A data analysis perspective by the Business Analyst and Data Scientist

Comparative study

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Abstract- Nowadays several terms intertwine with each other such as a business analyst and data scientist. Some have dealt with them on the basis that they have the same job, and some have distinguished that the difference between them is significant. This research aims to explore previous studies and scientific articles to compare them. What is the role and responsibilities of each of them and what are the scientific expertise and personal skills required? The researcher found that the business analyst and data scientist both aim to serve their institutions in growth and development in the business sector regarding analyzing data. However, the differences between them exist and should be clear to all interested parties, from data analysts to institutional owners.

Index Terms- data analysis, business analyst, data science, data scientist.

I. INTRODUCTION

Nowadays data flows in huge quantities from various and varied sources, including texts or images or videos. Data flow is becoming a standard solution for managing increasingly complex business processes. Successful business process management has become dependent on modeling and effective data flow analysis (Sun, 2006).

All organizations try to take advantage of the data flow and convert it into valuable information that helps in decision-making, development, and business competition. To this end, organizations use various analytical tools that help to obtain the necessary and useful information from the data collected and analyzed and thus help in a major aspect in decision-making. Good managers can use these tools and data analysis techniques on their own, but as these tools become more and more relevant to technology, some managers need the help of a business analyst to improve the efficiency and competitive advantage of the enterprise (Zdenka 2011).

Hence the need for a job as a business analyst whose duty is to meet the aspirations of institutions and enable them to take advantage of the opportunities available for them. With the development of technology to a large extent, the growing and diversified flowing data in its forms and sources required very advanced techniques to analyze it at an advanced level and benefit from it as well as it required higher scientific experience and personal skills.

The goal has become to not only meet the needs and requirements of institutions and respond to their inquiries but to provide opportunities that even businesspersons did not think.

From this new need, the data scientist emerged and began to discover the best business opportunities through deep analysis and very sharp human intelligence.

In the current research, the researcher explores the role and responsibilities of both the business analyst and the data scientist in analyzing the data. Along with the scientific knowledge and personal skills required for each of them that determine how each of them sees the data. Moreover, what each of them aims when analyzing data?

The research aims to find a unique definition of both the business analyst and the data scientist. To achieve this, the evolution of the role of the business analyst and data scientist and their scientific experience with the personal skills will be addressed to know what each of them capable of offer for their institutions and the business environment. This research may be useful for organizations to know their needs in data analysis and employ the analyst appropriate to their requirements and capabilities.

II. LITERATURE STUDIES

A. Data Analysis

Data plays an important role in the growth of any organization. It is required a lot of analysis and research to understand data in its multiple patterns and including special skills to help understand its directions and infer how it will contribute to business growth. Data analysis can lead to the necessary improvement and changes in organizations' development growth and the capabilities to compete in the business environment.

The traditional data flow may come from basic customer records, historical stock price information, or sales movements. Recently, this flow reaches a huge amount of data flowing from the ever-increasing data in institutions and industries that use and produce big data. Besides data streamed through online channels, for example, Facebook, Google, LinkedIn, or financial trading data (Valchanov,2018).
 Charles says in his study (2019) that the analysis refers to dividing data into separate components for examination and audit. Therefore, data analysis is an important process to obtain from primary data useful information for decision-making. Data is collected and analyzed to give answers to questions of enterprise managers and to test hypotheses or verify the possibility. The Xia study (2015) also defined data analysis as the process of examining, purifying, transforming, and modeling data to discover useful information, to reach conclusions, and supporting decision making.

In Vashist's study (2010) the authors said that data analysis contains multiple aspects and approaches, including various techniques under a range of names, and is used in various fields of business, natural sciences, and social sciences. On the other hand, in the past several years, data analysis has rapidly increased in the language of common and current business.

Data analysis in a business environment is defined by Frue (2019) as a research tool for identifying business needs and proposing appropriate solutions to some related problems. The approach varies from improving project management and software to strategic planning. Besides, business analysis can be defined as the set of tasks and techniques used to act as a link between stakeholders to understand the organization's structure, policies, and operations and to propose solutions that allow an organization to achieve its strategic goals.

It should be noted that traditional data analysis, which is mostly done from the analysis of databases in the organization, has produced valuable and important information quantities, but this information over time has become the raw material for advanced analysis processes to know the behavior of the product or customers or other of the organization's interests. More data streams from various sources enabled data analysts to give more raw materials both within and outside the organization's activity to explore broadly the knowledge after collecting and cleaning up this big data using advanced tools in this analysis.

Many researchers have provided definitions of types of data analysis methods, including (Frue, 2019) , (Ajah, 2019)

- Descriptive Analysis: View historical data and describe what happened, and help identify a negative or positive event. Through which the researcher enables logical and realistic analysis of the effect of various variables on a specific phenomenon.
- Diagnostic Analysis: aims to determine the cause of something, can be done to find out the reason behind an event.
- Prescriptive Analysis: collects existing information from other types of data analysis and forms an organization's action plan to address the problem or decision.
- Predictive Analysis: This analysis helps make predictions about trends and behavior patterns. It uses many techniques taken from the data modeling statistics, data mining, artificial intelligence, and machine learning to analyze data in making future predictions.
- Cognitive Analysis: integrates a variety of applications to provide context and answers by collecting data from several different sources and examining in-depth unstructured data, providing decision-makers with a better understanding of their internal processes, customer preferences, and loyalty.
- Augmented Analysis: Provides robotic business intelligence using natural language processing and machine learning. It provides clear results that help in making daily decisions with a high degree of confidence.

B. Data Science

Data science is a combination of skills in three main areas; expertise in mathematics, technology, and strong business acumen (Lo. n.d.). Data science is dominated by overlapping disciplines, which is based on the use of scientific methods, manipulations, algorithms, and systems to extract knowledge and ideas from the data in its two forms, whether structured or not structured. Data science also depends on machine learning techniques, artificial intelligence, and big data processing programs. It is considered a broad field and a mixture of several fields related to each other. It is focusing mainly on knowing and understanding the data that a particular organization has and using it to solve a problem or answer specific questions or provide recommendations derived from exploring the future and tips for management to improve the work or avoid problems, all by following the scientific well-known methodologies.

Sharma (2019) identified the predominantly data science uses for decision-making and predictions using predictive causal and guideline analyzes (predictive as well as decision science) and machine learning when there are no parameters based on which can make predictions, hidden patterns must be found within a set data to make meaningful predictions. The most frequently used algorithm for pattern detection is aggregation.

C. Data Analyst

In this section, previous studies and articles will be studied to know how the systems analyst has been defined, and what his responsibilities are, his/her scientific expertise and personal skills.

The business analyst should have obtained a bachelor's degree in business administration or one of the business analysis programs. Some certifications will be required for professional business analyst such as Certified Business Analysis Professional or Professional in Business Analysis or Certified Analytics Professional.

Business analyst has a good understanding of the technical knowledge whose main focus is to identify opportunities for improving business operations. He/she uses technology to solve problems affecting productivity, distribution, and revenue. Business analysts work requires a high degree of specialized skills to solve business problems through a variety of typical job duties. In other words, the business analyst acts as a link between technology and business. He/she must have a broad understanding of the market and be interested in difficult questions to get value for money and add value to industry innovations.

The business analyst performs business data analytics tasks, regardless of job title or organizational role. The business analyst plays a major role in ensuring that technology is used appropriately to achieve the organization's goals (Richards, 2014). Moreover, the business analyst is somewhat of a vague job title, which can reflect many different roles like data analyst, marketing analyst, operations analyst, financial analyst, etc. He/she is a vital link between information and work. It can be said that a business analyst protects users and IT from each other and plays the role of a mobile bridge for users and ditches for IT staff to enable them to understand each other (Vashist, 2010).

Scientific experiences and personal traits of a business analyst

As the nature of business changes, the role of business analyst is also changed. Now required is to work not only as human reservoirs of the desires and requirements of users but also requires him/her to become inventors and creators and to be facilitators of such innovations to their clients and users. Thus, the shift is simply who applies what leaders want to discover new requirements. This can be accomplished by creative thinking, which is the most important skill of business analysts (Nguyen, 2008).

From a new perspective, creative thinking is a way to look at problems or situations that suggest unconventional solutions. Creative thinking can be encouraged through an informal process such as brainstorming and an organized process such as lateral thought (Shum, 2016). The business analyst is also characterized by logical thinking. This thinking includes high mental processes, in which the person is vital and active, and requires a structured knowledge store integrated into building the cognitive person, along with continuous attention to achieve the goal, and logical thinking begins with sensory experiences and then develops to low-level experiences of abstraction, then to more abstract experiences (Plessis, 2012).

The business analyst must also have good communication skills. This means he/she can facilitate business meetings, ask good questions, listen to answers, and understand what is being said. In today's world, communication does not always happen face to face. The ability to be powerful in a virtual environment via conference calls or web meetings are equally important (Brandenburg, n. d.).

Convincing skill is another skill required by the business analyst. It means the ability that some people enjoy and that enables them to change the behavior, convictions of another person, or group towards another individual, group of individuals, events, or ideas, which are necessary skills for business analysts. Persuasion is often accomplished by conveying a certain message, feelings, information, or reasoning to the other party, or a mixture of it (Nazar, 2013).

According to (EDUCAB, n. d.) there are many tools and techniques for business analysts to use for data analysis process like Blueprint, Axure, Bit Impulse, etc.. That increased productivity and enable them to create very interactive prototypes and business analysts may not need deep technical knowledge they should be confident of a technical point of view in evaluating improvements, designing business cases and defining new standards or modifications to the project.

The most important business analyst tools can be identified as shown in Table 1.

Table 1: business analyst tools

	Tool	Benefits
1	Business Process Model and Notation (BPMN)	BPMN is a graphical representation that allows the business analyst to specify business processes in a business process model.
2	Business Process Execution Language (BPEL)	BPEL is a prominent form of contracting agreement in the construction industry.

3	Service-Oriented Architecture (SOA)	SOA is an XML-based language that allows web services in a service-oriented architecture (SOA) to interconnect and share data.
4	Blueprint	Blueprint is essentially a collection of services. The communication can involve either simple data passing or it could involve two or more services coordinating some activity
5	Axure	Axure is a reproduction of a technical drawing, allows the business analyst to documenting an architecture or an engineering design, using a contact print process on light-sensitive sheets.
6	Bit Impulse	Bit Impulse is a kind of design tool that enables the business analyst to construct a visual, interactive display of concept concepts that can be conveyed to the customer / leader or to a development team.
7	Online Analytical Processing (OLAP)	OLAP is a business analytics tool made by BIT Impulse. It gives the business analyst the great possibilities of data analytics in the application. It has advanced ways of OLAP data visualization.

Business analyst responsibilities

The business analyst deals with work problems and performs daily valuations. He/she provides answers to a specific set of business questions asked. The business analyst is responsible for creating new models that support business decisions by working closely with the financial reporting and information technology departments to develop programs and strategies to increase imports and manage costs. Requires a solid understanding of organizational requirements and reporting, as well as a lot of experience associated with forecasting and financial analysis.

From the study (Sonteya, 2012) the responsibilities of the business analyst can be defined as follows:
- Show information about the organization's mission, vision, and goals.
- Provide insight into how the organization's approach is aligned with its priorities and then with operations.
- Awareness and ability to use process-modeling tools, such as BPMN, BPEL, OLAP, etc.
- Experience in personal relations and cooperation.
- Demonstrate practical knowledge of auditing.
- Carry out the ongoing research of market climate change to assist in the transformation process.
- Demonstrate awareness of change management.
- Discover the process's inability and work to find a solution.
- Take advantage of modeling techniques to achieve potential outcomes.
- Explain information about SOA and BPEL related programs
- Discover relevant SOA programs for use in applications.
- Demonstrate a strong understanding of the service infrastructure.

Sonteya's article (2012) indicates job description for a business analyst, according to Robert Half Technology which includes:
- Create a detailed business analysis, and identify problems, opportunities, and solutions for business.
- Budgeting and forecasting.
- Planning and monitoring.
- Analysis of variance.
- Reports preparation.
- Identify business requirements and communicate them to stakeholders.

In Chatterjee study (Chatterjee, 2019) she lists the following responsibilities:
- Engage with existing and potential clients and assist them in approving products and solutions to meet their business requirements.
- Ensuring consistent growth in product awareness, adoption and use by customers.
- Highlight product concepts and solutions through presentations, demos, user preaching, and effective documentation.
- Leading discovery sessions with information technology and business leaders to understand the client's business goals and needs.
- With an excellent understanding of product features and related technologies, the solution is designed to best meet customer requirements.
- Proactively create documentary files like business cases, usage scenarios, solution diagrams, common questions, meeting notes, etc.

- Leading other client success teams to ensure the successful completion of the project milestones for production and the initial stage of the project.
- Communication, progress, expectations, and escalation of awareness and solution problems.
- Training and customer support and promoting the adoption and use of solutions.
- Provide regular and adequate user comments and feedback to the product team.

D. Data Scientist

It has already been said above that the need for more accurate and deep analyzes and the need to explore the future and raise the rate of achieving future expectations led to the emergence of the term "data scientist".

A data scientist is someone who has the task of working with a lot of data to extract useful insights either to fix business problems or reveal hidden trends and patterns that can be used to achieve business goals. He can predict the future using trends from the past, present, and, expected future (Villanova, 2018).

The data scientist has a bachelor's degree in the data science program. Some certifications will be required for professional data scientist professionals such as a professional certificate in Data Sciences.

The data scientist revolves around a new technical discovery that can solve complex problems and extract facts using accurate statistics (EDUCAB, n. d.). He/she knows how to extract meaning and interpretation from data, using both statistics and machine learning methods and methods. The data scientist spends a lot of time collecting and cleaning data because the data is usually never clean.

This process requires perseverance, familiarity with the world of statistics and software engineering skills, and is necessary to understand biases in data and to correct login outputs of code. Once the data scientist converts data into a form, the crucial part is exploratory data analytics, which combines visualization with a sense of data. Moreover, the data scientist has a unique knowledge of mathematics, technology, and business acumen skills. Data scientists work to extract ideas and develop information products at the primary database level. A common personality characteristic of data scientists is that they are deep thinkers with intense intellectual curiosity (Lo, n. d.).

Scientific experiences and personal traits of the data scientist

Babu (2019) determined that data scientist needs to learn the latest software and advanced knowledge of machine learning and may need programming and should have detailed knowledge of mathematics and statistics. He/she must understand big data, store data, visualize data as well as machine learning (EDUCAB, n. d.). The data scientist must be expert in one or more of the most important programming languages including Python, R, Java, SQL, and Julia

The data scientist is characterized by intelligence, great scientific curiosity, and the ability to use the latest tools of scientific analysis to explore the flow of data. He/she tries to find new surprising innovative opportunities for employers that may achieve great strides in the field of competition in the labor market. Indeed, intellectual curiosity appears to be a vital feature of the data world. Stumm (2011) has defined scientific curiosity as the desire to recognize and appreciate more individuals, cultures, ideas, and concepts. Besides, this interest also stimulates investment of time and energy in the pursuit of knowledge.

Table No. 2 represents the most important scientific expertise that must be possessed by the data scientist as identified by the studies mentioned above.

Table 2: data scientist tools

	Tools	Benefits
1	Machine learning	Machine learning is the scientific study of algorithms and statistical models. The data scientist uses it to let computer systems to perform a specific task without using explicit instructions, relying on patterns and inference instead.
2	Artificial intelligence	Artificial intelligence is the intelligence possessed by machines ,which helps tremendously in analyzing data in a very fast and accurate way.
3	Data wrangling (data munging)	Data wrangling allows the data scientist transforming and mapping data from one "raw" data form into another format to make it more appropriate and valuable for analytics.
4	Big Data	Big Data helps the data scientist to treats and analyze, systematically extract information from, and deal with data sets that are too large or complex to be dealt with by traditional data-processing application software.
5	Data warehousing	Data warehousing is typically used to connect and analyze business data from heterogeneous sources. It helps the data scientist to make use of technologies and components which help the strategic use of data.
6	Data visualization	It is a graphical representation of information and data. It helps the data scientist to use visual elements like charts, graphs, and maps, data visualization tools to provide an accessible way to see and understand trends, outliers, and patterns in data.
7	Programing languages	Python, R, Java, SQL, MATLAB

Responsibilities of the data scientist

The responsibilities of the data scientist as defined by Bandyopadhyay (2017):are as follows
- Framing the problem: by asking questions like who is the customer? How exactly does the customer ask the data scientist to solve his/her request? How can their vague request translate into a specific and concrete problem?
- Collection of primary data needed to solve the problem: Is this data still available? What pieces of data would be useful if so? Otherwise, what data do data scientists need? What kind of tools will you need to collect this data in a usable form?
- Data processing (data sparring): Real raw data is rarely used. Inaccurate data collection errors lost values , and many other problems the data scientist will have to deal with. The data scientist will first need to clean the data to convert it into a model for further analysis.
- Data exploration: What kinds of trends or clear correlations do data scientists see in the data? What are the high-level properties, and which of them is more important than others?
- Conducting in-depth analysis (machine learning, statistical models, and algorithms): this stage is where all advanced data analysis equipment is applied to monitoring high-value observations and forecasts.
- Communicate the results of the analysis: All analyzes of the data science and scientific results are of little use unless he/she can clarify what they mean to stakeholders clearly and convincingly. Data narration is vital and important.

In addition, O'Neil (2013) listed the following responsibilities of the data scientist:
- Identify data analytics problems that provide the greatest opportunities for the organization.
- Define correct data sets and variables.
- Collecting large groups of structured and unstructured data from various sources.
- Clean and validate data to ensure accuracy, completeness, and standardization.
- Develop and implement models and algorithms to extract large data stores.
- Analyze data to determine patterns and trends.
- Interpreting data to discover solutions and opportunities.
- Communicate results to stakeholders using visualization and other means.

From Chatterjee 's study (2019) he explained several responsibilities to the data scientist, including:
- Demonstrate and lead deep technical expertise in solving business problems in the real world by applying machine learning.

- Collaborate with other team members inside and outside the data science team to create and deliver world-class data science products.
- Prepare monthly plans and prioritize requests from partner product teams.
- Partnering with the product team to create key performance indicators (KPIs) and new measurement methodologies.
- Translate data into actionable insights for stakeholders.
- Automate reporting for weekly business metrics, and define areas of opportunity to automate and expand custom analyzes.

III. RESEARCH METHODOLGH

The current research aims to find the distinguished definition by finding out the difference and similarities between business analysts and data scientists concerning their scientific expertise, personal skills, and responsibilities. To achieve this goal, the comparison method is used because it is best suited for research purposes. The comparison method relies on monitoring and extrapolating the published and related intellectual production. It is the work of comparing two or more things to discover something about one or all of the many things that are compared (Jochen, 2004). The researcher searches in literary studies to find the definitions, scientific experiences, responsibilities, and personal skills required for both the business analyst and the data scientist to find a unique definition for them. It was found that most of the research and articles that were studied in this research were based on specific criteria for comparison. Common standards between them can be determined as follows: scientific experience, personal skills, and responsibilities.

Previous studies and scientific articles have studied these differences and identified them in general, however current research seeks to find the distinct differences between the business analyst and the data scientist to come up with a definition that distinguishes them from each other.

IV. DISCUSSION AND ANALYSIS

Table No. 3 Shows the most distinguishing differences between the business analyst and the data scientist as well as the similarities. The most important resemblance between them lies in the goal or purpose of their work as both the business analyst and the data scientist aim to support and assist corporate leaders in making appropriate decisions regarding development and competition.

The business analyst begins the analytics process from the reality of the questions or requests that are asked and tries to link the leaders of the enterprise and technology to enable them to understand what technology can offer to them in addressing business problems and support the development of the organization.

While the data scientist begins to analyze data from the reality of the desire to explore the new and try to get opportunities for the organization that has not been fully seen or imagined yet. The data scientist develops his/her questions and tries to answer them through careful analyzes, patience, and scientific curiosity, and thus aims to discover unexpected opportunities.

A business analyst can study and analyze past and present data and find, for example, the movement of a particular product for the organization during a future period. On the other hand, data scientist, by using big data and deep analyzes, he/she can reach the movement of a specific product that has not been put on the market yet.

Both of them are characterized by good communication skills, the ability to solve problems, creative and critical thinking. Moreover, the ability to persuade business owners of the solutions or proposals that reach them. This enables them to solve the organization's problems and meet its requirements. In addition, the data scientist besides, characterized by acute intelligence and great scientific curiosity.

Both of them have good experience in mathematics, statistics, technology, business, and software engineering skills. The business analyst is considered an SQL expert. On the other side, the data scientist characterized by a deep understanding of machine learning.

Table 3: Comparison between Business Analyst and Data Scientist

Factors	Business Analyst (BA)	Data Scientist (DS)
The main responsibility	Corporation service	Corporation service
The additional responsibilities	Acts as a link between technology and business leaders. BA deals with work problems and answers specific business questions.	Predict the future using trends from the past. DS deals with business problems and answers the ungiven questions.
Personal attributes	Driven by creative thinking.	Driven by intellectual curiosity
Soft skills	Communication skills, persuasion, and problem-solving skills.	Communication skills, persuasion, and problem-solving skills.
Scientific experiences	Experiences in mathematics, statistics ,technology ,business , and software engineering skills. Spreadsheet Tools - Data Visualization- Blueprint- Axure -Bit Impulse-Business intelligence- BPMN- BPEL-SOA.	Deep experience in mathematics, statistics, technology ,business acumen, and software engineering skills. Machine Learning-data warehousing-Data visualization- Hadoop
Programming languages	Python – R – SQL – HTML – JavaScript	Python – R – SQL - Scala
The purpose of the data analysis	To address the problems of the organization.	To discover unexpected opportunities for business growth in the organization.
The focus during the analyzing	Data with trends in the past - present.	Data with trends in the past - present -predicting the future.

Since this comparison is between human beings, there is no way for decisively separating responsibilities, scientific expertise, or personal characteristics. We cannot prevent the business analyst from developing him/herself and going beyond his/her previously defined role and providing brilliant proposals, and at the same time, we cannot expect everyone who graduates from data science programs to gain the data scientist's high capabilities from the first steps.

The data scientist gains the high capabilities by the continuing working and analyzing data and gets a deep experience by using scientific curiosity and gain the accumulated experiences and achievements and provide valuable opportunities for business that constitute a milestone in the development of the organization and can be added to his/her record.

The word "scientist" is a valuable word and it is given to the one who has given him/herself to science and delved into scientific knowledge in a specific field, meaning that knowledge in his/her specialization outweighs the habit. This can not be gained only after working hard and digging deeper into the field for years and making many achievements and building a broad experience that is the outcome of permanent work along with the sharp intelligence and scientific curiosity.

To redefine both the business analyst and the data scientist according to what has been addressed, it could be said that:

- **Business analyst**: A person who graduated from one of the business analysis programs, with scientific experience in data analysis and in particular data modeling applications. He/she also has communication skills, persuasion, and creative thinking. Business analyst aims to solve business problems and provide appropriate suggestions to meet the requirements of enterprise leaders to develop business. He/she is the link between technology and business leaders to enable them to understand the benefits of technology and benefit from it. He analyses data from past and present trends.

- **Data scientist**: A person who graduated from a data science program with scientific experience in data analysis, especially in machine learning. He/she has communication and persuasion skills and is characterized by logical thinking, scientific curiosity, and a high ability to analyze data patiently and carefully. He/she aims to provide unexpected opportunities for the organization's leaders to enable them to compete and rise to the top. Data scientist analyzes data from past and present trends, discovering and predicting future opportunities. He/she is characterized by a large sum of achievements, exploration of opportunities, and unexpected solutions.

Thus, the two previous definitions clearly distinguished the data scientist by having accumulated experience of unforeseen achievements and hidden opportunities discovered in the interest of the distinctive development and progress of the organization. To sum up, the business analyst sees the data analysis from the perspective trends in the past and present to support the organization's plans and answer the business questions, on the other hand, the data scientist sees the data analysis from the perspective trends in the past and present and future to discover unexpected opportunities for business growth.

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