DATA VISUALIZATION, DASHBOARDS & STORYTELLING

Bachelor in Data and Business Analytics BDBA SEP-2023
DVDSN-DBA.3.M.A

Area Information Systems and Technology
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Degree course: THIRD
Number of credits: 3.0
Semester: 2º
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Professor: **IVÁN MAURICIO DÍAZ LEIVA**

E-mail: idiazl@faculty.ie.edu

IVÁN MAURICIO DÍAZ LEIVA

Ivan Diaz, Senior Analytics Manager at Kearney Analytics since May 2022, has 14 years of international experience in product & project management tohether with strategy consulting at prominent firms such as Kearney, BCG, Bain & Co, and Deloitte S&O. At Kearney he is the lead for the Data & Analytics transformation hub, and during his tenure at BCG GAMMA, Ivan served as the Head of the Iberia node, supervising 18 analysts across various disciplines, including Data Engineering, Data Science, Geo-Analytics, and Software Development. He holds an MSc in Business Analytics and Big Data from IE Business School (Dean's list) and an MBA (Cum Laude) from Stellenbosch Business School, along with certifications in PRINCE 2, Scrum Master, and Product Owner.

Since November 2018, Ivan has been sharing his expertise as an instructor for Data Visualization, Communication & Storytelling with Data courses at IE University's Master's in Business Analytics and Big Data, Bachelor's in Business Analytics and Big Data, and the ieXL BootCamp. His teaching has been consistently been recognized with academic awards for all three cohorts. He has developed and delivered the following courses:

- DATA VISUALIZATION, DASHBOARDS & STORYTELLING
- COMMUNICATION & STORYTELLING
- DEV-MLOPS
- ML FOR HEALTHCARE

Few selected software development projects:

- RetailDevelopment and deployment of a cross country, harmonized software solution, for Trade Terms & Promo performance improvement (Azure, Databricks, Delta Lake, Power BI)
- Oil & Gas (Retail)Software development and deployment of a Personalization Engine for fuel and convenience store retailers. Managing a cross-regional team of 6 Developers, including DevOps, Back & Front Ends, and Data Science and Engineering Modules (AWS, Spark,

Docker, Django, React)

- InfrastructureDevelopment and deployment of a data-intensive platform for Project Planning optimization and prediction of large infrastructure project deviation for a large multinational construction firm (AWS, Spark, Django, React)
- PharmaDeveloped of a SaaS Control Tower solution, for the coordination and planning of Pharmaceutical studies across Europe (AWS, Postgres, Python, Tableau)

Office Hours

Office hours will be on request. Please contact at:

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Teams channels have been set up for this purpose idiazl@faculty.ie.edu

SUBJECT DESCRIPTION

At its most fundamental level, we think of Data visualization as the means to present raw data through graphical representations to allow our audience to explore the data and uncover insights.

However, effective Data Visualization is far more than this, as it demands from us, as practitioners, to carefully craft these visualizations into engaging and persuasive narratives. Narratives that successfully capture our audience from both their emotional and rational perspectives. Only through this holistic approach, we can truly influence and inspire our stakeholders, pushing beyond mere visualizations to impactful stories.

As we will see, the connection between data visualization and storytelling is as important through the preliminary stages of our data exploration (EDA), as it is during the standard interactions of the data practitioner with the rest of the organization and clients. As data practitioners, we are not only expected to report our findings, but we are responsible for driving change and captivating others to act on such findings. Succeeding at this requires you to have a persuasive and robust story, supported by compelling and reliable data.

In this context, this course will introduce students to the fundamental concepts, applications, and best practices for the development and delivery of impactful data visualization and dashboards. If you want to lead this change, harness the power of data visualization and storytelling, buckle up and enjoy the ride!

Caveat emptor: Faithfully adhering to the agile spirit, this syllabus will be modified and adapted to the specific requirements, needs, and pace of the class. Lead this journey, provide feedback, and let's get the most out of this experience together!

LEARNING OBJECTIVES

During this course, you will be exposed to methods used by top business consulting firms to craft, communicate, and drive change through facts (from data). Between others you will be able to:

1. Understand the importance of storytelling through Data Visualization
2. Practice structured critical thinking, and practice haing a hypothesis-driven approach to Data Exploration
3. Unearth and validate insights by applying analytical thinking and programmatic techniques

4. Apply concepts to a use case of your choice to create an impactful storyline
5. Enhance your data visualization toolkit, know when to use them, and get inspired!

TEACHING METHODOLOGY

IE University teaching method is defined by its collaborative, active, and applied nature. Students actively participate in the whole process to build their knowledge and sharpen their skills. Professor's main role is to lead and guide students to achieve the learning objectives of the course. This is done by engaging in a diverse range of teaching techniques and different types of learning activities such as the following:

Learning Activity	Weighting	Estimated time a student should dedicate to prepare for and participate in
Lectures	13.33 %	10.0 hours
Discussions	13.33 %	10.0 hours
Exercises in class, Asynchronous sessions, Field Work	33.33 %	25.0 hours
Group work	20.0 %	15.0 hours
Individual studying	20.0 %	15.0 hours
TOTAL	100.0 %	75.0 hours

PROGRAM

CONTENT

The course aims at providing students with the required skills to **1.** Extract actionable insights from data; **2.** Craft effective visualizations, dashboards, or applications, and **3.** Efeffectively and persuasively deliver the message to a wide variety of stakeholders. To achieve this, the course kicks off by providing a brief introduction to the tools used in the course, followed by an in-depth introduction to the fundamentals of data visualization and advanced visualization techniques, to finally bring everything together by discussing the best practices for effective Storytelling.

Disclaimer: The following description of the material covered is tentative. An attempt will be made to cover all listed topics. However, the pace of the classes will depend on the group's performance and progress.

SESSION 1 (LIVE IN-PERSON)

Introduction to the course, and mutual alignment on expectations

During this session, we will review the syllabus and what we are going to be covering during the next 15 sessions. We will ground expectations regarding the approach of this course, and we will see how the different assignments will take place. As it is a practical hands-on-driven course, recommendations and tips will be given regarding the group project and individual assignments.

- The Agile approach to the course (...and life)
- The Elevator Pitch (Memorable visualizations)
- Why a course on Data Visualization? (Information Design vs. Data Visualization)
- Intro to the whole course structure: Situation, Problem, Solution and Impact

- Main objectives and first Demoof the Tool!
- Q&A

SESSION 2 (LIVE IN-PERSON)

Visualizations, Dashboards, and Storylining with Power BI

During these two sessions, we will understand the use of the Power BI ecosystem, together with its use to provide business intelligence to different organizations. Students will also be provided with the instructions and fundamental concepts for their first individual Assignment.

- Why are Power BI and Python the preferred tools for this course?
- Power BI market positioning and employability
- Power BI (PBI) ecosystem
    - PBI Desktop
    - PBI Service
    - PBI Apps
- Setting everything up (Desktop, Service and Virtual Machines)

- **First Individual Assignment Instructions**
    - Overall f/ work WHY, WHAT, WHO and HOW
    - What's your key message (Problem/ Question and potential Solution)
    - MECE Logical Tree (Mutually Exclusive, Collectively Exhaustive)
    - So What?
- Q&A

Videos:

Multimedia Material: Pyramid Principle® Explained (Youtube)

Multimedia Material: Storytelling & Presenting 1: Thank You, Barbara Minto (Vimeo)

Multimedia Material: Storytelling & Presenting 2: Thank You, Robert McKee (Vimeo)

SESSION 3 (LIVE IN-PERSON)

In depth - Critical and Analytical thinking (SO WHAT?)

After introducing our overall Storytelling f/ work, we'll have a deeper dive into one of the pillars of our Storytelling framework. We will ask WHAT is the message we want to convey, and WHAT impact may it have on our stakeholder’s business or life. We’ll also ask one of the most important questions we should always ask after finishing any Visualization:

- Overall f/ work: **WHAT**, HOW, WHY and WHO
- “SO WHAT!?”
    - ... is your key message?
    - ... is the key question?
    - ... do stakeholders need to know?
    - ... do stakeholders takeaway?
- To answer this question, we will also examine two of the most useful and fundamental structures in business storytelling the "SPAI" framework:
    - Situation
    - Problem

- Answer
- Impact

Students will also take a deeper dive into the MECE thinking tool, which does no only help them structuring their thinking and communicate their ideas better, but would also improve their problem-solving skills, the MECE framework (Pyramid Principle, or hypothesis tree). Used by scientists, engineers, and consultants alike.

The MECEness of a good framework:

Mutually
Exclusive
Collectively
Exhaustive

Articles:

Article: Data visualization mistakes — and how to avoid them (Financial Times, NOVEMBER 28 2017) (ced)

Article: Mistakes, we've drawn a few (Medium.Economist.com, Mar 27, 2019)

SESSION 4 (LIVE IN-PERSON)

Core Principles of Data Visualization (I)

We think of Data visualization as the means to present raw data through graphical representations to allow our audience to explore the data and uncover insights. However, effective Data Visualization is far more than this, as it demands from us to carefully craft those visualizations into an engaging narrative, one that successfully captures our audience from both emotional and rational perspectives. Only through this holistic approach we can truly influence, convince, and inspire others. This is where data visualization provides its full value, pushing away from mere visualizations to impactful stories.

- Overall f/ work: WHAT, **HOW**, WHY and WHO
- The fundamentals of data visualization best practices, creating an insightful data visualization
- Market Place, Advanced visualizations and interactions
- Choosing the right visualizations
    - Comparison
        - Compare a measure across dimension(s).
    - Composition
        - Show the different parts that make up the whole.
    - Distribution
        - Show range in your data – the normal tendency and outliers
    - Relationships
        - Show the ways values are connected and correlated to each other often across multiple dimensions of measures

Videos:

Other / Complementary Documentation: From Data to Viz

Other / Complementary Documentation: The Data Visualisation Catalogue

Other / Complementary Documentation: Data Viz Project

SESSION 5 (LIVE IN-PERSON)

Core Principles of Data Visualization (II)

We think of Data visualization as the means to present raw data through graphical representations to allow our audience to explore the data and uncover insights. However, effective Data Visualization is far more than this, as it demands from us to carefully craft those visualizations into an engaging narrative, one that successfully captures our audience from both emotional and rational perspectives. Only through this holistic approach we can truly influence, convince, and inspire others. This is where data visualization provides its full value, pushing away from mere visualizations to impactful stories.

- Overall f/ work: WHAT, **HOW**, WHY and WHO
- The fundamentals of data visualization best practices, creating an insightful data visualization
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    - Relationships
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Videos:

Other / Complementary Documentation: From Data to Viz

Other / Complementary Documentation: The Data Visualisation Catalogue

Other / Complementary Documentation: Data Viz Project

SESSION 6 (LIVE IN-PERSON)

Key Analytical charts (Power BI & Python) (I)

In these two sessions, students will be introduced to Statistically driven charts for Data Visualization, as well as AI & Analytical features of Power BI. Interaction and guidelines for more advanced charts will be showcased making use of Python's Seaborn Library

- Overall f/ work: WHAT, **HOW**, WHY and WHO
- Histograms
- Boxplot
- Timeseries forecasting
- Scatterplots
- Influencers
- Decomposition Trees

Book Chapters: OpenIntro Statistics; chapter 2: Summarizing Data

SESSION 7 (LIVE IN-PERSON)

Key Analytical charts (Power BI & Python) (II)

In these two sessions, students will be introduced to Statistically driven charts for Data Visualization, as well as AI & Analytical features of Power BI. Interaction and guidelines for more advanced charts will be showcased making use of Python's Seaborn Library

- Overall f/ work: WHAT, **HOW**, WHY and WHO

- Histograms
- Boxplot
- Timeseries forecasting
- Scatterplots
- Influencers
- Decomposition Trees

Book Chapters: OpenIntro Statistics; chapter 2: Summarizing Data

SESSION 8 (LIVE IN-PERSON)

Dashboards Reporting

During the upcoming sessions, we will understand the use of Power BI to provide intelligence to the business, based on data generated during their day-to-day operations, and how this reporting tool is used within organizations to set KPIs and have close to real-time intelligence.

- Overall f/ work: WHAT, **HOW**, WHY and WHO
- ?Effectively presentting your findings
    - Use appropriate visual cues
    - Leverage key visualization concepts
    - ?Visualize variables with the end-user in mind
    - Add reference lines, trend lines, and banding to strengthen your message
    - ?Use both color and shape attributes to add dimensionality
    - Common mistakes and how to avoid them
- What is an effective Dashboard?
    - 3 types of dashboards with distinct purposesStrategic
        - Operational
        - Analytical
    - Best practices and mistakes to avoid

- **First Group Assignment Instructions**
- Dashboard
    - Strategic
    - Analytical
    - Opertational
- Q&A

Multimedia Material: Power BI visualization best practices by Marco Russo (Youtube)

Article: The Most Effective Power BI Dashboard Tips and Tricks (Zebra Bi, March 30, 2022)

Article: Tips for designing a great Power BI dashboard (Microsoft Ignite, 03/25/2022)

Multimedia Material: How to declutter data visualizations (5 steps) (Youtube)

SESSION 9 (LIVE IN-PERSON)

Advanced Power BI - introduction to DAX (I)

We now introduce Data Analysis Expressions (DAX) and provide a view of the foundational skills required to enhance data models with calculations.

- Overall f/ work: WHAT, **HOW**, WHY and WHO

- Modeling your data in Power BI/ Data Schemas adn relationships
- Intro to data preparation in Power BI Desktop (PBI)
- DAX and M Language overview
- Calculated Column vs Calculated Measures
- Functions types and commonly used functions
- Simple vs Iterative functions
- Variables and Parameters

Multimedia Material: Making DAX Easy (Youtube)

Multimedia Material: Write Your First CUSTOM M FUNCTION in Power BI (Youtube)

SESSION 10 (LIVE IN-PERSON)

Advanced Power BI - introduction to DAX (II)

We continue with further exercises on Data Analysis Expressions (DAX) and the foundational skills required to enhance data models with calculations.

- Overall f/ work: WHAT, **HOW**, WHY and WHO
- Modeling your data in Power BI/ Data Schemas adn relationships
- Intro to data preparation in Power BI Desktop (PBI)
- DAX and M Language overview
- Calculated Column vs Calculated Measures
- Functions types and commonly used functions
- Simple vs Iterative functions
- Variables and Parameters

Multimedia Material: Making DAX Easy (Youtube)

Multimedia Material: Write Your First CUSTOM M FUNCTION in Power BI (Youtube)

SESSION 11 (LIVE IN-PERSON)

Storytelling with Power BI Desktop and Services

In this session, students will be exposed to Power BI Desktop and Service features which render the conventional Dashboard/ BI Tool into a fully comprehensive Storytelling medium, enabling the user to convert traditional Dashboards into full e2e presentations (i.e. PowerPoint) or Web applications

- Overall f/ work: WHAT, **HOW**, WHY and WHO
- Dashboards vs Reports vs Apps
- Design report navigation and layout
- Filters and Slicers and interactions
- Tooltips and drill through
- Buttons, bookmarks, and selection
- Use advanced interactions
- Configure conditional formatting
- Apply slicing, filtering, and sorting
- Publish and export reports

SESSION 12 (LIVE IN-PERSON)

Fundamentals of storytelling: WHY

In this session, students will hone their understanding and practice of the fundamental principles behind effective Storytelling. We will also explore the three remaining pillars of our Storytelling framework, The Why, The Who & The How.

- Overall f/ work: WHAT, HOW, **WHY** and WHO
- 200 Countries, 200 years, in four minutes: Joy of Stats
    - Comunicating Analytics - 8 Key Principles
- We will now ask WHY is it important for our stakeholders to listen to what we have to say, and most importantly WHY are we crafting a story, to begin with?
- Start with Why - Simon Sinek

  ... to gain Alignment?

  ... to Inspire or motivate?

  ... to Call for an action?

SESSION 13 (LIVE IN-PERSON)

The fundamentals of storytelling: WHO & HOW

We will now focus our attention on the most important module of the entire Storytelling framework, our audience! We put ourselves in their shoes and ask "So… What's in it for me??"

- Overall f/ work: WHAT, HOW, WHY and **WHO**
- **WHO**
    - ... is your audience?
    - What is their perspective?
    - What are their needs?
-

SESSION 14 (LIVE IN-PERSON)

Wrapping up and bullet proffing the presentation

This session would be used as a rehearsal of the potential questions that the clients can ask them during their final presentation, adapting the message, pose, action plan and different dashboards, visualizations and stories for the final project.

- **Final Group Assignment Instructions**
    - Putting everything together
    - Delivering the message
    - Overall Storyline
    - Situation, Problem, Solution and Impact
    - Dashbaord Handover
- Q&A

Multimedia Material: What's in a Data Story? Understanding the Basics of Data Storytelling (Youtube)

SESSION 15 (LIVE IN-PERSON)

Data Visualization and storytelling group final presentation

Students will present their group projects during the final session. There are two components to the final presentation:

1. The live presentation in class (10')
2. The material you deliver/ handover together with it (ppts, pbix, ipynb, etc.)

Expectations and guidelines:

1. Present an End-to-End keynote of the analysis you made for the dataset/ problem you have chosen (The presentation shuld be done using Power BI Desktop, or Power BI Service)
2. The key criteria is your ability to put everything together:
    - Good overall storyline e.g. Context/ Situation; Problem and how you framed it (MECE) into a Solution (Data-driven and supported statements/ arguments); Impact (Data-driven/ measurable potential outcomes); Next steps [Optional]
    - Purpose-driven data visualizations (So what!?) to support, illustrate, communicate and influence your audience (Right visualizations for the right type of problem)
    - Clear So What/ insights titles! Go beyond the description and provide insights/ Conclusions or recommendations!
    - Good Identification of a few key relevant questions (Problem) and the respective attempt to answer them (Solution)
    - Adherence to the "6 design principles"
    - "Zero-defect" slides/ pages – Silly errors, text size, sources, etc.
3. Preferably explore and go beyond conventional plots where appropriate (explore plots beyond bar & pie charts)
4. Enjoy and have fun!

- Kahneman, Daniel. Thinking, Fast and Slow. New York Farrar, Straus & Giroux Inc, 2013.
- Bergstrom, Carl T. Calling Bullshit. Random House, 2020.
- John Allen Paulos. A Mathematician Reads the Newspaper. New York, Anchor Books, 1996.
- Nassim Nicholas Taleb. Fooled by Randomness?: The Hidden Role of Chance in Life and in the Markets. New York, Random House, 2016.
- Nate Silver. The Signal and the Noise?: Why Most Predictions Fail but Some Don't. New York, Penguin Press, 2012.
- Conn, Charles, and Robert Mclean. Bulletproof Problem Solving. Hoboken, New Jersey, John Wiley & Sons, Inc, 2019.
- Minto, Barbara. The Minto Pyramid Principle?: Logic in Writing, Thinking, and Problem Solving. London, Minto International, 2012.
- Koch, Richard. The 80/20 Principle?: The Secret of Achieving More with Less. New York, Currency, 2018.
- Mccloskey, Deirdre N. Economical Writing. Prospect Heights, Illinois, Waveland Press, 2000.
- Mccandless, David. Information Is Beautiful. London, Collins, 2009.
- Cole Nussbaumer Knaflic. Storytelling with Data?: A Data Visualization Guide for Business Professionals. Hoboken, New Jersey, Wiley, 2015.
- Yau, Nathan. Visualize This. Chichester, John Wiley And Sons, 2011.
- Ellenberg, Jordan. How Not to Be Wrong?: The Power of Mathematical Thinking. New York, The Penguin Press, 2014.
- Provost, Foster, and Tom Fawcett. Data Science for Business?: What You Need to Know

Aboout Data Mining an Data-Anal. Beijing Etc., O'reilly, 2013.
- Levitt, Steven D, and Stephen J Dubner. Freakonomics a Rogue Economist Explores the Hidden Side of Everything. New York, Ny Morrow, 2006.
- Rudder, Christian. Dataclysm?: Who We Are When We Think No One's Looking. New York, Crown Publishers, 2014.
- Haidt, Jonathan. The Righteous Mind?: Why Good People Are Divided by Politics and Religion. New York, Pantheon Books, 2012.
- O'neil, Cathy. WEAPONS OF MATH DESTRUCTION?: How Big Data Increases Inequality and Threatens Democracy. Crown, 2017.

OTHER MATERIALS

EVALUATION CRITERIA

Your final grade in the course will be based on both individual and group work of different characteristics that will be weighted in the following way:

criteria	percentage	Learning Objectives	Comments
Individual work	35 %		
Class Participation	15 %		
Workgroups	30 %		
Group Presentation	20 %		

RE-SIT / RE-TAKE POLICY

Class participation and discussion

Class participation will be evaluated based on the following criteria:

- Quality (not quantity) of your participation in class discussion: The most important dimension of participation concerns what it is that you are saying. A high quality comment reveals depth of insight, rigorous use of case evidence, consistency of argument, and realism. Frequency refers to the attainment of a threshold quantity of contributions that is sufficient for making a reliable assessment of comment quality. The logic is simple: if contributions are too few, one cannot reliably assess the quality of your remarks. However, once threshold quantity has been achieved, simply increasing the number of times you talk does not automatically improve your evaluation. Beyond the threshold, it is the quality of your comments that must improve. In particular, one must be especially careful that in claiming more than a fair share of "airtime", quality is not sacrificed for quantity. Finally, your attempts at participation should not be such that the instructor has to "go looking for you". You should be attempting to get into the debate on a regular basis.

You might want to avoid being classified as one of the following types of students:

· Repeaters, i.e., students that, consciously or unconsciously, make comments that are really just repeats/rephrasing of what has already been said (by other students, or you). This wastes time and adds nothing to learning.

· Ramblers, i.e., students that take a lot of time to say simple things or they may tell long personal/professional stories, or they roam into topics that are not relevant, or simply make low-quality comments just to participate. They waste valuable time and prevent other students from being able to participate.

· Students that have been distracted (by Facebook, etc.) or who have stopped paying attention and then, later on, when they realized they have missed a term or concept, they ask you about it.

Group Presentation

The group project is an integral part of this course. It consists on working closely with a "client" on identifying a real-world problem, the formulation of appropriate hypotheses, the collection and vidsualization of data, and the presentation and interpretation of obtained results. At the end of the semester, you must submit your group presentation and full report including all the steps the group went through to arrive to the final conclusion as well as the main challenges faced when meeting the client. Further instructions on the presentation will be given by the professor.

The group presentation will also take into consideration the quality of the questions and interactions that will be evaluated by the professor and the client and the final presentation delivered by the groups.

Individual Submissions

When especified in advance, certain asynchronous sessions will contain individual assignments. These assignments will be specified well in advance so that students can work on them and must be submitted by the end of the corresponding asynchronous session.

In order to pass the course, you need a minimum grade of 3.5 in the final grade.

BEHAVIOR RULES

Please, check the University's Code of Conduct here. The Program Director may provide further indications.

ATTENDANCE POLICY

Please, check the University's Attendance Policy here. The Program Director may provide further indications.

ETHICAL POLICY

Please, check the University's Ethics Code here. The Program Director may provide further indications.