



University of the Philippines
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Fundamentals of Business Analytics

A Business Analytics Course

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Fundamentals of Business Analytics

A Business Analytics Course

Welcome to this introductory course on business analytics. This course provides students with an overview of the current trends in business analytics which drive today's business. The course will provide understanding on data management techniques which can help an organization achieve its business goals and address operational challenges.

COURSE OBJECTIVES

At the end of the course, you should be able to:

1. Discuss the value of business in managing business operations;
2. Describe the various sources of data (structured, unstructured) and the concept of data management;
3. Describe the importance of data, how data can be used by an organization towards competitive advantage, and how it enables organizations to make quicker and better business decisions;
4. Describe, understand and explain business modelling, the business modelling process and be able to apply it in a variety of different situations;
5. Describe the basics of business intelligence include data gathering, data storing, data analyzing and providing access to data;
6. Describe how statistical analysis can help to better understand past events and predict future events;
7. Discuss the fundamentals of project risk management, various methods used for effort and cost estimation, various phases within a project, dependencies and critical path;
8. Describe various database models like the hierarchical database model and network model; and
9. Discuss the ethical norms as required under policies and applicable laws governing confidentiality and non-disclosure of data/information/documents and proper conduct in the learning process and application of business analytics.

COURSE OUTLINE

BAFBANA consists of five modules and will run for sixteen (16) weeks.

MODULE 1. Overview of Big Data and Business Analytics

- A. Introduction to Business Analytics
- B. History of Business Analytics
- C. Big Data and Business Analytics
- D. Big Data Investments by the Numbers
- E. Providers of Big Data Services

MODULE 2. Business Analytics Framework

- A. Framework for Business Analytics
- B. Types of Analytics

MODULE 3. Data and Database Management

- A. Data, Information, and Knowledge Management
- B. Database
- C. Database Management
- D. Functions and Components of a Database System

MODULE 4. Applications of Business Analytics

- A. Types of Analytics
- B. Applications of Business Analytics in Finance
- C. Applications of Business Analytics in Human Resource
- D. Applications of Business Analytics Marketing

MODULE 5. Ethics Issues in Business Analytics

- A. Ethical Issues
- B. Ethical Implications of Business Analytics

COURSE MATERIALS

Your learning package for this course consists of:

1. Course guide;
2. Study guide for each module, which includes the lecture notes and learning activity guides;
3. Video lectures; and
4. Additional reading materials in digital form available on the course site.

These course materials are uploaded in the course site and can be downloaded for your reference.

STUDY SCHEDULE

This course is a guided independent mode of study with some collaborative learning in the form of asynchronous online discussions. This means that students can post their contributions to the discussion anytime within the specified period or number of days, instead of conducting the discussion at the same time. In general, it is up to you to decide how many hours to spend on each module, including the online discussions and other learning activities.

The study schedule below will guide you on your pacing as you go through each part of the course/lesson and in doing the course requirements:

Date/Period	Topic/s	Activity
Week 1	Course Overview	<ol style="list-style-type: none">1. Read the course guide.2. Introduce yourself in the "Self-Introductions" forum3. Participate in Discussion Forum
Week 2-3	MODULE 1	<ol style="list-style-type: none">1. Watch the video lecture "Introduction to Big Data and Business Analytics" by Dr. Eric Capistrano.2. Participate in the Discussion Forum3. Take Online Quiz#1.
Week 4-5	MODULE 2	<ol style="list-style-type: none">1. Watch the video lecture "Framework for Business Analytics" by Mr. Dominic Ligot.2. Participate in the Discussion Forum3. Submit Assignment 1

Week 6-8	MODULE 3	<ol style="list-style-type: none"> 1. Watch the video lectures "Introduction to Data and Database Management" by Dr. Eric Capistrano and "Database Management" by Prof. Reginald Recario. 2. Participate in the Discussion Forum 3. Take Online Quiz#2.
Week 9-11	MODULE 4	<ol style="list-style-type: none"> 1. Watch the video lecture "Applications for Business Analytics" by Mr. Dominic Ligot. 2. Participate in the Discussion Forum 3. Submit Quiz#3.
Week 12-14	MODULE 5	<ol style="list-style-type: none"> 1. Watch the video lectures "Ethical Issues" by Atty. Banez and "Ethical Implications of Business Analytics" by Dominic Ligot 2. Participate in the Discussion Forum 3. Submit Assignment 2

COURSE REQUIREMENTS

To earn the certificate of completion for this course, you are required to do the following:

1. Contribute at least 1 substantial posting in the each of the online discussion forums.
2. Take all online quizzes.
3. Submit all assignments.
4. Submit the final assessment.

ONLINE DISCUSSION FORUMS

There will be a series of online discussions and activities for this course. In addition to gauging your understanding of the course topics, the online discussions provide everybody an opportunity to apply the concepts discussed in the modules in specific situations.

As we progress through the course, we will be posting discussion topics and specific questions/instructions, so make it a point to visit the course site regularly (i.e., at least twice a week).

Remember the following when participating in online discussions:

- All discussions will take place in the course site. A separate discussion forum will be created for each topic.
- Everybody is encouraged to contribute to the discussions by answering the discussion question and/or reacting to each other's postings. You need to post at least one (1) substantial response in each discussion topic if you wish to acquire the Certificate of Completion. Passing remarks like "I agree" are not considered substantial.
- Do not post lengthy contributions. Be clear what your main point is and express it as concisely as possible.
- Discussions on a topic usually last one week. The forums will remain open throughout the course's duration.
- Please be guided by netiquette rules (see <http://www.albion.com/netiquette/corerules.html>) when participating in online discussions. Respond to other postings courteously. Personal messages should be emailed directly to the person concerned.
- If you would like to use some printed or online reference materials in your posting, don't forget to cite them accordingly (e.g., According to Hernandez (2010), this concept is...).

ONLINE QUIZZES

There will be online quizzes at the end of each module. These will help you test and enhance your understanding and mastery of the lessons.

There is a set time limit to each quiz, so you need to manage your time effectively when taking the test. You will automatically receive your test score and other feedback after finishing and submitting the online quiz.

While your scores will not be included as part of your final grade, you need to accomplish all the quizzes if you intend to get the Certificate of Completion.

ASSIGNMENTS

The assignments are intended to help you to integrate and apply what they you have learned. Instructions on how to do the assignment will be posted on the course site.

You must submit and get a passing mark in this assignment if you wish to get the Certificate of Completion. Assignments should be uploaded in the course site on or before the deadline.

FINAL ASSESSMENT

You will be asked to undertake a final assignment at the end of this course. Guidelines for the assignment will be posted in the course site.

CERTIFICATION

For UPOU to issue a Certificate of Completion, you need to submit and pass all the required outputs for this course.

GENERAL GUIDELINES

In addition to the specific guidelines given in the different sections of this course guide, please observe the following house rules.

1. Check the course site regularly for announcements, updates and reminders.
2. Take note of the deadlines.
3. All requirements must be uploaded in the proper submission bins via MyPortal. Submissions via email will not be accepted/graded.
4. Practice academic integrity and intellectual honesty at all times and in all course activities. Cheating in any form will not be tolerated.

FACULTY-IN-CHARGE

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MODULE 1: OVERVIEW OF BIG DATA AND BUSINESS ANALYTICS

Introduction

Everyone who runs a business would tell you that making decisions is the most important task in the role. Business managers are always faced with questions on what to sell, how much to sell, to whom, through what mode. A manager or entrepreneur has to know how much it would need to make his or her product, how to cut down on expenses, how to market the product to customers, and when the business can be expanded. Decisions do not just come about on their own. They are a product of analysis based on the information available to the decision maker.

Business managers have always gathered information to base their decisions on. But with the development of computers which can store and process large amounts of data, business analytics began to offer more possibilities for decision makers. In this module, we will learn more about the role of business analytics, big data, and business intelligence.

Learning Objectives

After completing this course, you should be able to:

1. Discuss the basic concepts on business intelligence, big data and business analytics;
2. Trace the evolution of business analytics; and
3. Give examples of big data service providers.

1.1. Business Analytics and Business Intelligence

In the era of knowledge economy, getting the right information to decision makers at the right time is critical to their business success, and one such attempt includes the growing use of business analytics (Min, 2017). Business analytics is one of the most talked-about topics in the field of business and information technology. And as expected, business analytics is becoming one of the most sought-after courses in the academe.

Business Analytics (BA)

What goes through your mind when you hear the word Business Analytics? Below are some of the definitions of business analytics.

1. Business Analytics is the art of assembling the data gathered through Business Intelligence in such a way that it can be analyzed by people. It is comprised of the tools with which people can disseminate the data that's been collected, to produce meaningful conclusions (Fulton, 2013).
2. Business Analytics is the use of data, information technology, statistical analysis, quantitative methods, and mathematical or computer-based models to help managers gain improved insight about business operations and make better, fact-based decisions (Evans, 2012).
3. Business analytics is comprised of solutions used to build analysis models and simulations to create scenarios, understand realities and predict future states including data mining, predictive analytics, applied analytics and statistics (<https://www.gartner.com/it-glossary/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 (Galleto, 2018).
5. Business analytics refers to a broad use of various quantitative techniques such as statistics, data mining, optimization tools, and simulation supported by the query and reporting mechanism to assist decision makers in making more informed decisions within a closed-loop framework seeking continuous process improvement through monitoring and learning (Min, 2017).

Business Intelligence (BI)

Now, let's look at what ***Business Intelligence (BI)*** is.

1. Business Intelligence as the process of collecting information from all sources to make data-driven decisions in an organization (Fulton, 2013, Galleto, 2018).
2. Business Intelligence as the process of combining aspects of reporting, monitoring and alerting, dashboards, scorecards, and ad hoc query data exploration (Capistrano, 2018, Galleto, 2018).

Activity

- **Watch** "Introduction to Big Data and Business Analytics" by Dr. Eric Capistrano
- **Read** articles by Fulton (2013), Min (2017), and Galleto (2018).



Study Questions

1. After learning about the different definitions of BA and BI, can you now compare/differentiate BI and BA?
2. Galleto (2018) mentioned that "While Business Intelligence answers what happened, Business Analytics answers why it happened and whether it will happen again". What are your thoughts on this?

1.2. Origin of Business Analytics

From ancient times, people have had this need to predict the future. They have used crude methods like stones and sticks to project how much crops they were going to harvest or how much they were going to yield. In this section, we shall trace the development of business analytics from the ancient to the modern time

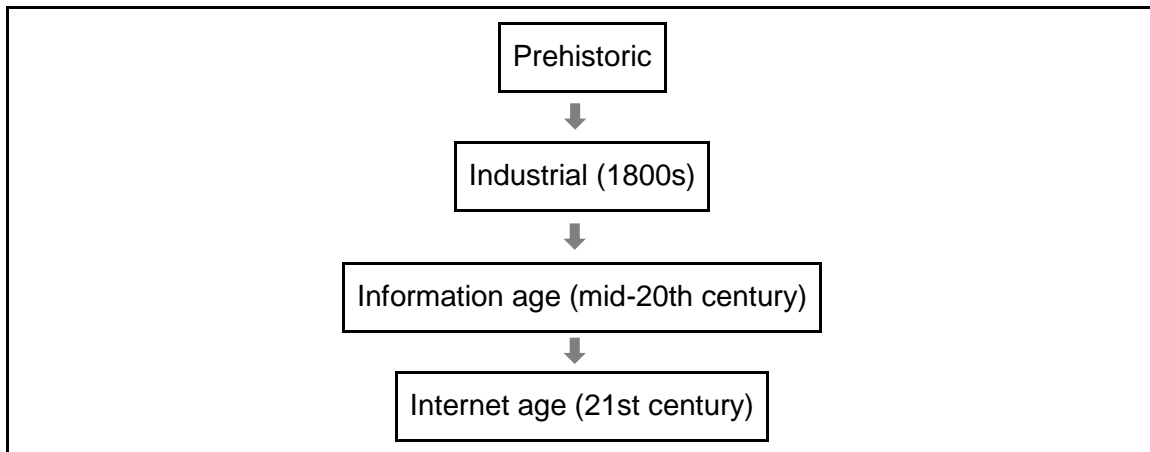
Activity

- **Read** an article on "The Origin and Evolution of Business Analytics" by Hokey Min (2017).
- **Read** an article on "The Evolution of Business Analytics" by Jess Hasson (2015)



Study Question

Trace the evolution of business analytics by writing down the features of analytics (i.e., its application, tools used) as employed in the following eras:



1.3. Big Data and Business Analytics

We have already defined Business Analytics and Business Intelligence. This time, let us learn another concept related to BA which is the Big Data. So, what is big data? SAS defines big data as a term that describes the large volume of structured and unstructured data which can be analyzed for insights needed for better decisions and strategic business moves. IBM, on the other hand, refers to it as data sets whose size or type is beyond the ability of traditional relational databases to capture, manage, and process the data with low-latency.

What is the difference? Business Analytics is said to focus on financial and operational analytics of the business while big data involved machine automation to analyze data. The importance of big data is not on how much data you have, but what you do with those data.

There are four aspects that define big data which are volume, variety, velocity and veracity.

1. Volume is about how huge the data sets are.
2. Variety includes how many pieces of data we gather together from social media data, government data, financial data, banking data, all sorts of transactions all combined together to make one or more profiles for your customers.
3. Velocity is the speed of data.
4. Veracity means that there is a lot of uncertainty, meaning, there is all of these different data coming together, but the problem is we don't know what to do with them.

Activity

- **Watch** "*Introduction to Big Data and Business Analytics*" by Dr. Eric Capistrano
- **Read** the article "Difference between Big data and Business Analytics" from <https://talentedge.in/articles/difference-big-data-business-analytics/>

1.4 Big Data Analytics Providers

A long list of big data service providers which are now available in the market can be found in the Internet.

Activity

- **Watch** "*Introduction to Big Data and Business Analytics*" by Dr. Eric Capistrano
- **Read** the articles "100 Most Promising Big Data Solution Providers - 2017" and "Forbes Cloud 100: 10 Big Data Analytics Providers That Matter"



Study Question

As an exercise, look in the web for examples of data service providers. List them down. What sorts of services do these big data providers sell to their clients?

References

100 Most Promising Big Data Solution Providers - 2017. Available from <https://talentedge.in/articles/difference-big-data-business-analytics>

Big Data. What it is and Why it Matters. Available from https://www.sas.com/en_ph/insights/big-data/what-is-big-data.html

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Galletto, M. 2018. What is Business Analytics?. Available from <https://www.ngdata.com/what-is-business-analytics/>

Gartner Inc, 2012. Gartner Says Worldwide Business Intelligence, Analytics and Performance Management Software Market Surpassed the \$12 Billion Mark in 2011 Available from <https://www.gartner.com/newsroom/id/1971516>

Hasson (2015). The Evolution of Business Analytics". Available from <https://www.socialmediatoday.com/technology-data/2015-02-10/evolution-business-analytics-infographic>

Min, H. 2017. Introduction to Business Analytics. Available from <http://www.informit.com/articles/article.aspx?p=2494418>

What is Big Data Analytics. Available from <https://www.ibm.com/analytics/hadoop/big-data-analytics>

MODULE 2: BUSINESS ANALYTICS FRAMEWORK

Introduction

Information, in its raw form, is not much useful for business decision making. It has to be collected, analyzed, and present din a way that is useful for decision making. In this module, we shall discuss the framework that allows us to turn this information into valuable data. We shall discuss how data becomes business value and explain the basic concepts on data analysis framework, data extraction, data warehousing and data analytics.

Learning Objectives

After completing this course, you should be able to:

1. Discuss how data becomes business value.
2. Explain basic concepts on data analysis framework, data extraction, data warehousing and data analytics.

2.1 Framework for Business Analytics

The process of turning raw data into business action is the framework for Business Analytics. There are 3 steps in turning data into analytics which are Data Extraction, Data Warehousing and the Extract, Transform, or Load Processes (ETL).

1. **Data extraction.** This is the first step in turning data into analytics. There are at least 3 sources of data which are the source systems, raw transactions, and from documents and forms.
2. **Data warehousing.** This is where the data is cleaned, curated, organized, and ready for analysis.
3. **Extract, Transform, or Load Processes (ETL).** This is the process of moving data from source systems to data warehouse to an analytical tool.

Activity

- **Watch** "*Framework for Business Analytics*" by Mr. Dominic Ligot



Study Question

How does data become business value?

2.2 Types of Analytics

Now that we have collected the right data and processed them into usable form, we need to find at what level are we going to dig deep into the data to get the fact-based insight we need to find out so we can come up with better business decisions.

There three types of analytics that can help businesses make the most out of the big data that they have and find the solutions to problems that they have: descriptive, predictive and prescriptive.

1. **Descriptive Analytics.** This is the data that is used to benchmark or to profile.
2. **Predictive Analytics.** This is used to determine relationships between two different types of data and making predictions about future data.
3. **Prescriptive Analytics.** This is used to create recommendations through simulation and optimization models.

Activity

- **Watch** "*Descriptive Analytics*" by Mr. Dominic Ligot
- **Watch** "*Predictive Analytics*" by Mr. Dominic Ligot
- **Watch** "*Prescriptive Analytics*" by Mr. Dominic Ligot



Study Question

Compare and differentiate descriptive, predictive, and prescriptive analytics.

Type of analytics	Similarities	Differences
Descriptive		
Predictive		
Prescriptive		

Reference

Ligot, D. 2018. "*Framework for Business Analytics*".

MODULE 3: DATA AND DATABASE MANAGEMENT

Introduction

Good business decisions rely on access to accurate data. To facilitate this, organisations need a system for recording, updating, and tracking data on a regular basis. Once collected, data can be retrieved and presented in formats useable to managers and employees of the organization through computerised databases. Various database elements can be linked through database management systems. In this module, we shall discuss the basic concepts on data, database and database management system. We will also talk about the functions and components of a database management system.

Learning Objectives

After completing this course, you should be able to:

1. Discuss the basic concepts on data, database, and database management system; and
2. Explain the functions and components of a database and a database management system.

1. Data, Database and Database Management Systems

What is data?

For every database system, the heart of each system is what you call the data (Recario, 2018). Data are facts or figures which we can store in a database. An example of this is your ID number, the name of your teacher, the number of students in your class now.

What is a database?

1. A database is a collection of logically related data and it is typically visualize as tables; composed of cells matched with several columns and rows (Recario, 2018).
2. In computer terms, database is a collection of data, not not necessarily always stored in a computer, such as records stored in a filing cabinet, in a notebook (Crisanto, 2018).

What is a Database Management System (DBMS)?

1. A DBMS is a collection of interrelated data using the software and hardware used to access the data in a useful manner such as database or set of databases stored in a disk or other media, a computer, or set of computers where the software to access the database can run (Crisanto, 2018).
2. A DBMS is a software package or software that allows you to store, retrieve, package your database (Recario, 2018).

Activity 3-1

- **Watch** "Introduction to Data and Database Management" by Dr. Eric Capistrano
https://www.youtube.com/watch?v=Gq48gqrUMUM&t=0s&list=PLIqeNUxu5x2HpIGrEaxWMGIb_h9MVEo6I&index=37
- **Watch** "Database Management" by Prof. Reginald Recario
https://www.youtube.com/watch?v=WeE7f9U7tyg&index=36&list=PLIqeNUxu5x2HpIGrEaxWMGIb_h9MVEo6I&t=0s
- **Watch** "Database Management Systems" by Prof. Mari Anjeli Crisanto
https://www.youtube.com/watch?v=gWMkgts1vms&t=0s&list=PLIqeNUxu5x2HpIGrEaxWMGIb_h9MVEo6I&index=57

Study Question



Can you give an example of a database management system that you are familiar with or have recently used?

2. Functions of a Database Management System

What are the functions of a DBMS? What are the advantages of using a DBMS?

Here are some of the functions of a DBMS (Crisanto, 2018, Recario, 2018):

- The DBMS can provide a **convenient** and **efficient** interface for storing, retrieving, and updating data, and for extracting useful information from the database, and a **clear** and **logical** view of the process that manipulates the data.
- **Data Independence:** DBMS maintains the segregation between the program and the data.

- **Concurrency Control.** This refers to a process to ensure that data is updated correctly and appropriately when more than one person is accessing the data
- **Recovery Services.** This refers to mechanisms for recovery of data that is apparently lost due to system crashes
- **Utility Services:** An initialization and maintenance operations on a database.
- **Manipulation of data.** It tells us that we can CRUD (create, retrieve, update, and delete) our data within the DBMS.
- **Database definition.** Metadata describes the contents of your database. This is a data that describes another data in terms of its constraints, size, and the data type of the tables or the databases that are contained within your DBMS.
- **Data Processing.** This allows the user to perform different types of operations such as string manipulation, date operations and so on. You can also manipulate the data based on an event or what they call 'triggers' which is based on the event or the conditions of the event.
- **Data sharing.** This means that within a database, privileges are provided to different types of users. Different types of users can access the same database but the same users can have different privileges.

3. Components of a Database System

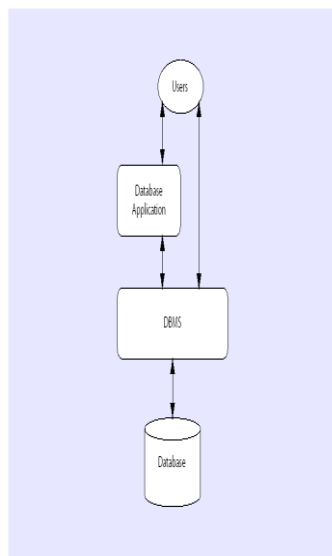


Fig. 1. Components of a Database System (Crisanto, 2018)

A database system has the following components (Crisanto, 2018):

1. Users

The users of a database system are the database administrator, system developer, and end user. A database administrator (DBA) is the person responsible for all the data resources in an organization. The DBA uses tools that come with a DBMS to improve the productivity and performance of database planning and design. The system developers are those groups of people who create the application programs that cater to the user requirements. And, they use their own tools to write programs that communicate with the DBMS. Finally, the end-users in an organization are the ones that can add, update, and delete data in a database through application programs or directly through a DBMS. They use the application program to accomplish their day-to-day tasks.

2. Database Application

The next component of the database system is the database application. This is a computer program that allows users to manipulate the data in a DBMS through a user-friendly interface. It can be divided into four broad categories: Personal which is restricted to a single user; Departmental which is referenced by hundreds of users over a shared system or network; Enterprise which extensions of departmental applications involving thousands of users; and the Internet which is the largest form of information sharing where billions of users are involved.

3. Database Management System (DBMS)

The DBMS decouples application programs from data. The databases store all its data in one location, thereby limiting data duplication. Examples of DBMS include Access, Oracle, IBM's DB2, and SQL Server.

4. Database

The final component of a database system is the database itself. This is the space in the disk or computer where the data are actually stored.

3.4. Components of a Database Management System

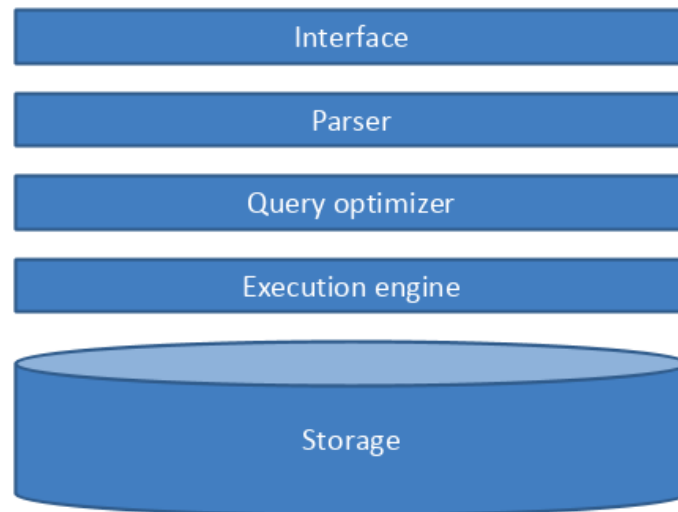


Fig. 2. Components of a DBMS (Recario, 2018)

A database system has the following components (Recario, 2018):

1. Interface

The interface is responsible for interacting with the user. It is also called the “middleman” as it communicates between two different parties: the end user, which is you, and the database management systems. The interface allows the end user to input values that will be understood by the database management system. It is also responsible for the receiving and outputting, and providing the results of the queries or the commands that the end user issued.

2. Parser

The parser is responsible for checking the correctness of the syntax that was provided by the end user through the interface. So it also checks the tables and other objects in the query.

3. Query Optimizer

If the parsing is correct and proper, then it will proceed to what we call the query optimizer. The query optimizer comes from the root word ‘optimize’, which means it simplifies the query form or the input into a simpler type of input that can be digested and can be understood by the database management system. This allows the DBMS to save time and save space when performing operations.

4. Execution Engine

The next one is the execution engine. Its main responsibility is to execute the output of the query optimizer. Once the query has been optimized, then it will pass the data or the optimized query to the execution engine whose sole purpose is to execute the command.

5. Storage

Storage is the physical location of your database, which can be the secondary or the primary memory.

Activity 3-2

- **Watch** "Database Management" by Prof. Reginald Recario
https://www.youtube.com/watch?v=WeE7f9U7tyg&index=36&list=PLiqeNUxu5x2HplGrEaxWMGlb_h9MVEo6I&t=0s
- **Watch** "Database Management Systems" by Prof. Mari Anjeli Crisanto
https://www.youtube.com/watch?v=gWMkgts1vms&t=0s&list=PLiqeNUxu5x2HplGrEaxWMGlb_h9MVEo6I&index=57

Assignment



What do you think are the advantages of having a database management system in an organization?

References

"Introduction to Data and Database Management" by Dr. Eric Capistrano
"Database Management" by Prof. Reginald Recario
"Database Management Systems" by Prof. Mari Anjeli Crisanto
EDUCBA. 2016. *4 Important Roles of Database Management System in Industry*.
Accessed: <https://www.educba.com/database-management-system/>

MODULE 4: APPLICATIONS OF BUSINESS ANALYTICS

Introduction

In Module 1, we discussed how data becomes business value. We learned that raw data needs to be extracted from its sources, cleansed, curated, and warehoused to prepare it for analysis. These data can be analyzed in different ways depending on the problem or situation at hand. They can be leveraged in various ways to optimize business operations. In this module, we will review the three types of commonly used analytics -- descriptive, predictive and prescriptive. We shall also give examples of applications for business analytics especially in the three functions which are mostly present in the industry: Finance, Human Resource, and Marketing.

Learning Objectives

After completing this course, you should be able to:

1. Discuss the three types of analytics namely descriptive, predictive and prescriptive; and
2. Give examples on the applications of business analytics in finance, human resource, and marketing.

1. Types of Analytics

Let's review the three types of analytics.

1. Descriptive : data-driven benchmarking

This is data that is used to benchmark and to profile to be able to establish historical trends. It is the commonly used analytics by companies. Going back to the example in the video on how Waze works (Ligot, 2018), understanding how the traffic is today or how bad the traffic is in a certain location, that's descriptive analytics. Here, you're not making any predictions nor looking for any relationships yet - just looking at data as it is.

2. Predictive : data driven prediction

Now that we already know how the data looks like, we can now understand the relationships in the data. Once we know the relationships inside the data, we can make predictions and forecasts by feeding new data into the predictive model. Now let us go back to the example on how Waze works (Ligot, 2018). Since we already have information on the destination and a time of departure, Waze will estimate the time of

arrival and predict how long it will take for us to travel, Waze will estimate the time of arrival. This is prescriptive analytics.

3. Prescriptive: data driven recommendation

The third type of analytics is the prescriptive analytics. It involves providing advice on what actions can be taken given the predictions about the future and what drives the future. To explain this further, let's go back to the example in the video on how Waze works (Ligot, 2018). If you want to know what the three best routes are, for example, between Quezon City and Makati, Waze can suggest the top three routes. The decision is up to you to choose which you think is the best route. And that's the essence of prescriptive analysis: knowing the costs and benefits of a decision.

Please see Table 1 for a summary of the said analytics.

Table 1. Comparison of Three Types of Analytics

Type of Analytics	Purpose	Questions answered	Examples
Descriptive	To benchmarking and profile data to make sense of historical trends	What happened in the past?	Historical trends in production, inventory, sales, customers, financials, etc.
Predictive	Find Relationships in data to understand the future and prepare for it	What will happen in the future?	Forecasting consumption patterns, demand for inputs from the inventory, inventory levels, etc.
Prescriptive	Assessing the future and prescribing actions to optimize business operations	What will happen in the future? Why it will happen? What actions can be taken to take advantage of the predictions?	Optimizing production, inventories, deliveries, etc.

Activity 4-1

- **Watch** "Applications for Business Analytics" by Mr. Dominic Ligot https://www.youtube.com/watch?v=wb4_XhHO2N4&t=0s&list=PLiqeNUxu5x2HplGrEaxWMGIb_h9MVEo6I&index=62

Study Questions



Think of a problem affecting your organization or an organization you are familiar with. Think of a problem that you think can be addressed by looking at available data within the organization. Which of the three types of analytics should you use? How can the type(s) of analytics help the organization help solve the said problem?

2. Applications of Business Analytics in Finance

Now that we are familiar with the types of analytics, let us look at the applications of business analytics in finance industry. An example of descriptive analysis in finance is using analytics in reporting financial results, from gathering financial inputs from different sources, cleansing it, to reporting it. Predictive analysis, on the other hand, is when we want to predict the trend of sales for the next two months using historical patterns of seasonality, and examining whether investing a lot in sales people might also drive the sales trend. Prescriptive analysis is applied when we want to determine the feasibility of the project, say the likelihood that the project will falter, or overshoot the budget, or fail. This is with the assumption that we have looked into consideration the various inputs such as cost of materials, location of project, etc.

Study Questions



Using an organization you are familiar with as an example, can you think of scenarios where the three types of analytics can be used in finance?

3. Applications of Business Analytics in Human Resources (HR)

Analytics plays an important role in human resources. Suppose you are an HR manager and you want to understand demographics of the employees in your company. You may need information on the diversity of the employees' location, address, school graduated, etc. This is where descriptive analysis can be used to manage human resources better. As an HR manager, you may also want to determine which employees are likely to resign, because recruiting new people will mean additional cost for the company. You may use predictive analysis in this case by looking at the historical patterns of resignations to determine the likely causes of resignations and the number of employees that are likely to resign in the future. Finally, as an HR manager, you may also want to determine the drivers that make employees stay in the company. Employee engagement, such as looking at what makes them content, happy and stay in the company (ex. party, bonus, free training, etc) is where prescriptive analysis can be used.



Study Questions

Using an organization you are familiar with as an example, can you think of scenarios where the three types of analytics can be used in human resources?

4. Applications of Business Analytics Marketing

Analytics is very useful especially if you are in the marketing industry. Let's say you are in charge of monitoring the results of an online marketing and sales campaign in your company. You can use descriptive analytics to determine how many people clicked the ads, how many people bought the product, how many people paid cash-on-delivery, or by credit card. If you want understand how factors (ex. price, marketing mix and attributing the effect, channels, mode of payment, etc) contribute to the performance to predict the future performance (success or failure) of a campaign, or do achieve targets, you can use predictive analytics. Prescriptive analytics in marketing can be seen through the recommendation engines which are found to be successful in driving more sales. These are the recommendations that you can see whenever you visit in an online shopping website, say to buy a book. This recommendation will go something like "those who bought that book also bought this book". This recommendation is based on the prescriptive algorithms which look on the patterns of people who buy the same product or profiles that look similar or items that are purchased together.

Activity 4-2

- **Watch** "*Applications for Business Analytics*" by Mr. Dominic Ligot
https://www.youtube.com/watch?v=wb4_XhHO2N4&t=0s&list=PLiqeNUxu5x2HplGrEaxWMGIb_h9MVEo6I&index=62

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MODULE 5: ETHICS ISSUES IN BUSINESS ANALYTICS

Introduction

What is ethics and why do we need to know ethical issues and considerations when we study about business analytics? Ethics is a moral principle that somehow guides a person on what is bad and what is good. As students, we need to be aware of our ethical obligations as we practice and apply business analytics in your profession. In the previous modules, we were introduced with concepts like big data, database, and business analytics and the potential and impact these tools can do in an organization if properly utilized. The results of business analysis when used as basis to make important decisions can affect people and the organization, thus, there is a need to learn about the ethical and legal considerations and implications of business analytics. As business analytics practitioners, we also need to know some of the general information about the data privacy and this module covers the data privacy act to serve as our guide.

Learning Objectives

After completing this course, you should be able to:

1. Discuss ethical concerns and ethical implications of business analytics; and
2. Explore the data privacy law and give examples on addressing data privacy concerns.

1. Ethical and Legal Considerations in Business Analytics

In this chapter, we will look into some examples on ethical and legal considerations in business analytics such as danger of discrimination and bias, problem when the integrity of the data has been compromised, and problems on the lack of transparency. We also briefly discuss the data privacy law and some examples on addressing data privacy concerns.

1. Discrimination and Bias

When we make decisions based on the results of business analysis involving big data, there is a high probability that it will affect thousands and even millions of people. Discrimination and bias happens when our judgement and assumptions are influenced by our own biases. Take a look at the example mentioned in our video material for this course (Bañez, 2018). Suppose you used business analytics to screen candidates for employment, and you decided that we are going to eliminate those who are not employed one year prior application, since you may feel that this seems objective and rational. You

want to hire people who have continuity in working and the one-year gap may be a source of suspicion. However, this decision may be biased to certain group of people such as mothers who have to take a one-year leave to take care of their children after giving birth. You may be biased against these mothers who will not be qualified for the job, not because they are not fit for the job, but because they chose to take care of their children after giving birth. These biases will involve serious consequences and certain people will be unfairly denied resources. In this example, your bias against women may cause a portion of women ending up being rejected from consideration even though they are just as good, or even better, than other candidates.

2. Integrity of Data Analytics

Another ethical issue concerns the integrity of data analytics. As we use the results of analytical analysis to make certain decisions, we should also take consideration the assumptions used to ensure its validity. Using wrong assumptions, even if we use the right analytical tools will bring us to wrong data. The right tool is useless if we have corrupted, incomplete, outdated, or irrelevant data. An example of this is when a credit card company used a data on a client's purchases which he never made in the first place, or mistakenly used on a different client with the same name. It can also be using correct data but interpreting it the wrong way. These are just some of the examples that show how integrity of data can be compromised.

3. Lack of Transparency

Transparency, is another ethical issue which is related to the first two issues that we have discussed earlier. Suppose you think that your company made a wrong decision in not promoting you. So how do you appeal to this if you think that their method is based on bias, and thus faulty? To appeal, you need to know the process to determine if you are right, and they are wrong, and decided based on bias. You also need to know that the data sets they used to decide is accurate. But chances are, none of these would be available to you because of non-disclosure, intellectual property, and other institutional agreements you have with the company. How can you now question that decision and make your appeal if you don't know how the decision arrived at? So here, you can see that we need transparency to provide us access as our means to understand how systems work and affect our lives.

Activity 5-1

- **Watch** "*Ethical Issues*" by Atty. Emerson Bañez
https://www.youtube.com/watch?v=LRn6Nvd6Qgc&t=0s&list=PLIgeNUxu5x2HplGrEaxWMGIb_h9MVEo6I&index=47

Assignment



Can you give examples on how ethical and legal considerations in business analytics such as discrimination and bias, data integrity, lack of transparency, and data privacy can affect or has affected your profession?

2. Ethical Implications of Business Analytics

Do you have this feeling whenever you visit a website that you are being watched and everything you click, every word you type, every choice you made, is being recorded? Disclosure of customer data is prevalent in day-to-day business, especially in the internet via social media and searches, and most individuals are unaware that whenever you perform a search or post something in social media, you already leave a digital trace in the world wide web and these traces can be used to profile you without your consent (Ligot, 2018). You should know by now that this is true and possible through the use of technology. Our information are being collected and analyzed, each time we visit a website, click an ad, shop online, etc, and most people are not aware of it.

Data Privacy Law

We leave digital traces whenever we go online, even if we are not disclosing our identity. And these traces are used by marketing companies to collect and process data such as which websites we visit, which products we buy, which ads we watch, and so on. With the growing concern that people are losing their information from companies who collects data without their knowledge, has prompted many countries, including the Philippines, to pass data privacy laws. In the Philippines, the Data Privacy Act was made to protect people and bring back control of their own information.

As a business analytics practitioner, you need to know some of the general information about the data privacy act (Bañez, 2018).

- **Consent Required and the Right to be Informed**

Before you can collect and process one's information, you need to get his/her consent. The consent has to be recorded and informed, meaning the person has to understand the purpose which his/her data is being collected and processed. He or

she has the right to know how his/her data will be processed and whom data will be shared.

- **The Right to Access**

Not only does the person have the right to be informed, he/she also has the right to access the data that a company may have about him/her--not only the content but the sources of the information as well. You can go to the companies that maintain your information and ask them exactly what they keep. The right to information and the right to access can help address our earlier concerns about bias and transparency. With the information you can obtain, you can determine whether or not the information was processed fairly or if they use correct or updated information. Since you know the information that they have about you, you can determine whether or not that information is correct or updated.

- **The Right to Rectify**

You also have the right to rectify. If the information they have about you is inaccurate or outdated, under the data privacy act, you have the right to have it corrected. You have the right to complain if the company fails to rectify the data or if the company fails to respect your other rights, you may complain before the National Privacy Commission or you can go to courts.

- **The Right to Complain**

Once it is established that your rights are violated, the company which violated your rights can be made to pay a fine, and pay you directly, damages. In some cases, the company's officers may become criminally liable – they can go to jail. The company that processes your data will also have the responsibilities to make sure that your data is protected from unauthorized access. So, they can't just leave your data out there in the open – they have to take reasonable steps to make sure that your data is secure. This responsibility, along with the right to access and right to rectify your information, can help address our earlier concerns about integrity.

Activity 5-2

- **Watch** "*Ethical Issues*" by Atty. Emerson Bañez
https://www.youtube.com/watch?v=LRn6Nvd6Qgc&t=0s&list=PLIgeNUxu5x2HplGrEaxWMGIb_h9MVEo6I&index=47
- **Watch** "*Ethical Implications of Business Analytics*" by Dominic Ligot
https://www.youtube.com/watch?v=PhDHtc_8nm8&t=0s&list=PLIgeNUxu5x2HplGrEaxWMGIb_h9MVEo6I&index=65



Study Question

Do you think that people are more cautious with the use of information now that the Data Privacy Act is in place in the Philippines? Explain.

References

"Ethical Issues" by Atty. Banez

"Ethical Implications of Business Analytics" by Dominic Ligot

ASSESSMENT

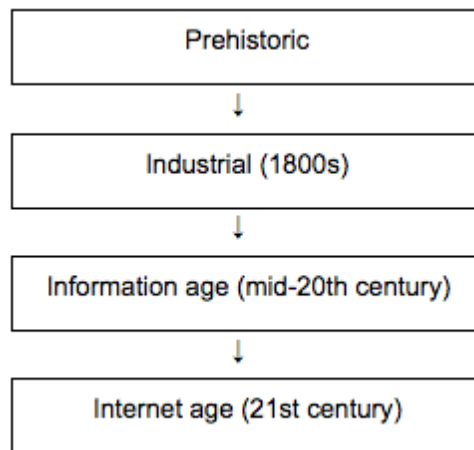
Module 1

Discussion Forum Questions:

1. After learning about the different definitions of BA and BI, can you now compare/differentiate BI and BA?
2. Galletto (2018) mentioned that "While Business Intelligence answers what happened, Business Analytics answers why it happened and whether it will happen again". What are your thoughts on this?
3. As an exercise, look in the web for examples of data service providers. List them down. What sorts of services do these big data providers sell to their clients?

Assignment:

Trace the evolution of business analytics by writing down the features of analytics (i.e., its application, tools used) as employed in the following eras:



ASSESSMENT Module 2

Discussion Forum Questions:

1. How does data become business value? Cite an example to illustrate your answer.
2. Compare and differentiate descriptive, predictive, and prescriptive analytics.

Type of analytics	Similarities	Differences
Descriptive		
Predictive		
Prescriptive		

Quiz:

1. In big data, variety is about how huge the data sets. (True or False) False:Volume
2. In big data veracity includes how many pieces of data we gather together from social media data, government data, financial data, banking data, all sorts of transactions all combined together to make one or more profiles for your customers. (True or False) False: Variety
3. In big data volume means that there is a lot of uncertainty, meaning, with all of these different data coming altogether but the problem is we don't know what to do with them. (True or False) False: Veracity
4. Refer to Module 1 Study Guide. According to Evans (2012), Business Analytics is the use of data, information technology, statistical analysis, quantitative methods, and mathematical or computer-based models to help managers gain improved insight about business operations and make better, fact-based decisions. (True or False) TRUE:
5. Refer to Module 1 Lecture Notes. According to Galleto (2018), 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. (True or False) TRUE
6. Business Intelligence is the process of collecting information from all sources to make data-driven decisions in an organization. (True or False) TRUE
7. Business Intelligence is the process of combining aspects of reporting, monitoring and alerting, dashboards, scorecards, and ad hoc query data exploration. (True or False) TRUE

8. The process of moving data from source systems into a data warehouse, and from a data warehouse into an analytical tool is often called ETL (Extract, Transform, or Load processes). TRUE
9. In the data extraction, there are at least 3 sources of data which are the source systems, raw transactions, and from documents and forms. (True or False) True
10. Predictive Analytics is the type of analytics where data is used to benchmark or to profile. (True or False) False Answer: Descriptive Analytics.
11. In business analytics, you need to follow a process turn data into value. (True or False) True
12. The process of turning raw data into business action is the framework for business analytics. (True or False) True
13. The first step to turning data into analytics is the data warehousing phase. False: Answer :extraction phase
14. Predictive analytics is used when you want to find relationships between two different types of data and making predictions about future data. (True or False) True
15. For the data to become business value, it has to be extracted from sources, curated and cleansed, and joined in a data warehouse. (True or False) True
16. Big data includes large volumes of structured and unstructured data that inundates a business on a day-to-day basis. (True or False)True
17. Prescriptive analytics is a way of providing recommendations and providing the decision-maker the costs and benefits of a decision. (True or False) True
18. Business intelligence is about combining aspects of reporting, data exploration, and ad hoc queries. (True or False) True
19. Veracity means that there are a lot of uncertainty, meaning, with all of these different data coming altogether but the problem is we don't know what to do with them. (True or False)True
20. In the data warehouse, the data is cleaned, curated, organized, and prepared for analysis. (True or False) True

ASSESSMENT Module 3

Discussion Forum Question:

Can you give an example of a database management system that you are familiar with or have recently used?

Assignment:

What do you think are the advantages of having a database management system in an organization? Explain.

ASSESSMENT

Module 4

Discussion Forum Questions:

1. Think of a problem affecting your organization or an organization you are familiar with. Think of a problem that you think can be addressed by looking at available data within the organization. Which of the three types of analytics should you use? How can the type(s) of analytics help the organization help solve the said problem?
2. Using an organization you are familiar with as an example, can you think of scenarios where the three types of analytics can be used in finance?
3. Using an organization you are familiar with as an example, can you think of scenarios where the three types of analytics can be used in human resources?
4. Using your current organization as an example, can you think of scenarios where the three types of analytics can be used in marketing (or promotion)?

Quiz: True or False

Part 1

1. In every database systems, the heart of each system is what you call the data. True
2. Data are facts or figures that we can store in a database. True.
3. Database is a collection of logically related data and it is typically visualize as tables; composed of cells matched with several columns and rows. True
4. In computer terms, database is a collection of data, not necessarily always stored in a computer, such as records stored in a filing cabinet, in a notebook. True
5. A DBMS is a collection of interrelated data using the software and hardware used to access the data in a useful manner such as database or set of databases stored in a disk or other media, a computer, or set of computers where the software to access the database can run. True
6. A DBMS is a software package or software that allows you to store, retrieve, package your database. True
7. The DBMS can provide a convenient and efficient interface for storing, retrieving, and updating data, and for extracting useful information from the database, and a clear and logical view of the process that manipulates the data. True
8. DBMS maintains the segregation between the program and the data. Trues
9. Data Independence refers to a process to ensure that data is updated correctly and appropriately when more than one person is accessing the data. False. Concurrency Control.
10. Utility Services refers to mechanisms for recovery of data that is apparently lost due to system crashes. False. Recovery Service.
11. Recovery Service is the initialization and maintenance operations on a database. False. Utility Services

12. Manipulation of data tells us that we can CRUD (create, retrieve, update, and delete) our data within the DBMS. True
13. Metadata describes another data in terms of its constraints, size, and the data type of the tables or the databases that are contained within your DBMS. True.
14. Data sharing allows the user to perform different types of operations such as string manipulation, date operations and so on. You can also manipulate the data based on an event or what they call 'triggers' which is based on the event or the conditions of the event. False. Data Processing
15. Data Processing means that within a database, privileges are provided to different types of users. Different types of users can access the same database but the same users can have different privileges. False. Data sharing.
16. The users of a database system are the database administrator, system developer, and end user. True
17. Database application is a computer program that allows users to manipulate the data in a DBMS through a user-friendly interface. True
18. The databases store all its data in one location, thereby limiting data duplication. True.
19. Database is the space in the disk or computer where the data are actually stored. True
20. Database application can be divided into four broad categories: Personal which is restricted to a single user; Departmental which is referenced by hundreds of users over a shared system or network; Enterprise which extensions of departmental applications involving thousands of users; and the Internet which is the largest form of information sharing where billions of users are involved. True
21. The parser is responsible for interacting with the user. It is also called the "middleman" as it communicates between two different parties: the end user, which is you, and the database management systems. False. Interface
22. Interface is responsible for checking the correctness of the syntax that was provided by the end user through the interface. So it also checks the tables and other objects in the query. False. Parser
23. The query optimizer comes from the root word 'optimize', which means it simplifies the query form or the input into a simpler type of input that can be digested and can be understood by the database management system. This allows the DBMS to save time and save space when performing operations. True
24. The main responsibility of engine is to execute the output of the query optimizer. Once the query has been optimized, then it will pass the data or the optimized query to the execution engine whose sole purpose is to execute the command. True
25. Storage is the physical location of your database, which can be the secondary or the primary memory. True
26. Descriptive analytics is used to benchmark and to profile to be able to establish historical trends. True
27. Understanding how the traffic is today or how bad the traffic is in a certain location is an example of a descriptive analytics. True
28. Once we know the relationships inside the data, we can make predictions and forecasts by feeding new data into the predictive model. True.

29. Descriptive analytics involves providing advice on what actions can be taken given the predictions about the future and what drives the future. False. Prescriptive Analytics
30. Prescriptive analytics in marketing can be seen through the recommendation engines which are found to be successful in driving more sales. True.

ASSESSMENT Module 5

Discussion Forum Question:

Do you think that people are more cautious with the use of information now that the Data Privacy Act is in place in the Philippines? Explain.

Assignment:

Can you give examples on how ethical and legal considerations in business analytics such as discrimination and bias, data integrity, lack of transparency, and data privacy can affect or has affected your profession?

FINAL ASSESSMENT

PART 1. TRUE OR FALSE

1. In big data, variety is about how huge the data sets. False:Volume
2. In big data veracity includes how many pieces of data we gather together from social media data, government data, financial data, banking data, all sorts of transactions all combined together to make one or more profiles for your customers. False: Variety
3. In big data volume means that there is a lot of uncertainty, meaning, with all of these different data coming altogether but the problem is we don't know what to do with them. False: Veracity
4. Refer to Module 1 Study Guide. According to Evans (2012), business Analytics is the use of data, information technology, statistical analysis, quantitative methods, and mathematical or computer-based models to help managers gain improved insight about business operations and make better, fact-based decisions. (True or False) TRUE:
5. Refer to Module 1 Lecture Notes. According to Galleto (2018), 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. (True or False) TRUE
6. Business Intelligence is the process of collecting information from all sources to make data-driven decisions in an organization. (True or False) TRUE
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18. Business intelligence is about combining aspects of reporting, data exploration, and ad hoc queries. True
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49. Descriptive analytics involves providing advice on what actions can be taken given the predictions about the future and what drives the future. False. Prescriptive Analytics
50. In marketing, prescriptive analytics can be seen through the recommendation engines which are found to be successful in driving more sales. True