Analytics: Making Sense of Data

In the previous module, you learned about Big Data; what it is, how it is collected and where it comes from. In this module, we will discuss the processes or techniques that are used to extract meaningful and useful data from the vast amounts of data that are being collected. In this module, we will talk about Analytics.

OBJECTIVES
06_Obj01: Define Analysis and Analytics
06_Obj02: Identify the components of DIKW Pyramid
06_Obj03: Identify the types of Analytics
06_Obj04: Identify the steps of Business Analytics

What is Analytics?

Analytics is a multidimensional field that uses mathematics, statistics, and computing to find meaningful patterns or knowledge from collected data.

Insight

When you read about analytics, you will definitely encounter the term “insights”. *Insight* is the useful data gained through analytics. In other words, insight is the knowledge hidden in collections of data.

Not all of the data that are collected are useful. For example, unstructured data such as a social media post may contain both useful and non-useful data. With the use of analytics, millions, if not billions of these posts can be processed to yield valuable insight.

Analytics Vs Analysis

The terms analytics and analysis are sometimes used interchangeably but there is a distinct difference between the two. Analysis is the detailed examination of the parts and structure of something. It is the process of studying or dissecting the parts of a whole. Analysis

literally came from a Greek word which means “to loosen” or “to unravel”

Analytics on the other hand, focuses more on insights extracted through analysis. In short, analysis is concerned about how data is studied while analytics is more concerned about what knowledge is gained from data.

Why is analytics important?

The DIKW Pyramid

To understand the important of analytics, we have to talk about the DIKW pyramid. DIKW stands for Data, Information, Knowledge, and Wisdom. The DIKW Pyramid or DIKW Hierarchy can be described as the representation of the levels of human understanding.

Data

Data are symbols or signs. In computing, data is defined as anything that can be stored and processed by a computer. In the context of the DIKW pyramid, data has no meaning on its own. For example, if you see the number 400 written alone on a piece of paper, you will have no idea what it stands for. You can identify it as the number four hundred but you don’t know what its purpose is or what it represents.

Big Data is, of course, a big collection of data. All these data are useless unless they can be analyzed.

Information

Information is data plus context or meaning. When data is defined, it becomes information. Going back to our example, the number 400 on its own doesn’t stand for anything but if you add a context such as “400 passengers”; we now have information that has meaning.

The main difference between data and information is that information can be useful. It can be used to answer questions such as *what, where, who, how many*, etc.

Knowledge

Knowledge can be defined structured or organized information that creates awareness or understanding. When we use information to come up with an answer, what we get is knowledge.

In our example, we have “400 passengers”. This information answers the question “How many passengers can fit on a Boeing 747 aircraft?” we now *know* that 400 people can fit in a 747.

Wisdom

Wisdom is the ability to improve or add value to something. Wisdom can also be defined as the application of knowledge. It is when we use what we know to improve something. For example, we *know* that 400 passengers can fit on a 747. Now, if we use that knowledge to come up with a way to fit more passengers in the plane, we will have gained wisdom.

Analytics is important because it can enable us to understand the meaning behind huge amounts of data and ultimately use this understanding to improve our endeavours.

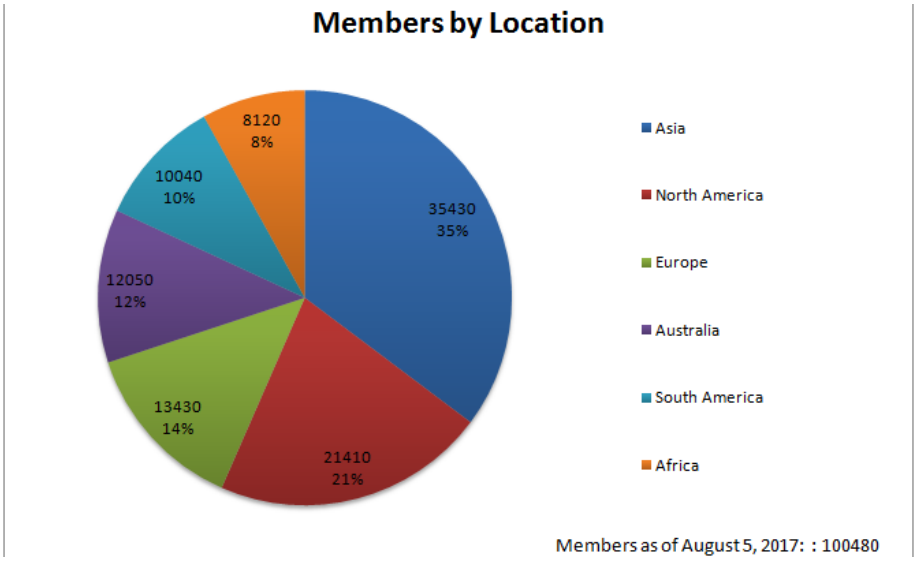
Types of Analytics

There are three main types of analytics; descriptive, predictive, and prescriptive. Each type is defined by its goal or the type of insight that it provides. The following are the definitions and examples of each kind. Note that the examples shown here are simplified; real analytics of real data in real life is way more complicated.

Descriptive Analytics

The first and the simplest type of analytics is descriptive analytics. Descriptive analytics is the interpretation of historical data to understand past events or the current state of things. As the name implies, it *describes* data. Descriptive analytics answers the question “What happened?”

As you learned in the previous module, Big Data is defined by its volume, variety, and velocity. These key attributes make the raw data that comprise Big Data virtually impossible for humans to understand. Descriptive analytics condenses the data into a form that can be more easily understood and utilized

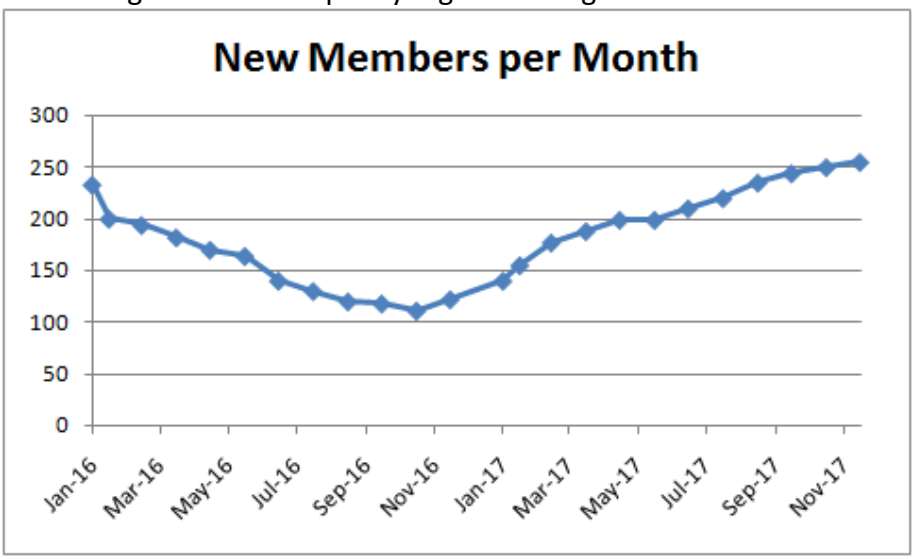


To better understand descriptive analytics and other types of analytics, let us imagine an organisation. We will call it World International. It has more than one hundred thousand members around the world and it gathers data about all of them. If we apply descriptive analytics to World International's data, we can gain insights to its membership. In the chart above we can see that most of the members are from Asia. We can also see that Africa has the lowest number of members.

Predictive Analytics

Predictive analytics examines data from the past to create forecasts or predictions about future events. This is done by identifying a trend in a collection of data. A trend is the general direction in which something is changing or developing. A trend is a pattern in the data. Studying these patterns can give insight to what will happen in the future.

Predictive analytics assumes that the future will be the same as the past. We use what we know in to predict what will happen but of course there are still factors and events that cannot be foreseen. Because of this predictive analytics cannot be 100% accurate. But still it can give us a pretty good insight into the future.



For example, our imaginary organization, *World International* keeps track of how many new members join per month. In 2016, the number of new members steadily declined. However in 2017, we see a gradual increase. Based on this recent trend, we can predict that the number of new members will continue to increase in the coming months.

Prescriptive Analytics

Prescriptive analytics is used to come up with the best course of action. It takes into account the results of descriptive and predictive analytics and suggests decision options. Prescriptive analytics answers the question "What should I do?"

Even if you have all the important facts and even if you can predict what may happen in the future, that still doesn't mean that you can make the right decisions. For example, World International's goal is to increase the number of members in the areas with the fewest members. Descriptive analytics tells us that Africa, South America, and Australia combined still have fewer members than Asia. We also know that global membership is likely to increase but that still doesn't

guarantee that there will be a significant increase in the bottom three continents.

This is where Prescriptive analytics comes in. It uses the data that you have and the predictions that you have made and suggest what actions you can take to achieve your goal.

The Unofficial Fourth Type

While many consider the three “tives” as the main types of analytics, there is also another kind of analytics that is worth looking into. *Diagnostic analytics* is used to examine data in order to determine the reason behind an event. It answers the question "Why did it happen?"

Going back to our example, we now know which continents have the most members and which ones have the fewest. Through diagnostic analytics we can determine the reason behind this. Why are there more members in Asia than any other continent? Why are there so few members in Africa?

Business Analytics

The term “business analytics” gets used a lot when talking about analytics. Sometimes, the two terms are even used interchangeably. Business analytics is the name given to the tools, technologies, and techniques used to process data into insights that can be used by businesses. It is practically analytics in a business setting.

According to Dr. Carol Anne Hargreaves, business analytics is a 7-step process. This process is similar to the Scientific Method. Data is used to make a decision that can solve a business problem or achieve a goal.

Step 1. Defining the business needs – This step involves understanding what problem needs to be solved or what goal needs to be achieved. In this step, it is also important to determine what data is available.

Step 2. Explore the data – data is refined into more usable forms. Statistical and visual representations are created

Step 3. Analyse the data – refined data is further examined to extract more actionable insights

Step 4. Predict what is likely to happen – predictive analytics techniques and technologies are applied to come up with several predictions.

Step 5. Optimise – The predictions and other insights are used to find the best solution to the business goal or problem.

Step 6. Make a decision and measure the outcome – a decision will be made based on the best solution. After some time, the outcome of the decision will be recorded and measured.

Step 7. Update the system with the results of the decision – the result of the decisions, the insights and actions from all the previous steps are recorded and integrated into the system.

Glossary of Terms

ANALYTICS – is a multidimensional field that uses mathematics, statistics, and computing to find meaningful patterns or knowledge from collected data.

INSIGHT – is the useful data gained through analytics

ANALYSIS – is the detailed examination of the parts and structure of something

DIKW – stands for Data, Information, Knowledge, and Wisdom

DATA – anything that can be stored and processed by a computer

BIG DATA – big collection of data

INFORMATION – is data plus context or meaning

KNOWLEDGE – defined as structured or organized information that creates awareness or understanding

WISDOM – is the ability to improve or add value to something

BUSINESS ANALYTICS – is the name given to the tools, technologies, and techniques used to process data into insights that can be used by businesses

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