A Brief History of Business Analytics.* Dataversity.
3. Lyon, Alex, Ph.D. (2016). *Frederick Taylor Scientific Management*. Organizational Communication Channel. September 2, 2016.
4. Limp, Paulo (Unmentioned posting date). *Exploring the History of Business Intelligence.* Toptal Freelance Job Portal.
5. Luhn, Hans Peter (1958). *A Business Intelligence System.* IBM Journal.
6. Codd, Edgar (1970). *A Relational Model of Data for Large Shared Data Banks*. Communications of the ACM, vol.13, no.6. (posted on https://www.seas.upenn.edu/~zives/03f/cis550/codd.pdf)
7. Dignan, Larry (2020) *Top Cloud Providers in 2020: AWS, Microsoft Azure, Google Cloud, Hybrid, SaaS Players.* ZDnet.com
8. Marr, Bernard (2013). *What the Heck is… Analytics?* LinkedIn.
9. Friedman, Jordan (2020). *What is Business Analytics?* USNews.
10. Occupational Outlook Handbook – Management Analysts. Bureau of Labor Statistics (BLS).
11. Salary.com - Business Analyst Salary in the United States. Salary.com
12. Oracle.com – Analytics Defined. Oracle.com
13. Nussbaumer Knaflic, Cole (2015). *Storytelling with Data.* Talks at Google YouTube Channel.
14. Columbus, Louis (2018). *Global State of Enterprise Analytics, 2018*. Forbes Magazine.
15. Davenport, Thomas H. (1954). *Competing on Analytics: The New Science of Winning.* Harvard School Press as retrieved and published on https://archive.org/details/competingonanaly00thom/page/n7/mode/2up
16. Harvard Business School Online – Program Syllabus
17. Wharton Executive Education – Business Analytics: From Data to Insights: Program Syllabus.
18. Coursera – Business Analytics Specialization: Courses
19. Kempthorne, Peter (2015). *Regression Analysis*. MIT OpenCourseWare YouTube Channel.
20. Angelini, Claudia (2019). *Encyclopedia of Bioinformatics and Computational Biology (Chapter: Regression Analysis)* as published on Science Direct.
21. Supply Chain Academy (2019). *Machine Learning – Predictive Analytics*. Supply Chain Academy YouTube Channel.
22. Michigan State University (2019). *Four Types of Data Analytics and How to Apply Them*. https://www.michiganstateuniversityonline.com/resources/business-analytics/types-of-data-analytics-and-how-to-apply-them/