QTEM Data Challenge 2019

The Solvay People Analytics Challenge

Introduction

There have been some important moves recently at Solvay. The 3 of you have just been appointed as Analytics Manager, HR Manager and People Analytics Manager for the company. Your new colleagues, Bruce (Global head of Innovating Ways of Working) and Mike (Data Scientist for People Analytics) want you to take the lead on a project they recently started: The Solvay People Analytics Challenge. The objective of this project is to unleash the full potential of Solvay employees.

Thanks to his tireless efforts, Mike has already retrieved data about the performance of employees from 2010 to 2017, as well as some basic information describing the situation of each employee for each year during that same time period. It is now your turn to lead this project. Mike and Bruce count on your fresh look to find innovative ways to improve employees' performances.

You have exactly two months to come back with a report. Be creative, play with the data, find information wherever you can and show what you've got!

Solvay & HR Mission

About Solvay

Solvay is an advanced materials and specialty chemicals company, committed to developing chemistry that addresses key societal challenges. Solvay innovates and partners with customers worldwide in many diverse end-markets. Its products are used in planes, cars, batteries, smart and medical devices, as well as in mineral and oil and gas extraction, enhancing efficiency and sustainability. Its light weighting materials promote cleaner mobility, its formulations optimize the use of resources, and its performance chemicals improve air and water quality.

Solvay is headquartered in Brussels with around 27,000 employees in 62 countries.

For more information, please visit: **https://www.solvay.com/en/what-is-solvay**

HR Mission

Solvay is committed to cultivating employees' personal and professional growth by offering career paths and opportunities, and by building skills for the future. Solvay is also committed to aligning its workforce with the needs of implementing a sound business strategy. The Group has developed and launched policies and processes with a view to attracting and retaining staff, and to fostering the development of all employees.

Evaluating Employees - Performance, Development and Career Review (PDCR)

The PDCR (*Performance, Development and Career Review*) is a yearly exercise to evaluate employees' performance over the course of the year. It is mandatory for all white-collar (and some blue-collar) employees. The evaluation is conducted by the employee's manager, who also solicits feedback from 3rd parties about the employee's performance during the year. The PDCR provides an opportunity for feedback, recognizing successes, and coaching and mentoring on areas for development.

At first, the PDCR was available only to white-collar employees at Solvay. Throughout the years, the PDCR has been progressively opened to a broader population including some blue-collar employees. You will notice that the number of PDCR observations per year reflects this widening of the target population.

There are 2 dimensions that are part of the performance evaluation:

Objectives: Each year, each employee discusses together with his or her manager what the employee should accomplish or achieve during the year (the employee's objectives). The "objectives" score is the manager's determination of the extent to which the employee accomplished the goals that were determined for the year. There are 5 different possible gradings (listed below from least to most successful):

- Unsatisfactory
- Partially successful achievement
- Successful Achievement
- Exceeds Expectations
- Exceptional Achievement

Nature of Contribution: The "Nature of Contribution" score describes the extent to which the employee's performance makes a difference to the performance of the place in the organization where they work (service, department, business…). You can think of the "nature of contribution" scores as reflecting the "impact" of the employee's work over the course of the year. There are 5 different possible gradings (listed below from least to most successful):

- Trails
- Acquires
- Masters
- Steers
- Transforms

Solvay's Structure: Matrix Organization

Solvay has a matrix structure, which is defined by two primary axes: entity and functional area.

- The **entity** is the place where a given employee works. For the context of this exercise, we have separated the entity into 2 groups: business (e.g. in one of the business units of the organization) vs. support (e.g. in one of the parts of the organization that supports the business, such as finance, information technology, legal & compliance, etc.).
- The **functional area** describes (broadly) what the employee does in his or her job. Functional areas are large domains of activity found in all corporations. Examples include: human resources, supply chain, etc.

Given the matrix structure, people who work in a given functional area can be present in both types of entities. For example, both the business and support entities employ people to do human resources work.

Your mission

The aim of this project is to find a solution to improve employees performances. Below are some inspirations on how you could proceed.

Tell us about employee performance throughout time.

- How can we summarize the stability, increase, or decrease of a given employee's performance across time? [Correlation, regression, GINI coefficients, other ways?]
- On balance, do employees improve or deteriorate?
- Where in the organization is improvement/deterioration the strongest?
- What factors predict increases or decreases in performance? (changing job, changing managers, changing place in the organization?)
- Are there factors that predict having an improvement or decrease in performance across the observed period?

And what about place in the organizational structure? (We know the "level" of each employee within Solvay – the Function Class variable in the dataset)

- How can we summarize the stability, increase, or decrease of a given employee's place in the organization hierarchy? [Correlation, regression, GINI coefficients, other ways?]
- On balance, are employees promoted, demoted, or do they remain in the same place?
- Where in the organization is promotion the most rapid? The least rapid?
- What factors predict promotion? Previous year or years' evaluation scores? Changes in job or place in the organization? Other factors?
- Who are the people who are promoted the most? What distinguishes them from the other employees?

What does this mean for the way Solvay manages its people?

- Given what we know about employee performance and promotion within the organization, what should we do to better manage and develop our people?
- We are looking for actionable recommendations based on the insights provided by your data analysis.

Data

The data are provided to you as a set of 16 .csv files. There is one set of files to describe the employee evaluations, and one set of files to describe the profile information of the employees. A separate file exists for each content area for each year.

Note that not all of the individuals in the employee data sets will be found in the evaluation data sets. This is because not all Solvay employees participate in the evaluation process (see PDCR description above).

Codebook

The **employee data** contain the following columns:

employee_id – A masked ID for each employee. A given employee has the same ID across years and across files.

year – The year of the observation.

age_range – The age range of the employee at the time of observation.

fn_class – The level of the employee within the organizational hierarchy. Higher numbers indicate a higher position in the pyramid. Employees without a value can be classified as "blue collar" and those with a value can be considered "white collar." The following levels of management are defined based on the function class: Junior Management (15-18), Middle Management (19-22), Senior Executives (23-26).

bus_supp – Whether the employee works in an area of the business, or in support (e.g. HR, IT, finance, etc.). This is the "entity" that we describe in the section above on Solvay's matrix organization.

fn_area – The content area of a given employee's job. See the description of the matrix organization above.

job_id – A masked ID describing the person's specific job title. Not readable as-is, but useful for telling whether someone changed jobs from one year to another.

length_service – Length of service of the employee within the organization (in years).

seniority_fn – Length of the seniority of the employee in their function class (the level in the organizational hierarchy) – in months.

seniority_job_mnths – Length of the seniority of the employee in their job (in months).

The **evaluation data** contain the following columns:

employee_id - A masked ID for each employee. A given employee has the same ID across years and across files.

manager_id - A masked ID for each manager. A given manager has the same ID across years and across files.

year - The year of the observation.

obj – The employee's rating on their "objectives" score, from 1 (Unsatisfactory) to 5 (Exceptional Achievement). See the description of the objectives score above.

noc - The employee's rating on their "nature of contributions" score, from 1 (Trails) to 5 (Transforms). See the description of the nature of contributions score above.

Evaluation Process

ROUND 1 - END OF MAY 2019: A COMMITTEE DELIVERS A SCORE TO ALL TEAMS AND SELECTS THE 3 BEST TEAMS

Jury

1. Academic representatives.
2. Corporate Representatives.

Report

1. Format of own choice (PowerPoint, interactive presentation with screen and voice recording, website or others…).
2. Codes used for data processing and models (+ brief explanation if needed).

Q&A session

1. 10 minutes on-line with experts.
2. Evaluation on your personal knowledge of technical aspects.

Evaluation

You'll be evaluated on your deliverables and Q&A session according to the evaluation grid below.

ROUND 2 - 25 OCT. 2019: RANKING OF THE 3 BEST TEAMS AT THE ANNUAL MEETING (AMSTERDAM)

Jury

1. Academic representatives.
2. Corporate Representatives.

Report

1. The first-round report with the option of modifying it.
2. Presentation support.

Presentation

1. 10 minutes to present.
2. 5 minutes for Q&A.

Evaluation

At your presentation, you will be evaluated on the communication and business sides of the project according to the evaluation grid bellow. You'll keep your analytics grade from first-round evaluation.

Evaluation grid

	Skills (based on QTEM Skills Matrix)	Weight in evaluation Round 1	Weight in evaluation Round 2
Transferable skills	**Adaptability/Flexibility:** face real world issues while defining an own way of solving problems.	Not evaluated	Not evaluated
	Initiative/Entrepreneurship: learn and find out new techniques to solve problems.		
	Teamwork/Leadership: collaborate digitally, within distance and in a multi-cultural environment with unknown colleagues.		
Analytical skills	**Defining analytical methodologies:** define an analysis appropriate to the issue to be solved, with the right balance between simplicity/understandability and robustness/precision.	50%	25%
	Processing and interpreting quantitative information: collect, process and analyze data using advanced and complex data management tools.		
Business skills	**Recommending policy or business decisions:** use facts and observed results to make relevant and sensible recommendations.	25%	25%
Communication skills	**Presenting quantitative information:** create compelling visuals displaying clearly key results/data using advanced tools	25%	50%
	Communication/Presence: use creative tools to make your presentation/report appealing and communicate effectively complex information to a heterogenous audience.		

NB: The evaluation grid may be slightly reviewed during the QDC