Data Analytics for Managers

(MNGT-E2014, 6 ECTS)

SYLLABUS

October 25th 2022

Instructors' contact information	Course information
Responsible teacher: Assistant Professor Iiris Saittakari E-mail: iiris.saittakari@aalto.fi Office: BIZ building, Management Studies Office Hours: upon agreement Module 2: Doctoral Researcher Lauri Neuvonen E-mail: lauri.neuvonen@aalto.fi Office: BIZ building, Management Science Office Hours: upon agreement Teaching assistant: Doctoral Researcher Yian Chen E-mail: yian.chen@aalto.fi	Status of the course: Mandatory course in Degree Programmes in Global Management; People Management and Organizational Development. Elective in Degree Programmes in CEMS, Strategic Management in a Changing Academic Year, Period: 2022-2023, Period II Location: V002 SAASTAMOISEN SÄÄTIÖ and Zoom Language of Instruction: English Course Website: https://mycourses.aalto.fi/course/view.php?id=37094

1. OVERVIEW

The course consists of two modules: 1) Principles of planning and leading with data; and 2) Decision making based on optimization and modelling.

The first module introduces the key issues associated with collecting, interpreting, and making conclusions based on data. Legal and ethical issues associated with different types of data are also emphasized. On this hands-on course, the students will analyze data related to real-life business decisions and make recommendations based on them. The analyses are conducted with selected software. The students will also visualize their findings and make recommendations based on them in a crisp and concise way.

The second module focuses on decision making based on mathematical optimization and modelling. Various business problems where models bring added value are discussed. The students will build and solve basic optimization models, as well as interpretate the results. Other software are discussed to provide an understanding of alternative options and opportunities.

2. PREREQUISITES

No formal prerequisites. The students must have MS Excel and PowerPoint installed on their computer before the course starts. Aalto University students and employees are provided, free of charge, with Microsoft Office 365 programs (e.g., Word, Excel and PowerPoint): Microsoft Office 365 Services | Aalto University

For the second module, you need to have the Solver Add-In installed in MS Excel.

Students are admitted to the course in the following priority order: 1) Global Management / People Management and Organizational Development students, 2) CEMS / Strategic Management in a Changing World students, 3) other students

3. LEARNING OUTCOMES

Upon successful completion of this course, the student is able to:

- Understand the basic principles of planning and leading with data, including critical evaluation of the source and context of the data
- Understand the legal and ethical issues associated with collecting, storing and handling data
- Apply data analysis to business problems, including 1) combining data from multiple sources, 2) conducting analysis by using relevant software, 3) visualizing the findings and 4) making recommendations based on them
- Build and interpret the results of basic optimization models that are commonly used to support decision making (Module 2 only)

4. ASSESSMENT AND GRADING

The course assessment will be based on the following components:

Module 1: Principles of data analytics

Reflection papers (20%):
1. Different types of data and tools (10%)
2. Legal and ethical issues associated with collecting, storing and handling data (10%)

Data analysis assignments (30%)
1. Assessing the data at hand; Creating a database (10%)
2. Describing and summarizing data; Conducting analysis (10%)
3. Visualizing the findings and formulating recommendations (10%)

Module 2: Optimization & modelling

Optimization assignments (50%)
1. Building and solving mathematical optimization based on Linear Programming (35%)
2. Interpreting the models and making recommendations (15%)

Course feedback (2 bonus points)

All assignments are to be conducted individually. Final grade (0 to 5) is based on the points below:

0-49 points = 0
50-59 points = 1
60-69 points = 2
70-79 points = 3
80-89 points = 4
90-100 points = 5

All assignments must be submitted an in order to get a final grade for the course. General feedback is given during the lectures and/or on MyCourses following the submissions. Specific feedback will be given personally for students upon request.

To get credit for the course, 70% of the Monday lectures must be attended (4/6). Workshops on Fridays are optional.

Note that turning in class assignments is considered acknowledgement of guidelines on scholastic honesty and academic integrity (see section 9).

5. ASSIGNMENTS

This course consists of individual assignments. A detailed description of the assignments will be given in the lectures.

Module 1: Principles of data analytics

Reflection papers (2x10%)
These assignments help you to reflect on the knowledge accumulated from the readings and lectures. The purpose of the reflection papers is to summarize the key knowledge and bring your own perspective to it. In the reflection paper, you should summarize YOUR key lessons of the material covered. You may for instance reflect on what you found surprising, particularly interesting, or things that you do not agree with. Excellent papers are ones where you describe your own learning as well as demonstrate critical and analytical thinking.

Reflection paper 1: Different types of data and tools, DL postponed to week 5
Reflection paper 2: Legal and ethical issues, DL week 4

Please use academic referencing (text references as well as reference list) is all writing. Failure to follow academic writing standards may lead to failing the assignments. Please use APA referencing style: https://apastyle.apa.org/

Format: Length of maximum 2 pages, font 12, line spacing: 1,5.
Deadline: The assignment must be uploaded to the assignment submission box in MyCourses by 23.00 on Friday of the submission week.
Evaluation: Maximum number of points for each reflection paper is 10.

Data analysis assignments (30%)
During the course you will perform assignments that will improve your data analysis skills. The assignments are to be conducted with MS Excel. The detailed tasks and data will be described during the course.

Deadline: All material must be uploaded on MyCourses on Friday at 23.00 each week.
Evaluation: Maximum number of points for the assignment is 30.

Module 2: Optimization & modelling

Optimization assignments (50%)

The optimization and modelling assignments will introduce you to prescriptive analytics and the methods used in mathematical problem solving. The assignments are to be conducted with MS Excel. The detailed tasks and data will be described during the course.

Deadline: All material must be uploaded on MyCourses on Friday at 23.00 each week.
Evaluation: Maximum number of points for the assignments is 50.

The practicalities and practices of using Zoom and hybrid mode will be discussed in the first session.

6. READINGS

The lecture slides will be available on MyCourses. The other readings you are expected to download yourself based on the references provided in the preliminary schedule. These readings are available via the Aalto University library services, and you can find them easily by searching with the article name (please note this works on any Aalto computer, but not elsewhere) or via our university library webpages.

Articles and other readings assigned for a particular lecture session
(scroll through – no need to learn these by heart)

Module 1:

Delen, D., & Ram, S. (2018). Research challenges and opportunities in business analytics. *Journal of Business Analytics*, 1(1), 2-12.

Hansen, H. K., & Mühlen-Schulte, A. (2012). The power of numbers in global governance. *Journal of International Relations and Development*, 15(4), 455-465.

Martinez, L. R. (2022). How Much Should We Trust the Dictator's GDP Growth Estimates?. *Journal of Political Economy*, 130(10), 000-000. (Read pages 1-5 only)

Richards, N. M., & King, J. H. (2014). Big data ethics. *Wake Forest L. Rev.*, 49, 393.

Saltz, J. S., & Dewar, N. (2019). Data science ethical considerations: a systematic literature review and proposed project framework. *Ethics and Information Technology*, 21(3), 197-208.

Module 2:

Mandatory articles:
"Strategic Planning of BMW's Global Production Network" (full text inside Aalto network)
https://pubsonline.informs.org/doi/abs/10.1287/inte.1050.0187

"Production and Distribution Planning in Danone Waters China Division " (full text inside Aalto network)
https://pubsonline.informs.org/doi/10.1287/inte.2018.0973

Optional articles:
"Selecting infrastructure maintenance projects with Robust Portfolio Modeling" (full text inside Aalto network)
http://www.sciencedirect.com/science/article/pii/S0167923615000858

"Kroger Uses Simulation-Optimization to Improve Pharmacy Inventory Management" (full text inside Aalto network)
http://pubsonline.informs.org/doi/pdf/10.1287/inte.2013.0724

"Optimizing Chevron's Refineries" (full text inside Aalto network)
http://pubsonline.informs.org/doi/pdf/10.1287/inte.2013.0727

"Blending OR/MS, Judgment, and GIS: Restructuring P&G's Supply Chain" (full text inside Aalto network)
Blending OR/MS, Judgment, and GIS: Restructuring P&G's Supply Chain | Interfaces (informs.org)

"Improving Supply-Chain-Reconfiguration Decisions at IBM" (full text inside Aalto network)
http://pubsonline.informs.org/doi/pdf/10.1287/inte.1050.0166

"Lockheed Martin Space Systems Company Optimizes Infrastructure Project-Portfolio Selection" (full text inside Aalto network)
http://pubsonline.informs.org/doi/abs/10.1287/inte.1080.0378

7. SCHEDULE

Module 1: Principles of data analytics					
Session	**Date**	**Topic(s)**	**Lecturer(s)**	**Readings**	**Assignment**
1	Mon 24.10. 9:15 – 12:00	Introduction Getting familiar with relevant software (Excel); Overview of different types of data; Basic principles and applications of contemporary analytics methods	Iiris Saittakari Company guest: Teemu Toivonen, Futurice	Delen & Ram, 2018 Hansen & Mühlen-Schulte, 2012 Martinez, 2022	Data analysis assignment 1 due 28.10, 23.00.
2.	Fri 28.10. 12:15 – 15:00	Workshop (optional attendance)	Iiris Saittakari		

3.	Mon 31.10. 9:15 – 12:00	Defining business problems and deciding how to solve them; Legal and ethical issues associated with collecting, storing and handling data	Iiris Saittakari; Hertta Vuorenmaa Company guest: Pyry Virtanen, Boston Consulting Group	Richards & King 2014 Saltz & Dewar, 2019	Data analysis assignment 2 due 4.11, 23.00.
4.	Fri 4.11. 12:15 – 15:00	Workshop (optional attendance)	Iiris Saittakari		
5.	Mon 7.11. 9:15 – 12:00	Making recommendations based on data analysis Using textual analysis and AI in D&I work	Iiris Saittakari; Kalliopi Platanou Company guest: Jan Bittner, EY-Parthenon		Data analysis assignment 3 due 11.11, 23.00.
6.	Fri 11.11. 12:15 – 15:00	Workshop (optional attendance)	Iiris Saittakari		
Module 2: Optimization & modelling					
7.	Mon 14.11. 9:15 – 12:00	Optimization & modelling: Introduction to prescriptive analytics and optimization. Intuition & basic mathematical formulation	Lauri Neuvonen	Strategic Planning of BMW's Global Production Network; Production and Distribution Planning in Danone Waters China Division	Data analysis assignment 4 and reflection paper 2 due 18.11, 23.00.
8.	Fri 18.11. 12:15 – 15:00	Workshop (optional attendance)	Lauri Neuvonen; Iiris Saittakari		
9.	Mon 21.11. 9:15 – 12:00	Optimization & modelling: Introduction to software tools and their use in optimization.	Lauri Neuvonen		Data analysis assignment 5 and reflection paper 1 due 25.11, 23.00.
10.	Fri 25.11. 12:15 – 15:00	Workshop (optional attendance)	Lauri Neuvonen; Iiris Saittakari		
11.	Mon 28.11. 9:15 – 12:00	Optimization & modelling: Introduction to software tools and their use in optimization. Machine learning and other tools	Lauri Neuvonen; Company guest: Arto Sorsimo, McKinsey		Data analysis assignment 6 due 2.12, 23.00.
12.	Fri 2.12. 12:15 – 15:00	Workshop (optional attendance)	Lauri Neuvonen Iiris Saittakari		

7. COURSE WORKLOAD

Classroom hours, lectures and workshops	36h
Assignments	124h
Total	**160h (6 cr)**

8. ETHICAL RULES

Aalto University Code of Academic Integrity and Handling Violations Thereof
https://into.aalto.fi/display/ensaannot/Aalto+University+Code+of+Academic+Integrity+and+Handling+Violations+Thereof