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Analysing the Impact of e-Banking and Socio-Demographic Factors on Customer Satisfaction with Banking Services using Graphical Visualization

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ABSTRACT

The digital transformation has permeated many industries and is becoming increasingly important for our everyday lives. Naturally, the digital transformation entered the banking industry with full impact transforming both products and services, as well as the traditional client-bank relations. Digital transformation, the fierce competition, and the pursuit of the desideratum of sustainable development challenge banking business models and especially the approach towards customers. Customer satisfaction has become an imperative for bank management due to a series of recent developments related to both the industry and the customers. The present paper aims at discussing the influence of socio-demographic factors and the satisfaction with e-banking on the general level of customer satisfaction with banking services in Romania, employing graphical visualization. The results revealed the following hierarchy of variables impacting the general level of satisfaction with banking services: income, the place of residence, the satisfaction with e-banking services, and education.

1. Introduction

The digital transformation has permeated many industries and is becoming increasingly important for our everyday lives. Naturally, the banking industry couldn't be an exception, and the digital transformation impacts products and services, as well as the traditional client-bank relations. Combined with the desideratum of sustainable development, the digital transformation challenges banking business models and the approach towards customers.

The context shifts the focus to customer satisfaction, because of both the development of the industry and the evolutions of customer behavior (Moraru and Ilie, 2021).

The aim of this paper is related to customers satisfaction with e-banking services and the relation to the general level of satisfaction with banking services. The paper employs graphical visualization to observe the impact of a series of independent variables on the dependent variable (customer satisfaction).

The article has several sections: introduction, a brief review of the relevant literature, research methodology, results, and conclusions.

2. Literature review

The interest of the banking industry in customer satisfaction has increased over the past decades due to a series of factors and developments. On the one hand, the recent crises have impacted banks' profits and shifted the focus toward customer satisfaction, as a strategic tool for maintaining the client base, as well as in their quest for new clients. On the other hand, there are factors such as the natural dynamism and evolution of the industry, and the more pronounced changes in consumer behavior, with customers becoming more demanding, more sophisticated, and more informed. At the same time, the digital transformation has opened a vast array of opportunities both related to products and services and to client-bank relations, especially after the 2007 crisis, when particular attention has started to be paid to the sustainable development, while the COVID-19 pandemic accelerated the entry and deployment of the digital transformation in the industry.

An extensive literature has been dedicated to customer satisfaction starting with the valuable contributions of Cardozo (1965). Since then, a sizeable body of literature has delt with customer satisfaction in the banking industry heralding the importance of the concept, both for management and scientific research. This vast body of literature focuses on different issues concerning customer satisfaction, ranging from assessing the

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impact of various determinants on customer satisfaction (Belas and Gabcova 2014, 2016; Keisidou et al., 2013; Mylonakis, 2009; Ozatac et al., 2016, Ilie et al., 2017, Moraru and Duhnea, 2018, Moraru et al., 2022) to pinpointing typologies of bank customers (Beckett et al., 2000). One may observe a more recent focus on customer satisfaction in relation to innovative banking services, such as e-banking or mobile banking. The development of innovative banking services driven by the technological development is therefore a predilect subject of recent research (Vijayaragavan, 2014, Sakalauskas et al., 2009, Ramnaraina and Pillay, 2015, Weber, 2005). The preoccupation is sustained by several trends that affect the banking industry. On the one hand there is the innovation and digital transformation that changed the game in several industries but is quite obvious in banking. On the other hand, there is the sustainable development trend that aims to transpose to the banking sector the general social and economic interest in a greener and more inclusive future. Important changes in consumer behavior patterns as well as changes in bank-client relations are also to be noted.

Several research directions may be identified. The antecedents of customers satisfaction with online banking represent one direction of research, as per Yoon (2010) or George and Kumar (2013). A very consistent research direction focuses on the relation between customer satisfaction and associated concepts such as service quality (Gonzales et al., 2004, Han and Baek, 2004, Santouridis et al., 2009, Rod et al., 2009, George and Kumar, 2014, Hammoud et al., 2018, Khatoon et al., 2020), customer loyalty (Suleiman et al., 2012, Casalo et al., 2008, Ramesh et al., 2020, Ahmed et al., 2021), or both quality and loyalty (Amin, 2016, Raza et al., 2020). Authors have also been preoccupied with developing different scales for measuring customers satisfaction with Internet banking (Chen et al., 2012) or for measuring problems in Internet banking with impact on customer satisfaction (George and Kumar, 2015).

3. Research methodology

Descriptive quantitative research was conducted in the fall of 2019 in two counties comprised by the Dobrudja Region (Constanta and Tulcea) in the South East of Romania, due to their importance in the overall economic activity of the country.

The research tool used was a questionnaire, divided in several sections aimed at obtaining on the one hand information on the respondents' opinions regarding the general level of satisfaction with banking services and the level of satisfaction with e-banking services together with a series of several other satisfaction determinants, and on the other, at obtaining several socio-demographic information such as age, level of education, gender, professional status, marital status, residence, and level of revenues/income. For the assessment of customer satisfaction (general level and with e-banking services) five-point semantic differentials, from 1 – very unsatisfactory to 5 – very satisfactory were used.

We determined the sample size (1,066 respondents) using the formula proposed by Daniel and Cross (2013), starting from a general population of 873,969. The figure represents the adult population, aged above 18 years in the two counties under survey, as provided by the official statistics for the year 2018. In the above-mentioned formula, the z-score was 1.96, corresponding to a confidence level of 95%, the margin error was 0.03, while the probability to obtain an affirmative answer to the question addressed was 0.5. After the collection of filled in questionnaires and a final check of their completeness, 1,094 questionnaires were subject to analysis.

The research employed Python, Colab Notebooks from Google. It helped us build 3D figures that allow observing the impact of the independent variables on the dependant variable. This way, by analysing the figures one may observe the variations of the dependant variable which provides a hierarchy of the independent variables impacting the dependant variable.

4. Results and discussion

Table 1 shows the structure of the sample, based on the socio-demographic factors gender, age, education, residence, marital and professional status, and income.

Table 1. The structure of the sample

i1 Gender (%)	F	51.5
	M	48.5
i2 Age (%)	18- 24	15.5
	25-34	16.9
	35-44	22.3
	45-54	22.4
	55-64	14.2
	>65	8.7
i3 Education (%)	Elementary	51.9
	University	37.3
	Post-university	10.8

i4 Residence (%)	Urban	80.2
	Rural	19.8
i5 Marital Status	Single	28
	Married	58.8
	Divorced	9.7
	Widower	3.6
i6 Professional Status (%)	Student	14.6
	Employee	64.0
	Entrepreneur	6.4
	Family worker	0.1
	Self-employed	2.0
	Unemployed	0.5
	Pensioner	12.4
i7 Income Lei (%)	<1000	19.6
	1001-1500	15.5
	1501-2000	21.1
	2001-2500	13.5
	2501-3000	7.6
	3001-3500	6.8
	3501-4000	6.9
	4001-4500	6.6
	>4500	2.4

A first representation, which facilitates data analysis, is the presentation of the frequency (density) of the data, for all the series, i1-i7, e-banking (EB) and customer satisfaction (CS) (figure 1).

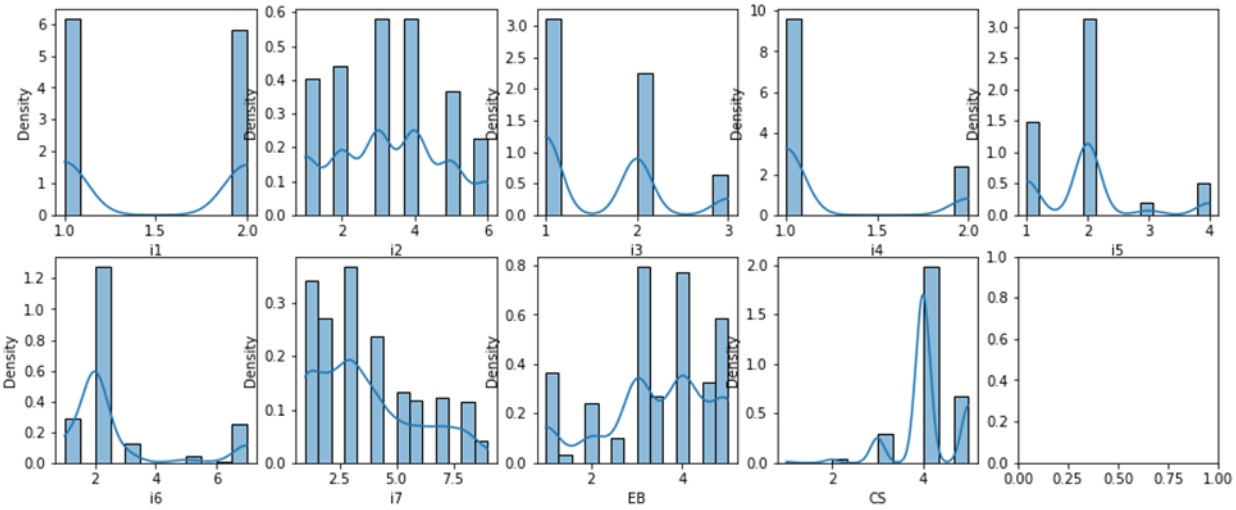

Figure 1. Representation of the data according to the density of their values

Source: Authors' simulation in Python – Colab Notebooks from Google with sns.histplot()

To focus the analysis on an acceptable number of data, which would facilitate the present research, a data value correlation algorithm was applied, which reduced the number of independent variables from eight (i1-i7 and EB) to four, respectively i3, i4, i7, and EB. In figure 2.a) the correlation of all series (with CS) is represented, and in figure 2.b) only those series with a correlation factor greater than 0.10, the minimum value imposed by the authors, are found.

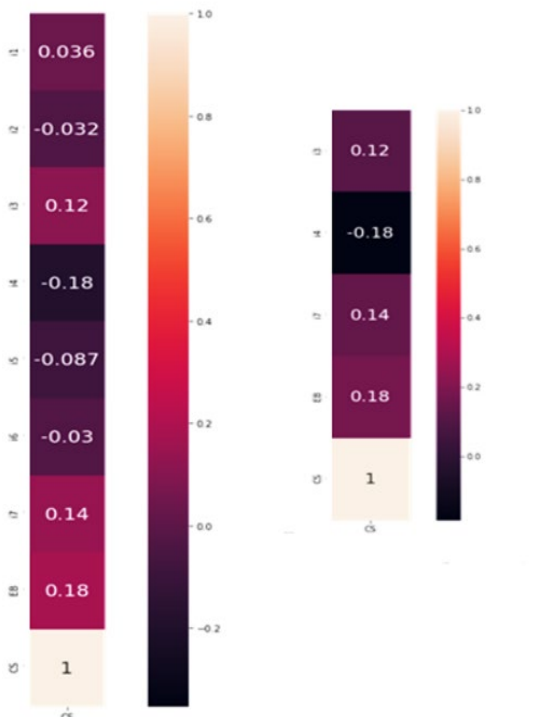

Figure 2. Correlation with CS

Source: Authors' simulation in Python – Colab Notebooks from Google with sns.heatmap()

A representation of all data values in cumulative form was presented in figure 3. The analyzed data are represented after applying the value correlation relationship and choosing the four series, as having greater influence on CS. From this point on, the analysis will focus only on these data series (i3 – education, i4 – residence, i7 – income, EB – E-banking, respectively CS - Customer satisfaction dependent variable).

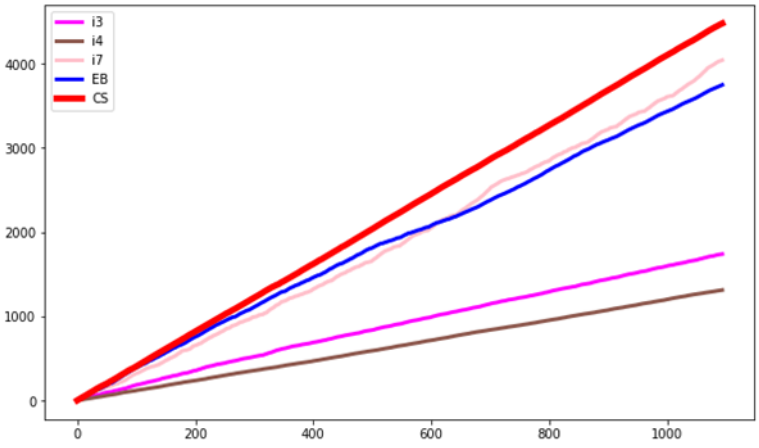

Figure 3. The evolution of the series. Cumulative values

Source: Author's simulation in Python – Colab Notebooks from Google with plot (subplots())

In order to analyze the influence of the four variables on CS, the first graphic representation (figure 4) contains graphs showing the areas with concentrations of values, by concatenating the CS values with each value of the other data series.

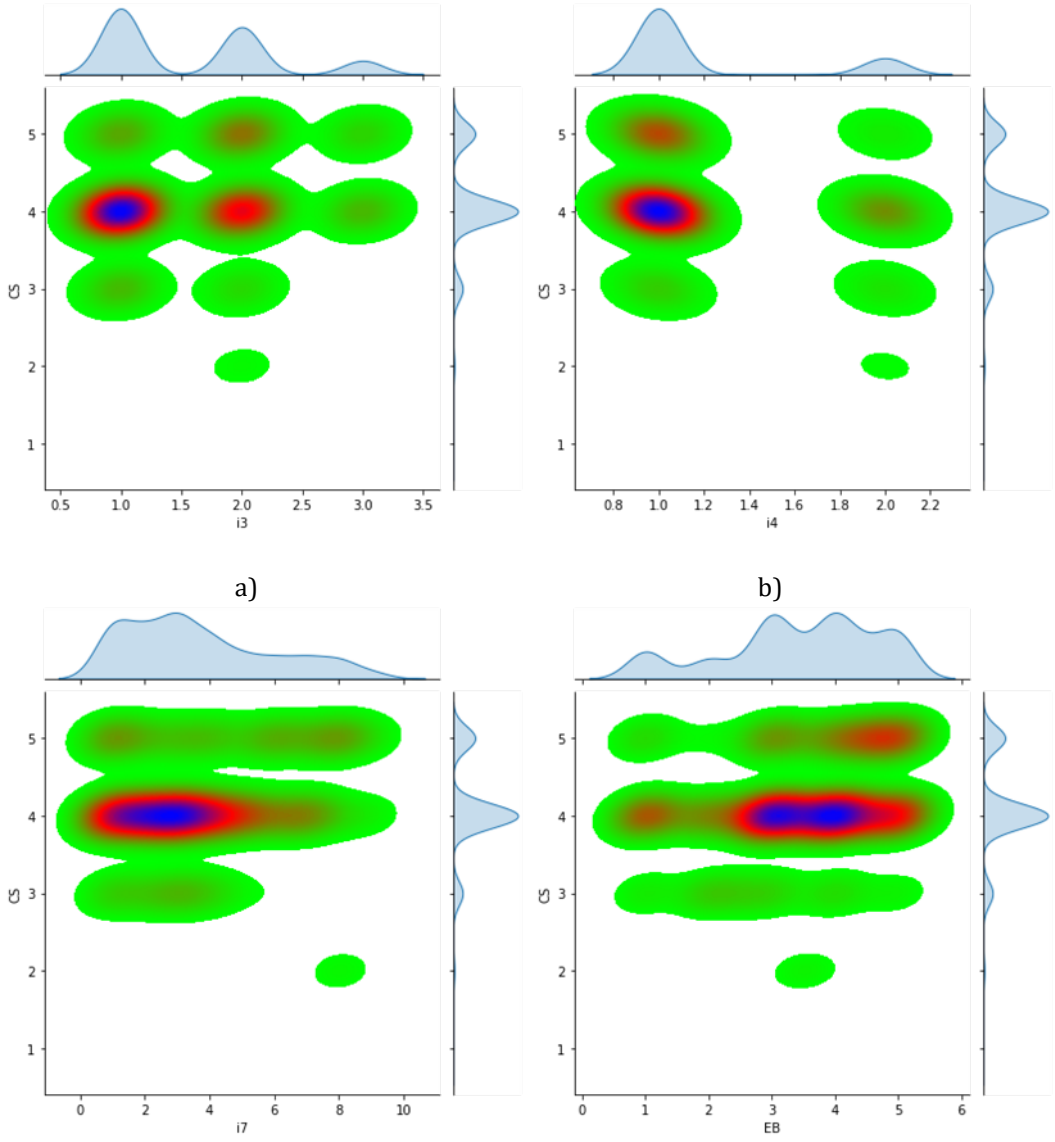

Figure 4. The concentration of values of the four variables against CS: a) i3; b) i4; c) i7; d)

Source: Authors' simulation in Python – Colab Notebooks from Google with sns.jointplot().

Figure 4.a) shows that most respondents who chose the variant "satisfactory" regarding CS have a level of education 1 and 2, that is elementary and higher education, respectively. It is also worth noting an increase in the value importance of CS with the increase in level 2 of education. In figure 4.b) a major concentration of the same variant of CS is observed for the majority with residence in urban areas. Regarding i7, the situation changes. The chosen variant for CS "satisfactory" corresponds to values of i7 (income) that are in the range 1÷6, that is a level of income up to 3500 Lei. Figure 4.d) shows the same majority that chose a satisfactory level of CS, but the respondents' values with respect to EB are found here between 3 and 5, that is average to very satisfactory, respectively.

To observe a comparison of the possible differences in the influence of the four variables on CS, 3D graphical representations were created by plotting the CS values against the independent variable taken two by two.

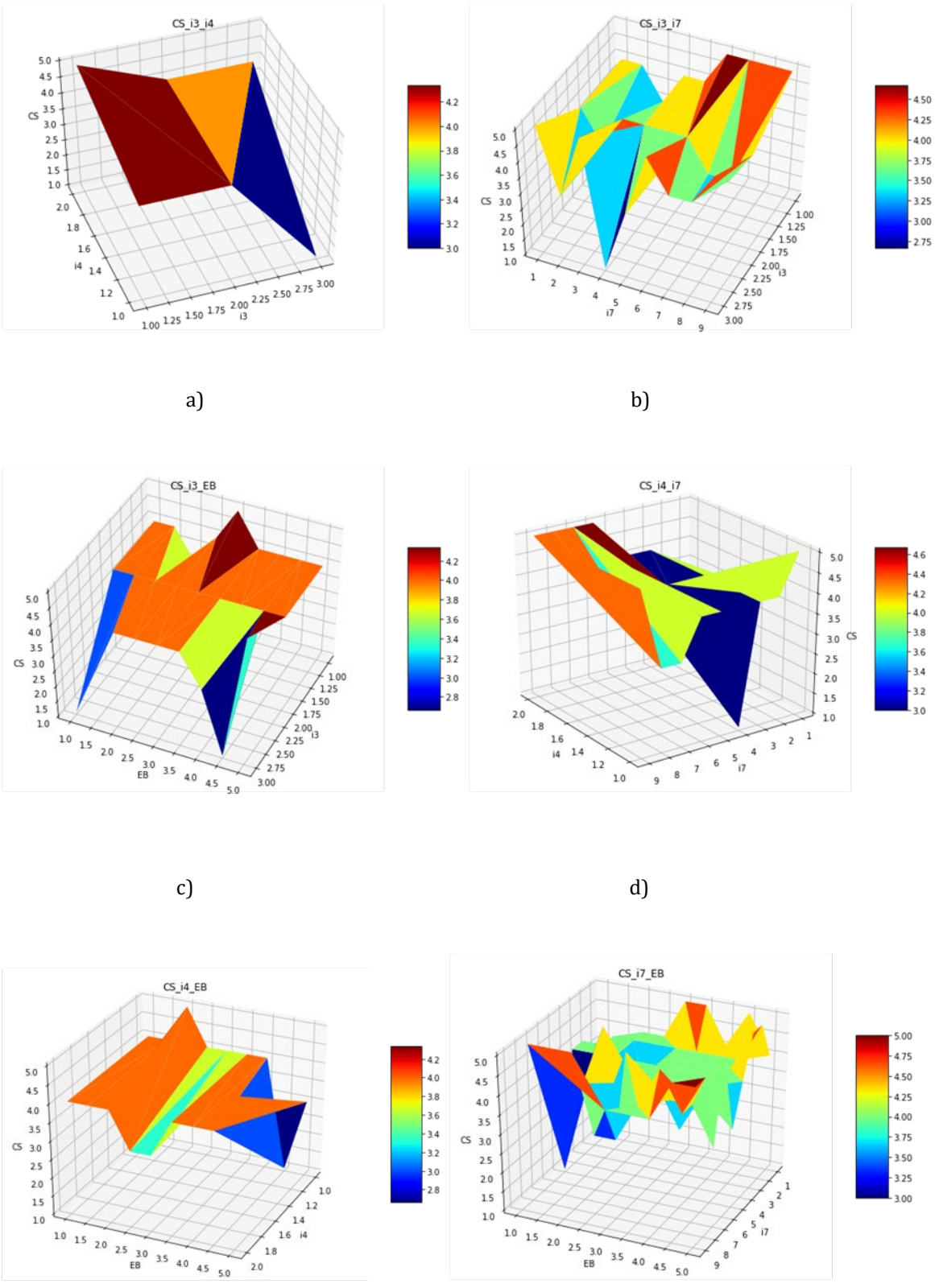

Figure 5. CS against the independent variable taken two by two: a)i3&i4; b)i3&i7; c)i3&EB; d)i4&i7; e)i4&EB; f)i7&EB

Source: Author's simulation in Python – Colab Notebooks from Google with ax.plot_trisurf().

Figure 5 shows that: i4 causes a sharper drop in CS values than i3 (fig. 5.a)); i7 determines more inflections on the CS evolution than i3 (fig. 5.b)); the same situation is observed in the case of EB and i3 (fig. 5.c)); i7 has an influence with more inflections than i4 (fig. 5.d)); i4 and EB have a similar influence, with a slightly greater importance for i4 (fig. 5.e)); the analysis of the figure (fig. 5.f)) again shows the heterogeneity of the given answers, which makes graphical analysis difficult, but here too i7 has a greater influence than EB. Thus, according to the analysis, i7 has the greatest influence on CS, followed by i4 and EB (with only slight differences), and finally i3.

5. Conclusions

Given the intrinsic dynamism of the industry, as well as the recent trends (a looming crisis, the pursuit of sustainable development, the fierce competition, the accelerated penetration of digital transformation) it is only natural to witness important changes in the approach towards customers, especially since the customers themselves have become more informed and more sophisticated. Therefore, these recent trends prompted a particular interest in customer satisfaction related research. This research is focused on the Romanian banking industry and customers, in an economically relevant region.

A first conclusion is that the data are highly heterogenous, resulting from the personal and subjective way in which the respondents perceive satisfaction. This makes it difficult to apply different methods and algorithms for data analysis and visualization. From the applied visual research, the greatest influence on the level of customer satisfaction is the size of the income (i7), followed by the place of residence (i4), and the E-banking services offered (EB). As for the lowest influence, it belongs to education (i3), which is mainly explained by the large access to information, regardless of the level of education. These four variables are the ones with the highest correlation to the customer satisfaction values, out of the set initially considered. It should also be noted that education (i3), income (i7), and e-banking (EB) have a directly proportional influence on the evolution of customer satisfaction, while residence (i4) has an inversely proportional influence.

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