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## SELF-SERVICE BUSINESS ANALYTICS AND DATA GOVERNANCE

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**Abstract.** *Self-service business analytics allows business/end users to develop analysis according to their specific requirements. Data governance must support self-service initiatives, and all self-service business analytics projects must take place with respect to data governance. Theoretical considerations ground a self-service business analytics project implemented in Microsoft Power BI.*

**Keywords:** data governance, business analytics, self-service business analytics, Power BI

**JEL classification** L20, L17

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### 1. Introduction

Data governance (DG) is a concept used at macro and micro level. On the macro level, DG refers to “the governing of cross-border data flows by countries” and consists of “norm, principles and rules governing various data types” [1]. On the micro level, DG is on an organization, e.g. company, public institution. It concerns the capability of the system to ensure “that high quality of data exists throughout the complete lifecycle of the data” [2]. Data governance has three pillars: people, processes and information technology. All together are responsible for the proper handling of the organization’s data across the business processes. To enable business insights, data governance is nowadays combined with analytics [3]. This approach implies three phases: 1 – data governance strategy and data profiling; 2 – master data governance; 3 – data quality metrics and scorecards [4].

The benefits of applying business analytics (BA) over data quality are significant, but the development of analytics should be in a structured and planned way according to the data governance framework done. Investments in BA tools should be on long term done in order to ground predictive modeling and automation.

According to Smith & Heffernan (2019), the demand of analytics is increasing and “the growth in “self-service” analytics has reached the point that research and advisory firm Gartner predicted more analysis will come from end users than from data professionals” [5]. Self-service is the next step in analytics maturity.

Based on the fact, that self-service BA (SSBA) is appropriate and beneficial to empower business users to explore and discover insights into data and tools such as Power BI make it easier to analyze data, we propose a SSBA approach for analyzing Romanian international migration.

## 2. SSBA initiative based on Power BI

According to Powell (2019), data governance implementation implies specific tasks in the development of the BA projects (figure 1). Power BI is an ecosystem, which includes a collection of services, applications, and connectors that facilitate the creation of reports, dashboards and the visual analysis of information.

Data governance issues are at least the following:

- identify data and tag sources, that contain sensitive data
  - DG task1: apply access policies to data sources;
  - DG task2: classify dashboards (confidential, organizational);
  - DG task3: manage application workspace;
- determine where the integrated data (data model) will be stored
  - DG task4: on-premises, in the cloud or in a hybrid deployment model;
- define access policy
  - DG task5: define and manage security roles and groups;
  - DG task6: define and implement monitoring solutions;
- train business users
  - DG task 7: train users on data governance and security.

DG task 7 is “particularly relevant for dataset designers within business units who will leverage Power BI Desktop and to access shape, and model data” [6].

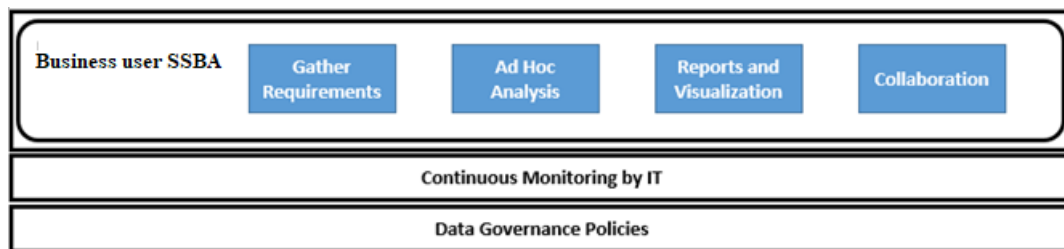


Figure 1. SSBA project [adapted from [6]]

Organizations need to re-examine their data strategies by giving users the access to self-service business analytics. This will increase their speed to insights and may improve their performance.

## 3. SSBA Case Study

The data governance issues (DG task1 – DG task7) build the backbone of our case study. Due to the fact, that the data published by the National Institute of Statistics is open data according to a governmental license starting with 2014 (DG task1), we settled our data source to one of the statistical databases [7]. International migration is a topic of considerable debate and there is a high demand for trusted data and analysis [8]. Primary data keeps the evidence of the Romanian international migration by gender and age group for the last four years (registered on January 1, 2016, 2017, 2018 and 2019). The data model integrates the before mentioned data sources into a relational schema (figure 2). With Power BI Desktop, on-premises alternative is valid (DG task4). Dashboards are delivered to an on-line collaborative community with Power BI service. They are not confidential; they are “organizational” (DG task2). According to the chosen BA tool, the workspace is configured (DG task3).

To secure the data model we have used the row-data security mechanism. It serves to restrict data access to given users. For the different business users/groups of the SSBA application, corresponding roles are defined (DG task5). A role defines, based on a Data Analysis Expression (DAX) filter, the access to the data. The activity of the users is continuously

monitored (DG task6). Any potential user is trained in order to understand the data model, to be capable to deploy further analysis and create dashboards. (DG task7).

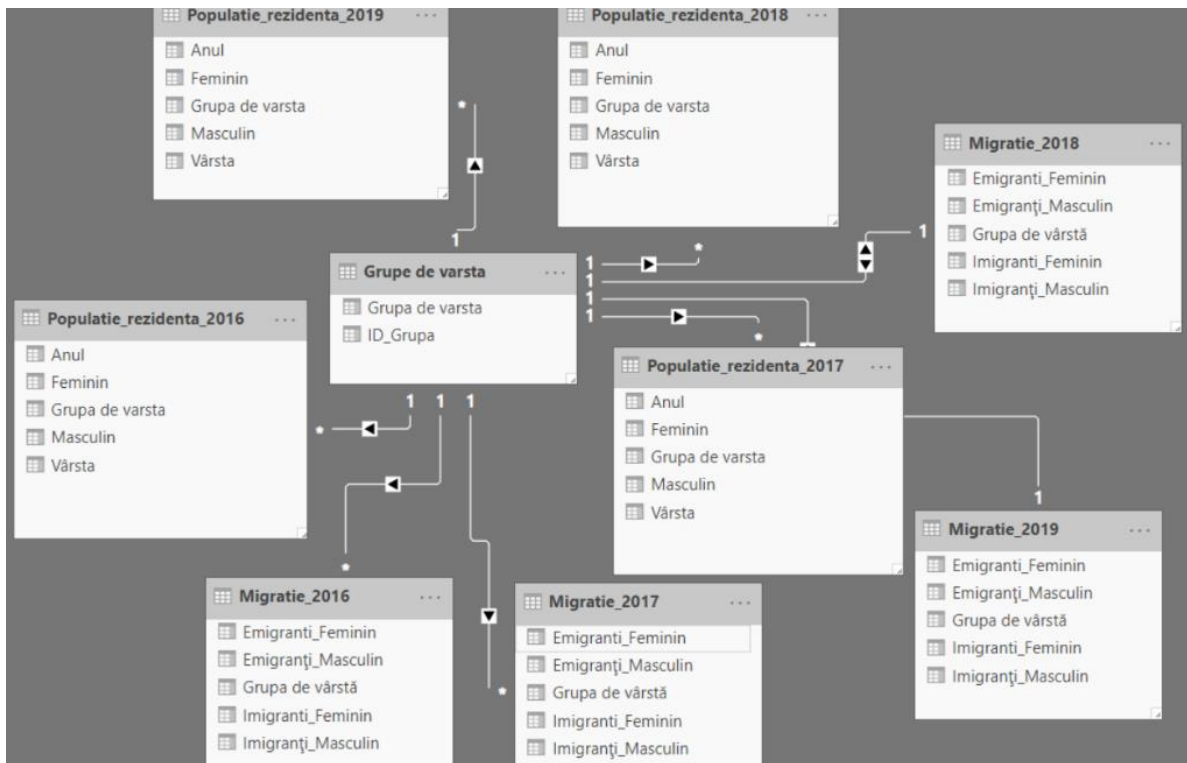


Figure 2. Data model

#### 4. Results

In a Business Analytics framework, relevant data is gathered from “carefully selected” sources, transformed in accordance with data’s intended use, and delivered in formats and timeframes that are appropriate for the data consumers. The considered data source is a trustworthy one. According to Russom (2011), the six Cs of trusted data are complete data, current data, consistent data, clean data, compliant data and collaborative data [9]. All of these characteristics are valid for our data model (figure 1) stored in a Power BI Desktop application. Ad hoc analysis based on the data stored in the model conducts to various reports and dashboard visualizations: 1- descriptive analysis regarding the resident population in Romania, the international migration of the Romanian citizen; 2 – predictive analysis of the Romanian emigrants.

For predictive analysis, the forecasting feature utilizes built-in predictive forecasting models to detect the step (monthly/weekly/annually) and seasonality in the data in order to provide forecasting results (figure 3).

The data model contains three dimensions (year (D1), gender (D2) and age group (D3)) and measures like the Romanian resident population (M1), emigrants (M2) and immigrants (M3) for evaluating the extent of migration. “Migration can affect the age structure of the populations of origin and destination both directly and indirectly. Migrations streams can also be predominantly composed of one sex, which will distort the sex structure as well as the age structure of the population”.

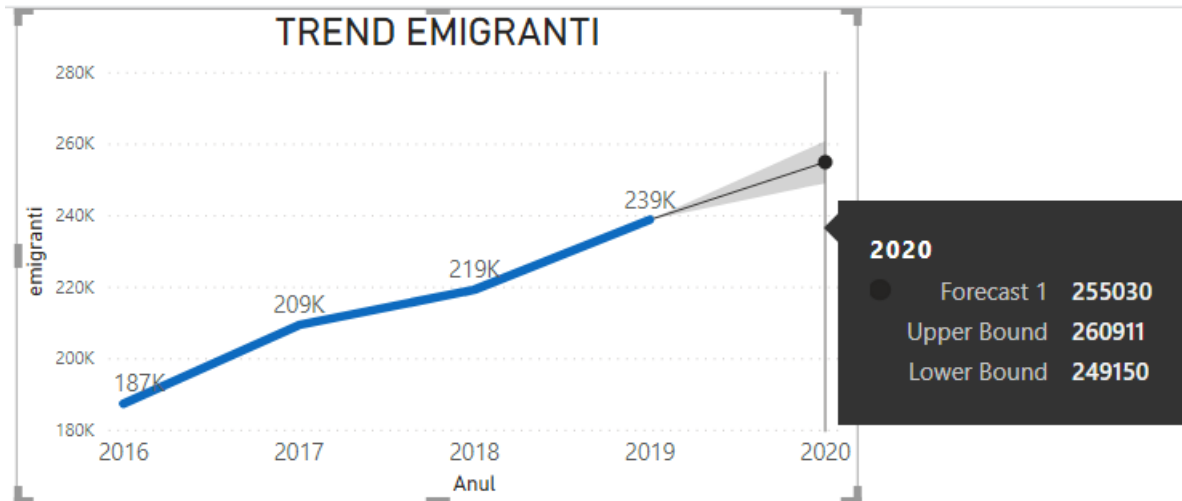


Figure 3. Predictive analysis

Annually, the emigration determine the population decline. The balance of the Romanian international migration is negative. In figure 4, we present the analysis based on the data registered on January 1, 2019.

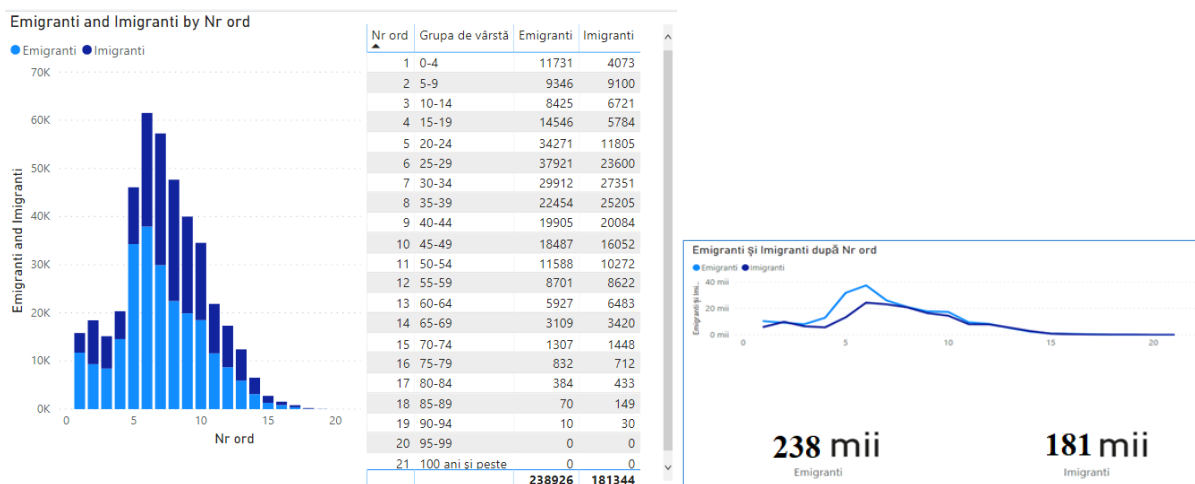


Figure 4. Romanian international migration. Emigrants and immigrants

Dimension D3 allows the analyses of the weight of the each age group, annually, in the total number of emigrants, immigrants and Romanian resident population. Age groups 5, 6 and 7 are determinant. People with ages between 20 and 34 years are leaving for searching new opportunities, jobs and professional careers. Variate analysis is possible based on dependences and variation of the measures values among the dimensions; suggestive dashboards offer relevant information to the end/business users (figure 5).

Data Analysis Expressions (DAX) and Python scripts extend the analysis and can be formulated by end/business users or teams. Therefore, the “dataset designer of the model will need to be familiar with both the governance policy determining the level of visibility users of the dataset will have, as well as how to implement the corresponding row-level security role” [5]. Business users can also disseminate the dashboards among different security groups.

Further measures, like gross migration, gross-migration rate, immigration rate (in-migration rate), emigration rate (out-migration rate), net migration, net-migration rate characterize the migration phenomena [10].

Based on data registered on January 1, 2018 and 2019 we analyze year 2018 (figure 6). Gross migration is the total flow of migrants across a border, i.e. in-migrants + out-migrants, or in the case of international migration, immigrants + emigrants.

Gross migration rate calculated for year 2018 is the number of permanent migrants in relation to the average population in this period (usually expressed as the number of permanent migrants per 1,000 inhabitants). Similar definitions for immigration, emigration rates and net migration rate.

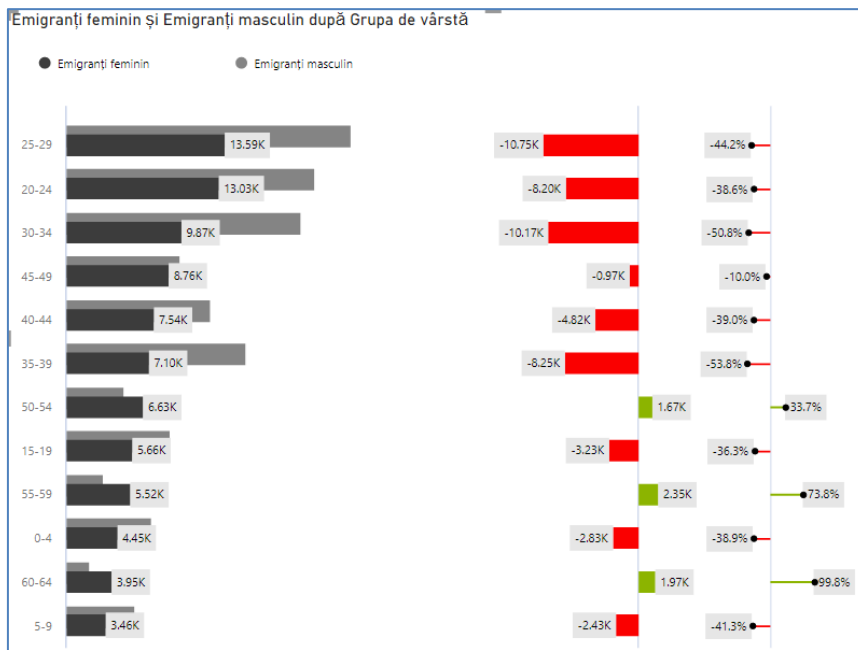


Figure 5. Emigrants' analysis by gender and age groups

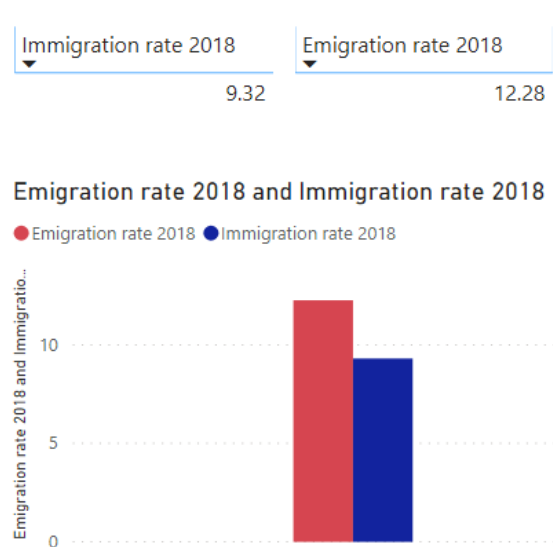
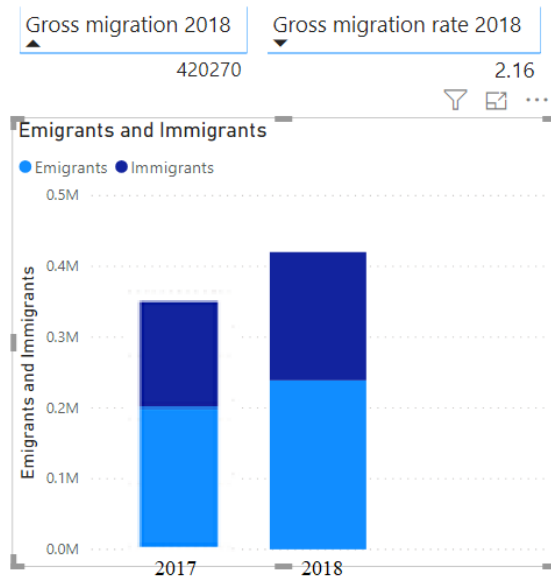


Figure 6. International migration indicators

## 5. Conclusions

Data governance, based on people, processes and technology, enables an organization to leverage their data as an enterprise asset. Data quality is ensured through a set of principles and practices in a practical and actionable framework. According to these, people, processes and technology are responsible for data availability, relevancy, usability, integrity and security in an enterprise. Data governance is important for business analytics success, and vice versa, business analytics unlock business value by using statistical, predictive and machine learning techniques. Business analytics integrated in data governance processes improve business insight and decision-making. Self-service business analytics, shortly SSBA, is now a trend. It gives business users the independence from IT when it comes to specific requirements of the user role.

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