Business Analytics for Operations and Marketing

2020-2021 Academic Year
Master of Research in Economics, Finance and Management

1. Description of the subject

- Business Analytics for Operations and Marketing
- Code: 32579
- Total credits: 6 ECTS   Workload: 150 hours
-                                 Term: 2
- Type of subject: Optative
- Department of Economics and Business
- Teaching team: Helena Ramalhinho, Daniel Serra, Jesica de Armas, Alberto Santini, Antonio Ladrón, Mohammad Ghaderi, Anna Torres

2. Teaching guide

⚙ Introduction

Business Analytics is the discipline of applying data-driven analytical models and methods to help making better decisions in business and organizations in general. Business Analytics focuses on transforming data into insights with the objective of improving the business and organizations performance. Business Analytics is a scientific discipline that applies data-driven Analytical and Mathematical Models and Algorithms from Statistics, Artificial Intelligence, Operations Research and Computer Science to help making better decisions.

The course focuses on the application of the Business Analytics methodologies to different areas such as Transportation, Retailing, Operations, Marketing, etc., considered always from a Multidisciplinary and Research Perspective. This multidisciplinary approach provides a key factor to obtain excellent results and make an impact on the business. The objective of the course is to introduce the students on the state-of-the-art research topics in this field.

The course can be taken by MSc students. The students must have basic background on Algebra, Statistics and Probability concepts.

⚙ Teaching methodology

Each professor will present the background and current research in each topic.
The course is made of 5 different topics taught by different professors. Each professor will select some papers related to the research they will discuss – and possibly some background readings that will help you understand where the papers fit in the current state of knowledge. The structure of the course will be as follows: intro to Operations and Marketing; Research topics in Operations; Research topics in Marketing; Research topics combining Operations and Marketing; Presentation of the short project.

⚙ Contents

Topics in BA for Operations

Combinatorial Optimization and Metaheuristics (Helena Ramalhinho)
The topics focus an introduction to Combinatorial Optimization models as Network Design, Routing, Location and Scheduling. Afterwards, the solution methods based on metaheuristics are introduced to solve large-scale complex business problems. Some real applications of these problems in different areas as Operations Management, Healthcare, Marketing, Logistics, Supply Chain Management, etc., will be also presented. Finally, it will be discussed several real applications of metaheuristics to solve combinatorial optimization in different businesses as for example Seat, Inditex (Zara), CatLab, Area de Guissona, etc.

Location Models and Optimization (Daniel Serra)

Location models are concerned with the placement of facilities and the allocation of customer demands to the selected facilities. Location models arise in both public and private sectors. Public services such as hospitals, ambulance bases, schools, fire stations, or sanitary landfills must to be located. Private companies must locate their production plants, distribution centers, warehouses, retail stores or service centers. Location models belong to the core activity in strategic logistic planning and the design of production-distribution networks. The lectures will focus on the presentation of classical location models (median, center and covering models), their application in real contexts and some solution methods. Particularly, it will be shown how to use optimization methods, like linear and (mixed) integer programming, for solving different types of location models.

Multi-objective optimization (Jesica de Armas)
Multiobjective optimization is an area of multiple criteria decision making that is concerned with mathematical optimization problems involving more than one objective function to be optimized simultaneously. Multi-objective optimization has been applied in many fields of science, including engineering, economics and logistics where optimal decisions need to be taken in the presence of trade-offs between two or more conflicting objectives. Minimizing cost while maximizing comfort while buying a car or maximizing performance whilst minimizing fuel consumption and emission of pollutants of a vehicle are examples of multi-objective optimization problems involving two and three objectives, respectively. In practical problems, there can be more than three objectives.

Matching and Assignment Problems (Alberto Santini)
Finding the perfect roommate, marrying the right person, being admitted to the best university, hiring the most suitable candidate. What do all these problems have in common? We will find out during our lectures on assignment and matching. After a brief introduction to these problems from a game theoretical point-of-view, we tackle them with tools from operational research and show some algorithms to solve them optimally. We focus on applications as varied as telecommunications, radiotherapy, and kidney transplants. With these lectures, I aim at presenting an example of how problems arising in micro- and macro-economics can be approached with optimization tools.

Topics in BA for Marketing

Modeling Diffusion of Innovations (Antonio Ladrón de Guevara)
Diffusion models have been used traditionally in marketing for capturing the lifecycle dynamics of a new product and forecasting its demand. The first diffusion model used in marketing (Bass, 1969) assumes the probability of a purchase by a new adopter as a linear function of the number of prior users. Since then, the models have become increasingly complex, in the attempt to capture the heterogeneity of the diffusion processes. Extensions of the Bass model include considering aspect like the impact of marketing variables in the diffusion process, cross-country and cross-product interactions, network effects, or repeat purchasing of frequent-consumption items, among others.

Branding (Anna Torres)

One of the most important intangible assets of the firm according to both marketing and finance experts is Brand Equity. In this course we will analyse the customer-based brand equity dimensions; the methodologies used to measure brand equity dimensions, as well as recent firm strategies used to increase such value. From the customer perspective, we will study the brand elements, like logos, as well as their impact on the brand equity dimensions.

Choice Analytics (Mohammad Ghaderi)
The focus of this topic is primarily on models used to describe and predict consumer choice. The discussion will cover fundamental theoretical concepts and representative classical models of consumer choice, as well as recent methodological advancements in this domain. The discussion will be extended to the family of choice-based conjoint analysis and its use for market simulation, segmentation, and product positioning.

Assessment and Grading System

The students will be required to do two activities:
- Short project: Select a research article on one of the above topics (and so, the professor associated that can help you). Prepare a summary making emphasis on the potential extensions and future research of the topic of that specific article, and you must present it in the last week of classes. This activity must be done individual and the report should have at most 5 pages.
- Group project: Select a research topic that combines Operations and Marketing, it should be an original idea but combining both areas. Prepare a research proposal on your topic. Notice that it is only required a research proposal, not a full research article. This activity can be done in groups of two students. Recommendations on how to write research proposals will be given during the classes.