

## **Towards Sustainability in Banking Services Development. Customer Satisfaction with Banking Services – Influences and Perspectives**

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### **Abstract**

*Sustainable development has become an imperative across businesses and industries and the banking industry makes no exception, especially since it is a very dynamic industry worldwide. However, the sustainable development faces numerous challenges and one of them is represented by the desideratum to achieve high customer satisfaction. Paying attention to customer satisfaction has become an imperative for bank management as a natural consequence of the development of the industry on the one hand, and the evolutions of customer behavior on the other. The present paper aims at assessing the influence of a series of socio-demographic factors on customer satisfaction with banking services in Romania, using an artificial neural network. We chose seven demographic variables (age, education, gender, professional status, marital status, residence, and income). The results revealed the hierarchy of the socio-demographic factors with impact on customer satisfaction with banking services.*

**Key words:** customer satisfaction; banking services; sustainability; Romania; demographic variables

**J.E.L. classification:** M31

### **1. Introduction**

Sustainable development has become an imperative across businesses and industries and the banking industry makes no exception, especially since it is a very dynamic industry worldwide. At the same time, the industry has been facing numerous challenges lately, such as the digitalization, increased competition, and instability of money and foreign exchange markets.

Paying attention to customer satisfaction has become an imperative for bank management as a natural consequence of the development of the industry on the one hand, and the evolutions of customer behavior on the other.

The paper aims at evaluating the influence of an array of socio-demographic variables on customer satisfaction with banking services, using an artificial neural network. The article is divided as follows: introduction, a conceptual approach to customer satisfaction with banking services, research methodology, results, and conclusions of the paper.

### **2. Literature review regarding sustainability and customer satisfaction with banking services**

The relation between sustainable development and the banking industry has been approached from two angles. On the one hand there has been explored the role of the banking industry in the sustainable development of the society (Weber, 2014; Jeucken, 2001; Schmidheiny and Zorraquin, 1998, Jeucken, 2004, Nguyen, 2016) while on the other hand, increasing attention has been paid to the sustainable development of the banking industry itself, especially following the 2007 financial crisis.

During the past twenty years, the banking industry has gone through both periods of crisis and of expansion in Romania. The recent crises have diminished the profits of banks, therefore providing a suitable context for the preoccupation towards sustainable development and customer satisfaction. At the same time, customers have changed their behavior being more prone to evaluate several other aspects besides the primary characteristics of the service they are looking for. Therefore, the sustainable development of the banking industry and the banking services tightly depends on customer needs and wants, their perception on the delivered quality, and eventually, on customer satisfaction. Customer satisfaction has therefore become a point of interest for the banking industry, not only a preferred research subject for theoreticians.

The sustainable development of the banking industry focuses on multiple angles and research directions varying from promoting sustainable business models in banking (Yip and Bocken, 2018), approaching social and ethical issues (Goyal and Joshi, 2011; de Clerck, 2009), and banking corporate social responsibility practices (Abiola, 2014; Perez et al., 2013; Weber et al., 2014; Pellicano et al., 2014; Scholtens, 2009, Chaudhury 2012) to green banking (Pinter et al., 2006, Meena, 2013; Biswas, 2011, Bihari, 2011, Kunhibava et al., 2019), social banking (Weber and Remer, 2011, Krause, 2019) or banking products and service innovation (Jeucken, 2010; Tan et al., 2016, Bouma et al., 2017).

It is obvious that the technological development have led to the creation of innovative and sustainable banking services such as e-banking or mobile banking services, as discussed in several papers (Vijayaragavan, 2014, Sakalauskas et al., 2009, Ramnaraina and Pillay, 2015, Weber, 2005). The bottom line is, however, that the sustainable development of banking services can only be achieved through customers. Therefore, it all comes down to the attention paid to customers and their needs (Raut et al., 2017), eventually translated into concepts such as customer satisfaction (Rebai et al., 2016; Tornjanski et al., 2017) or customer loyalty (Ibe-enwo et al., 2019).

Customer satisfaction as a general concept has been vastly debated in the literature and within this body of literature customer satisfaction with financial services, especially banking services received special attention. Research evolved around topics such as identifying types of banking services customers (Beckett et al., 2000) or pointing out satisfaction determinants (Belas and Gabcova 2014, 2016; Keisidou et al., 2013; Mylonakis, 2009; Ozatac et al., 2016, Ilie et al., 2017, Moraru and Duhnea, 2018).

### **3. Research methodology**

The data for the study were obtained from a questionnaire-based descriptive quantitative research conducted in two counties in the South East of Romania, Constanta and Tulcea, in the autumn of 2019. The questionnaire comprised a socio-demographic section (age, level of education, gender, professional status, marital status, residence, and level of revenues/income) and a section aimed at assessing the general level of satisfaction and a series of satisfaction determinants with banking services (on five-point semantic differentials, from 1 – very unsatisfactory to 5 – very satisfactory).

The sample size was determined using the formula in Daniel and Cross (2013). The general population was 873,969 (the adult population, aged above 18 years in the region under survey, according to the official statistics for 2018), 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. The resulting sample size was 1,066. 1,098 questionnaires were collected but after eliminating the incomplete ones the analysis was conducted on 1,094 questionnaires.

The socio-demographic data were introduced in an artificial neural network (ANN) in order to determine the hierarchy of the input data influence on customer satisfaction, through ANN training and testing. Therefore, in order to obtain a hierarchy of the socio-demographic factors a feedforward ANN with backpropagation training algorithm was used. Open source Python 3 through the online Colab Notebooks from Google was used (modules Pandas, Numpy, Matplotlib, Seaborn for the graphic representation of the data and modules Pandas, Sklearn, Numpy, and Torch.nn for the construction, training and testing of the ANN).

#### 4. Results

The structure of the sample is presented in table 1.

*Table no.1. The structure of the sample*

Gender	(%)	Education	(%)	Professional Status(%)	Residence (%)	Income-Lei(%)
F	51.5	Elementary	51.9	Student	14.6	Urban 80.2 <1000 19.6
M	48.5	University	37.3	Employee	64.0	Rural 19.8 1001-1500 15.5
		Post-university	10.8	Entrepreneur	6.4	1501-2000 21.1
				Family worker	0.1	2001-2500 13.5
				Self-employed	2.0	2501-3000 7.6
				Unemployed	0.5	3001-3500 6.8
				Pensioner	12.4	3501-4000 6.9
						4001-4500 6.6
						>4500 2.4
Marital Status	(%)	Age	(%)			
Single	28	18- 24	15.5			
Married	58.8	25-34	16.9			
Divorced	9.7	35-44	22.3			
Widower	3.6	45-54	22.4			
		55-64	14.2			
		>65	8.7			

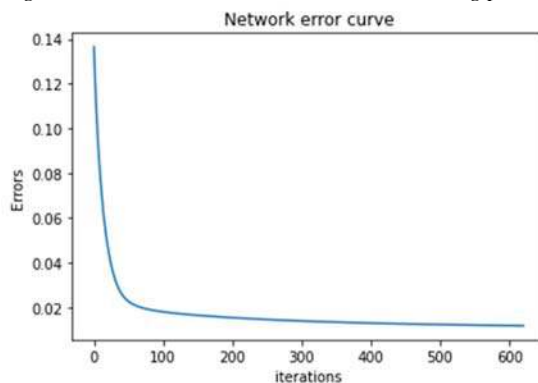
Source: Authors' processing

The ANN had the following features:

- Type: feedforward,
- Hidden neuron activation function: tanh = hyperbolic tangent,
- Optimizer for weights modification: ADAM = ADaptive Moment Estimation,
- Learning rate = constant = 0.00001,
- Batch size = 5,
- One hidden layer with 15 neurons,
- Stop after no iteration change = 200.

Figure 1 presents the evolution of the network error in the training process.

*Figure no.1 Network error evolution in training process*



Source: Authors' Simulation in Google Colab Notebooks Python

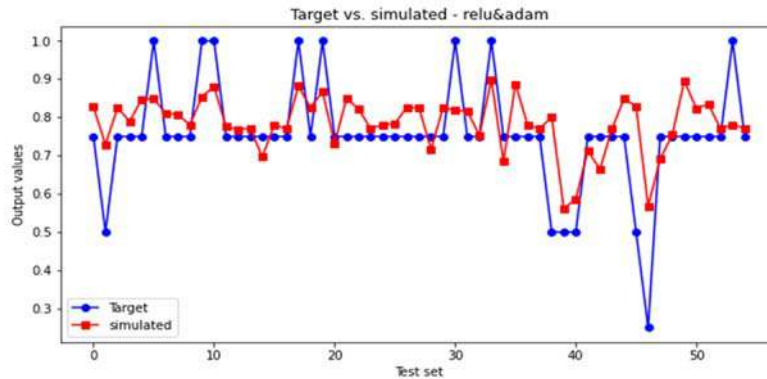
The results of the training were as follows:

- No. of iterations = 621,
- Max. error = 0.219,
- Min. error = -0.328,
- Mean absolute error (on testing) = 0.085,
- Mean squared error (on testing) = 0.128,
- Mean absolute error (on training) = 0.109,

- Mean squared error (on training) = 0.023,
- Random Forest Regressor: model score on training data = 0.740; model score on testing data = 0.579.

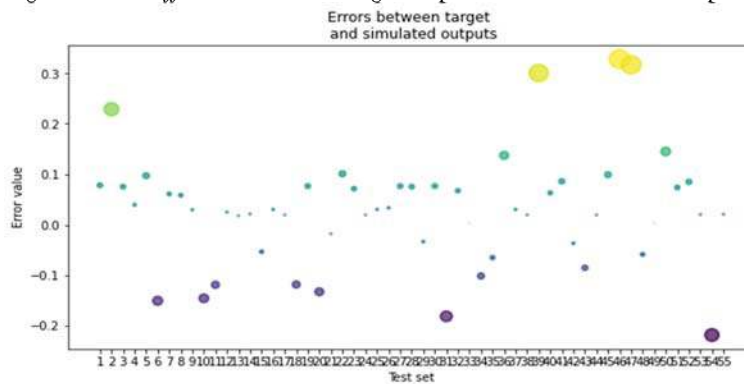
Figure 2 shows the comparison between the target output data and the simulated output data.

Figure no.2 Comparison between target output data and simulated output data. Test set



Source: Authors’ Simulation in Google Colab Notebooks Python

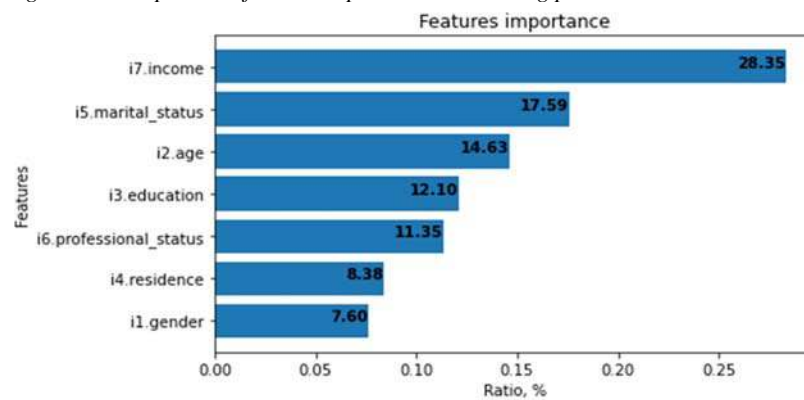
Figure no. 3. Difference between target output data and simulated output data



Source: Authors’ Simulation in Google Colab Notebooks Python

The simulation revealed the importance of the analyzed factors as predictors of customer satisfaction (figure no.4).

Figure no. 4 Input data feature importance in training process



Source: Authors’ Simulation in Google Colab Notebooks Python

## 5. Conclusions

The banking services industry is very dynamic, both worldwide and in the Romanian market. The recent developments within the banking industry have brought forth the concern for sustainable development and the related concept of customer satisfaction. Nowadays, the profits of banks depend on the ability to achieve sustainable development goals and the diversification of banking services. Banks therefore changed their approach and directed their efforts towards customer retention and gaining new customers. This present-day concern with customer satisfaction is what prompted this article, which builds upon several other research articles already published by the authors.

The study focuses on the Romanian customers, in one of the most important regions of the country as far as the economic activity is concerned, and investigates several demographic factors in relation to customer satisfaction with banking services. The use of an artificial neural network revealed a hierarchy of socio-demographic factors influencing customer satisfaction with banking services, with the most relevant being the income. There is a vast body of literature dedicated to customer satisfaction determinants in the banking industry; however, considerably fewer studies focus on the socio-demographic factors. In our opinion, the research on customer satisfaction should take into account the socio-demographic characteristics of the customers and develop consumer profiles that may enable the industry to develop tailored services that best fit customer demands.

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