Postmodern Openings

ISSN: 2068-0236 | e-ISSN: 2069-9387

Covered in: Web of Science (WOS); EBSCO; ERIH+; Google Scholar; Index Copernicus; Ideas RePeC; Econpapers; Socionet; CEEOL; Ulrich ProQuest; Cabell, Journalseek; Scipio; Philpapers; SHERPA/RoMEO repositories; KVK; WorldCat; CrossRef; CrossCheck

2020, Volume 11, Issue 2 Supl.1, pages: 93-106 | <https://doi.org/10.18662/po/11.2Sup1/181>

Churn Prepaid Customer Profile in Romanian Postmodernism Telecommunications

Andreea DUMITRACHE¹,
Denisa MELIAN², Stelian
STANCU³

¹ PhD. Student, Academy of Economic
Studies, Bucharest, Romania,
dumitrache.andreea03@gmail.com

² PhD. Student, Academy of Economic
Studies, Bucharest, Romania,
denisa.melian@yahoo.com

³ Prof. Univ. Dr., Academy of Economic
Studies, Bucharest, Romania,
stelian_stancu@yahoo.com

Abstract: The telecommunications industry is one of the sectors in which customers play an essential role in maintaining stable incomes. Having an impact on all spheres of postmodern life, telecommunications helps bring about major changes in the world. This can be considered the reason why the world can grow and grow at such a rapid rate. The telecommunications industry offers not only a better social awareness, but also a better life in general. Customer profiling is a very important resource for telecommunications companies because it helps to form a portrait of their customers. The purpose of this paper is to identify the profile of the client who makes churn from a telecommunications company in Romania. The study is performed on the prepaid segment using an analytical method that is easy to view and interpret, Violin Plot. In our study, this technique identified the situation of the prepaid churn customer in telecommunications as being defined by inactivity, small recharge values and extra-options.

Keywords: *Churn; class imbalance; customer; telecommunications.*

How to cite: Dumitrache, A., Melian, D., & Stancu, S. (2020). Churn Prepaid Customer Profile in Romanian Postmodernism Telecommunications. *Postmodern Openings*, 11(2Sup1), 93-106.
<https://doi.org/10.18662/po/11.2Sup1/181>

1. Introduction

Telecommunications in Romania for the last 20 years is an example of what an industry is capable of doing when it is not restricted by regulations. Mobile communications entered the market at a time when landline telephony dominated the country and while a company (Romtelecom) retained monopoly over landlines. Economic change after the 1989 revolution created an environment in which this economic branch was able to expand through private enterprises, involving both the monopoly of the former state and a fiscal regime favorable to both domestic and foreign private investments.

While development has been very rapid on a global level, Romania has made great progress, given the low priority for state investments of the 1980s, coupled with consumer enthusiasm over the last decade and commitments made by foreign investors.

With the development of the mobile phone market and the customers of this segment have diversified, so nowadays we find two important categories of consumers: postpaid customers (who benefit from monthly subscriptions paid, with a contract for a longer period of time) and prepaid clients (who benefit from pre-paid subscriptions). In general, prepaid clients are represented by the young generation. They are much more dynamic and due to the limited urgency we can consider them as bidders. Customers with prepaid subscriptions do not have a relationship linked by a contract with the telecommunications service provider. They buy credit for the SIM card when they need it, some do it regularly, others don't.

With increasing competition in the telecommunications market, it has become even more vital for telecommunications operators to be proactive in providing customer services and to position themselves precisely in the complex market. Nowadays, operators have shifted their attention from attracting the customer to keeping it, because with the market almost saturated it is simply considered more profitable. Churn at the company level or the loss of a customer is a problem that many companies in many industries face. This problem can be considered as a source of multiple financial losses. According to the experts, regarding the phenomenon of churn this is very dangerous for companies because it leads to the loss of the current customers. They believe that it is more expensive to gain new customers than to keep existing ones.

The main purpose of this paper is to identify the profile of the churn client in the telecommunications industry through a graphical technique that is easy to see and understand. We will address a sample from the prepaid

segment. Violin Plot is a simple technique to graph numerically data. The violin type graphics are similar to those of the box plot.

2. Literature review

Given the major increase in communication through telecommunications networks and with the advancement of technology, we now have a very large amount of information available. Due to increasing competition, telecommunications companies have dedicated more time to bringing in new customers than to retaining existing ones. This factor was analyzed by Van Den Poel and Lariviere in 2004. They analyzed the method of keeping customers within the same company.

Telecommunications seem to be an inseparable part of our daily lives because mobile phones play an important role in improving effective communication both individually and organizationally and beyond. It has been observed that a human being holds the mobile phone almost all the time, even during sleep (Adebiyi et al., 2015).

The opportunities in the telecommunications market seem endless, and the growing demand for mobile systems is creating a global market. Therefore, actors in this industry are looking for the most profitable markets around the world (Hossain & Suchy, 2013).

Today's society is more than accustomed to telecommunications, so the world would end if it were eliminated. The main cause of the increase in telecommunications is the need for communication. Nowadays this activity has become an indispensable one for both people and companies. In order to be able to keep communication even over long distances, various advanced technologies have appeared, such as television and radio, but the most efficient inventions are represented by the telephone and the Internet. With the help of these inventions, companies can have remote employees.

With the advent of e-commerce, customers are more interested in the market and the opportunities it offers, expectations are becoming higher and customers are increasingly willing to change their current supplier and choose a new one. This fact caused the phenomenon of migration of customers from one competitor to another. Phenomenon found in the literature under the name of churn. Lejeune (2001) defined the term churn as the periodic abandonment of current suppliers.

Customer-level churn is a widespread phenomenon in a variety of industries. Bobbier (2013) argues that the annual churn rate for mobile operators in Europe is between 20% and 38%.

Geppert (2003) considers that the churn is actually the movement of customers from one service provider to another in search of better and cheaper products and services. Richeldi and Perrucci (2002) argue that subscribers become churners when they suspend their subscription or consume less and less of the services offered, showing more and more inactivity.

As the main source of profit is represented by customers, you can say that they have an important role in maintaining and evolving the telecommunications industry. Taking these aspects into account, tools have been developed for predictive modeling and understanding of their behavior, Lazarov and Capota (2007).

Management solutions that use customer relations help to gather information about consumers, so that in the future the organization can use this kind of information to meet most of the general needs of customers (Baran et al., 2012).

In order to increase the profitability of companies, it is necessary to analyze the retention of old customers as well as the gaining of new ones, which is done with the help of various data management programs. profitability (Lazarov & Capota, 2007).

Dahiya and Bhatia (2018) used the following techniques: decision and regression trees to construct the churn prediction model. In their paper are presented three sets of small, medium and large data with various attributes. In the paper they used 10 numerical variables, but also 50 instances for a smaller data set. For the average data set, they collected a set of 50 numeric variables with 200 instances. The last, but not the last set is the large one that has a much larger number of variables, namely 100 (these being divided into both numerical and categorical variables). Besides this impressive number of variables, we also have an impressive number of instances, namely 608. After establishing these 3 data sets, the authors applied various predictive methods, and at the end they analyzed and compared the results obtained. After comparing all the results obtained from the application of the models, they came to the conclusion that the best results were given by the decision tree which had much better results than the logistic classifier.

Băcilă et al. (2013) analyzed in their paper various marketing techniques useful for keeping customers active and gaining their loyalty. The main factor in the realization of the two is the company's products and services, they must be developed and sold taking into account customer demand, but also their dynamics. Meeting customer requirements is the starting point of marketing in most telecommunications companies and can

be achieved by recognizing that customer needs and desires are heterogeneous. Customer segmentation allows operators to illustrate the entire business market as a sum of several cohesive but smaller markets. Customer market segmentation is a concept of grouping people who have demands, but also common behaviors in terms of their actions in response to marketing strategies applied by the company. The study was conducted on a sample of 76,753 prepaid customers.

In the paper, the method that was used to segment the analyzed clients was the K-means cluster. In order to draw a conclusion on the internal cohesion belonging to the analyzed cluster, the average amount belonging to the error indicator of the analyzed squares was chosen. Also, here ANOVA was used to determine if there is the slightest difference between the analyzed clusters. Following the applied methods, seven different segments emerged, which highlight seven different types of customer behavior in terms of marketing strategy. This result allows the company to improve the strategies applied so that the company's customer relationship is visibly improved, but also more efficient for the company's revenues. The results obtained from the tests also help to create models that will guide the expenses for services that are growing rapidly. It must be considered that this analysis model is efficient for a large, representative customer base.

In general, the segmentation of customers that are part of the telecommunications market starts from the way customers spent their money to recharge credit, to make calls on or off the network, to send SMS and to surf the Internet. In order to have a high yield, companies must choose customers with different characteristics and then adapt to their needs, according to Bose and Chen (2010).

Most of the time, maintaining and increasing customer profitability is as important as winning customers from competing companies in the telecommunications market (Tsipitsis & Chorianopoulos, 2009). In order to be able to create a loyal relationship with customers, large telecommunications companies should use the principles of the customer using a management method.

Customer profiling is an extremely important marketing concept, because only when you truly understand the customer's needs can you say that you have managed to improve your loyalty relationship with him (Storbacka, 1997).

According to Băcilă et al. (2013) on the prepaid segment, analyzing a period of 6 calendar months, approximately 19.9% of the analyzed clients saved with about 6 units when the category of voice calls was analyzed.

Following the same analysis, customers spent 33.3% less for the category of written messages, at the bottom of the ranking being the Internet with only 3 units spent. The authors of the article believe that marketing strategies need to be improved so that they are suitable. customer, but taking into account the services offered by the mobile operator.

Prepaid churn modeling is usually done by performing an analysis on the details of aggregate calls, which often include additional factors such as details such as: duration, cost or service interruption, but also historical customer data, Alberts (2006).

The first step in managing the phenomenon studied in this paper is to identify the particularities of customers with a high tendency to churn. There are not many published papers in the field of telecommunication churn modeling in the prepaid segment due to the commercially sensitive nature of the problem. Most of the available research concerns the churn of customers with postpaid subscriptions, Hung et al. (2006).

The available studies are for the churn in the segment of pre-paid subscriptions are very few. Most papers that focus on the problem of the churn phenomenon on the prepaid segment involve a fixed configuration, unique in terms of definition of results, population used and data parameters, Archaux et al. (2004).

Churn modeling for prepaid customers is usually done by performing an analysis of the details of aggregate calls, but often includes additional factors, such as details obtained after signing the subscription contract (eg, call duration, cost and not in finally the termination of the contract with the telephone company), but also historically saved data of the client, according to the article written by Alberts (2006).

For a better understanding and distinction between the two classes, churn client behavior versus active, non-churn client behavior we will use an exploratory data analysis technique, known in the literature as the EDA (Exploratory Data Analysis) technique. The data analysis aims to find their characteristics. In general, it is preferred to choose the most visual solution. Choosing from all the steps that are part of the EDA technique category, we will directly apply the data visualization.

The violin chart, Violin Plot is an easy-to-use EDA technique. It provides the best statistical characteristics of the graphical representations of the data sets. They add the information obtained from the density estimates to the synthesis statistics in the box graphs. Given that all statistical information is encompassed in a single graph, we can say that it is an efficient tool for data analysis and research, according to Hintze and Nelson (1998).

The Violin Plot chart contains a union of statistics and density in a single chart. All this makes the Violin Plot an effective tool in any problem of data analysis and exploration (Baumer et. al., 2017).

3. Methodology and data

In this article we analyze the profile of the client churn on the prepaid segment. The study is conducted on a sample of 10,000 randomly selected clients from a database of a Romanian telecommunications company. Customers who made churn are marked with 1 in the variable Churn. The variables used to determine the particularities of the two classes: churn and non-churn are present in the following table.

In this study we want to analyze and determine the profile of churn customers using as a source of information, data from one of the largest mobile network operators in Romania. The operator has approximately five million active subscribers and has provided us with access to an anonymized database that also contains historical data. Thus, the rights of customers on the protection of personal data were not violated. The data were collected at the end of 2019.

Table 1. Churn and non-churn KPI's

Source: Authors' own research

No.	Name	Description
I1	Smartphone	shows the existence of a smartphone device - the variable is populated with 1, if the client has a smartphone device and 0 otherwise
I2	Handset_commercial_age	represents the commercial age of the device model that the customer has in use
I3	Handset_recency	the variable can be translated as the device count, the indicator actually representing the number of months since the device was used
I4	Flag_4G	shows if the customer's phone is prone to 4G coverage, if equipped with this option
I5	Activity_out_m	indicates the client's activity regarding his interaction with another consumer of the same types of services (another telecom customer); more specifically, the indicator shows if there has been any activity carried out by it: sms, phone call etc. in the last month
I6	Activity_inout_m	shows the activity of entering and leaving the client, more precisely it indicates if it had activity

		received and performed within the telecommunications network and not only, that is, if it initiated, performed and received, received at least one of the specific actions of the telecommunications network mail in the last month, such as: sms, phone call, mail etc.
I7	Recharge_value	represents the value with which the prepay card of the client was refilled in the last month
I8	Recharge_occ	shows the number of recharges in the last month
I9	Recharge_value_6M	is a historical indicator that shows the total value recharged in the last 6 months of the client
I10	Recharge_occ_6M	is also a historical indicator and shows the number of reloads in the last 6 months
I11	Last_recharge_value	presents the value of the last recharge of the prepaid number in question
I12	EO_value	shows the average value of the last extra options (offers) on the account
I13	Last_EO_value	indicates the value of the last extra option (offers) on the account
I14	Avg_recharge_value	represents the average value of prepay card reloads, more precisely presents an average of the credit from the client's account

In Table 1 all the indicators used are listed and described. Due to the lack of information, generally present in the data sets that are part of the prepaid segment, we have restricted categories of variables, such as: information about the client's device, its activity in relation to other receivers, the purchasing power and the acquisition of to the consumer, in this chapter being present both current and historical information.

The data set we analyze contains 14 indicators based on which the profile of the churn client in the postmodern telecommunications industry will be built. In this paper we will use a solution that is part of the exploratory data analysis techniques, known in the literature as EDA (Exploratory Data Analysis). Violin Plot, the technique applied to the indicators above is a graphical technique. I chose this approach because it is easy to use and interpret.

Data visualization and interpretation are techniques of graphical representation of information and data with which we can extract insights and conclusions to guide us in business. We use different sets of charts, such as statistical, informational, and other tools, such as Violin Plot, to present

information in a clear and efficient manner. For the study in question, the characteristics of the two classes will be identified through the violin plot, Violin Plot.

4. Results

In the construction of the comparative analysis, the particularities of the two classes were identified through the violin plot, Violin Plot. Each of the fourteen indicators is graphically represented in the figures below, divided into the 2 groups: churn and non-churn. Violin Plot is an easy technique to apply, visualize and interpret each variable depending on how and in what way it is concentrated distributed on each class, thus realizing the difference or defining particularity of the behavior of a client who made churn compared to a customer still active.

As can be seen from the graphical representations made here, the behavior of the prepaid client who will make churn is defined by an increasingly reduced activity, sometimes led even to inactivity, so outgoing (the client does not take any action outside, Figure 5), as well as input (the client does not receive any type of interactive signal: telephone call, text message, etc., Figure 6). Also, we notice that among the population of non-churn consumers is predominantly the use of smartphone devices, their distribution being more concentrated in value 1.

Another characteristic specific to the class of churn is the commercial age of the device model that the client has in use and its lifetime so far. More specifically, churn customers have higher values in terms of the I3 indicator (handset_recency), those who are older in the phone are more prone to churn. According to the graphical representation (Figure 2), most consumers who use a device (phone) over 200 days are part of the churn class. This presents high values in terms of the commercial age of the device model that the customer is currently using. Also, besides the signs of card inactivity and the age of the phone model, churn customers are also characterized by low recharging and extra-option values. Therefore, they show signs of non-use of the telephone number, preceded by a very low activity and low recharge and extra-option values, in this class predominating non-adoption (customers use the credit directly, not acquiring an extra option).

Non-churn clients are active customers, who make and receive signals from outside (Figure 5 and 6), in the field of telecommunications, these typologies are called in and out activities (input and output), have high recharge values so far (when the database was interrogated), as well as past (in the last 6 months), Figure 7 and 9, are adoptions, that is, they adopt extra-options and acquire credit on a regular basis (once a month, once every two months on Saturday).), Figure 8 and 12., reloads often and with high values (Figure 10).

Figure 1. Violin Plot I1

Figure 2. Violin Plot I2

Figure 3. Violin Plot I3

Figure 4. Violin Plot I4

Figure 5. Violin Plot I5

Figure 6. Violin Plot I6

Figure 7. Violin Plot I7

Figure 8. Violin Plot I8

Figure 9. Violin Plot I9

Figure 10. Violin Plot I10

Figure 11. Violin Plot I11

Figure 12. Violin Plot I12

Figure 13. Violin Plot I13

Figure 14. Violin Plot I14

Source: Authors' own research

5. Conclusions

The migration of a client to a competing company, suppliers of the same category of services and products, a common action under the name of churn has become a situation faced by companies from almost every postmodern industry. This situation has become very expensive for companies because according to the specialists, nowadays existing customers are much more valuable than acquiring new customers.

Customers with prepaid subscriptions in the telecommunications sector have no contractual obligations towards the service provider, so customers can change the provider at any time without any prior notification. This makes the task of identifying their profile even more challenging and financially rewarding.

As presented in the results chapter, the violin graphics show as the main features of the customer profile churn prepaid: inactivity, the old model of the phone, the small values of recharging. Therefore, the profile outlined with the help of the Violin Plot technique shows signs of non-use of the telephone number, preceded by a very low activity and low values of recharging and extra-options.

References

- Adebiyi, S. O., Oyatoye, E. O., & Kuye, O. L. (2015). An analytic hierarchy process analysis: Application to subscriber retention decisions in the Nigerian mobile telecommunications industry, *International Journal of Management and Economics*, 48(1), 63 – 83. <https://doi.org/10.1515/IJME-2015-0035>
- Alberts, L. J. S. M. (2006). Churn prediction in the mobile telecommunications industry [Unpublished Masters Thesis]. Department of General Sciences, Maastricht University. <https://pdfs.semanticscholar.org/c3a3/f1802e650eadc1400fd4ec79dfd99a80df35.pdf>.
- Archaux, C., Martin, A., & Khenchaf, A. (2004). An SVM based churn detector in prepaid mobile telephony. *International Conference on Information & Communication Technologies (ICTTA)* (pp. 19—23). <https://doi.org/10.1109/ICTTA.2004.1307830>
- Băcilă, M. F., Rădulescu, A., & Mărar, I. L. (2013). Customer segmentation based on the value of consumption patterns in telecommunications. *International Conference “Marketing – from information to decision” 6th Edition* (pp. 1-51). https://www.researchgate.net/publication/268447379_Consumption-Based_Segmentation_an_analysis_of_a_telecom_company's_customers

- Baran, R., Zerres, C., & Zerres, M. (2012). Customer relationship management (CRM).
<https://hytc.edu.vn/Portals/0/files/635832614505799766customer-relationship-management.pdf>
- Baumer, B., Kaplan, D. T., & Horton, N. (2017). Modern data science with R.
<https://doi.org/10.1111/insr.12256>
- Bobbier, T. (2013). Keeping the customer satisfied: The dynamics of customer defection, and the changing role of the loss adjuster.
<https://www.iiste.org/Journals/index.php/IKM/article/download/41073/42230>
- Bose, I., & Xi, C. (2010). Exploring business opportunities from mobile services data of customers: An inter-cluster analysis approach. *Electronic Commerce and Applications*, 9(3), 197-208.
<https://doi.org/10.1016/j.elerap.2009.07.006>
- Dahiya, K., & Bhatia, S. (2018). Customer churn analysis in telecom industry. *International Journal of innovative research explorer*, 5.
<http://www.ijire.org/gallery/54-april-631.pdf>
- Geppert, C. (2002). Customer churn management: retaining high-margin customers with CRM techniques.
https://www.amr.kpmg.com/microsite/kpmgme/downloads/CHURN_02_26final.pdf
- Hintze, J. L., & Nelson, R. D. (1998). Violin plots: A box plot-density trace synergism. *American Statistician*, 52(2), 181-184.
<https://doi.org/10.2307/2685478>
- Hossain, M. M., & Suchy, N. J. (2013). Influence of customer satisfaction on loyalty: a study on mobile telecommunication industry. *Journal of Social Sciences*, 9(2), 73 – 80. <https://doi.org/10.3844/jssp.2013.73.80>
- Hung, S., Yen, D. C., & Wang, H. (2006). Applying data mining to telecom churn management. *Expert Systems with Applications*, 31(3), 515-524.
<http://didawiki.cli.di.unipi.it/lib/exe/fetch.php/dm/telecomchurnanalysis.pdf>
- Lazarov, V., & Capota, M. (2007). Churn prediction. *Journal, Business Analytics Course*.
<http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.462.7201>
- Lejeune, M. (2001). Measuring the impact of data mining on churn management. *Internet Research*, 11(5), 375-387.
<https://doi.org/10.1108/10662240110410183>
- Poel, D. V., & Lariviere, B. (2004). Customer attrition analysis for financial services using proportional hazard models. *European Journal of Operational Research*, 157(1), 196-217. [https://doi.org/10.1016/S0377-2217\(03\)00069-9](https://doi.org/10.1016/S0377-2217(03)00069-9)

- Richeldi, M., & Perrucci, A. (2002). Churn analysis case study. Enabling end-user datawarehouse. Mining Contract No.: IST-1999-11993. Deliverable No.D17.2. https://sfb876.tu-dortmund.de/PublicPublicationFiles/richeldi_perrucci_2002b.pdf
- Storbacka, K. (1997). Segmentation based on customer profitability – retrospective analysis of retail bank customer bases. *Journal of Marketing Management*, 13(5), 479-492. <https://www.tandfonline.com/doi/ref/10.1080/0267257X.1997.9964487?scroll=top>
- Tsiptsis, K., & Corianopoulos, A. (2009). Data mining techniques in crm: inside customer segmentation. John Wiley & Sons Ltd.