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System Engineering and Informatics



Diploma Thesis

Customer Attrition Research in Mobile Communications

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DIPLOMA THESIS ASSIGNMENT

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Informatics

Thesis title

Customer Attrition Research in Mobile Communications

Objectives of thesis

The main purpose of this thesis is to identify the factors that cause churn behavior of mobile connection services consumers and have the biggest impact on customer satisfaction. To reach this final aim various techniques will be utilized to survey customers, build statistical models based on their answers and to compare those models in order to identify the one that gives better results in explaining the customer attrition behavior. Our focus will be in using predictive modelling tools to make a prediction on the future churn behavior of the customers and to evaluate different models prediction power.

Methodology

To carry out thesis research a survey on churn and satisfaction of Belarusian mobile services customers is held. Main aims of the questionnaire will be to define level of customer satisfaction, customer loyalty, service value to a customer and basic usage characteristics and to maintain general knowledge of customer demographics. Based on the gathered data all the mentioned factors will be compared and evaluated according to their impact on customer attrition behaviour and a prediction model of a customer intention to churn in the near future will be built. All the gathered data will be divided into a training and testing set.

The thesis begins with a review of some basic and contemporary literature sources covering CRM organisational issues, methodology and key factors of success of a CRM strategy. It concentrates on the customer attrition issues, giving an answer to the questions of churn causes and consequences to a company and which methods business can use to manage customer attrition. Several statistical techniques for predictive modelling such as clustering, random forests and logistic regression and others are described in the literature review and later on some of them are utilized in the practical part.

In the first step of the practical part the survey building process will be described alongside with some general information about the gathered data. On the next step quality of the dataset will be evaluated: data will be cleaned, if needed, and checked for possible relationship among variables. After that modelling process will follow.

As the dataset has only categorical variables, three algorithms of predictive modelling will be applied: clustering, random forests and logistic regression. At the end of the modelling quality of each model will be evaluated. All the procedures will be performed in SAS software.

The proposed extent of the thesis

60 – 80 pages

Keywords

Customer relationship management (CRM), customer attrition, logistic regression, random forest, cluster analysis, predictive modelling.

Recommended information sources

ARMSTRONG, G. – KOTLER, P. *Principles of marketing*. Harlow: Pearson, 2012. ISBN 978-0-273-75243-1.

CHRISTENSEN, R. *Analysis of variance, design and regression : applied statistical methods*. London ; Chapman & Hall: London ; Chapman & Hall, 1996. ISBN 0-412-06291-7.

KOTLER, P. – KELLER, K L. *Marketing management*. Harlow: Pearson, 2015. ISBN 9781292092621.

KUMAR, V. – PETERSON, J.A. *Statistical Methods in Customer Relationship Management*. Wiley, 2012.

MOOIJ, M K D. *Consumer behavior and culture : consequences for global marketing and advertising*. Thousand Oaks, Calif.: Sage Publications, 2004. ISBN 0761926682.

OTT, R L. *An introduction to statistical methods and data analysis*. ISBN 978-0495017585.

SHIMP, T A. *Advertising, promotion, and other aspects of integrated marketing communications*. Mason, Ohio: South-Western Cengage Learning, 2010. ISBN 978-0-324-59360-0.

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Declaration

I declare that I have worked on my diploma thesis titled "Customer Attrition Research in Mobile Communications" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on _____

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Customer Attrition Research in Mobile Communications.

Souhrn

Tato diplomová práce se soustřeďuje na jeden ze čtyř typů chování zákazníků - zákaznického opotřebení. Popisuje příčiny a důsledky odcizení zákazníků a popisuje statistické metody analýz dat zákazníků, které slouží k pochopení hlavních důvodů, proč se zákazník chrlí ve vybraném odvětví a způsoby, jak se tomu vyhnout.

Případová studie prezentovaná v tomto výzkumu využívá statistické techniky používané pro práci s průzkumy zákazníků, jako jsou grafy, kontingenční tabulky a testy hypotéz, ordinální a multinomální logistická regrese pro analýzu kategorických dat a poskytnutí některých poznatků o vlivných faktorech výkonu služeb ovlivnit spokojenost zákazníků a zákazníkovi.

Klíčová slova: Řízení vztahů se zákazníky (CRM), zákaznická opotřebení, analýza klastrů, logistická regrese, prediktivní modelování.

Customer Attrition Research in Mobile Communications.

Summary

How to attract and retain a customer? This question is always on top of the business world. XXI century is without a doubt an age of a new business culture. As a competition in every market has become international and an amount of information grows exponentially every day, it is increasingly harder to reach a targeted customer. The concepts of mass production and mass marketing that were created during Industrial Revolution are no longer applicable due to informational avalanche that is a part of a daily routine of each person. Thus, today it is a knowledge of the targeted customer and a connection on a personal level that form a successful brand. This idea lies in the very core of a client relationship management (CRM) concept.

Customer behaviour varies in time depending on company's course. Thus, depending on a targeted result in customer behaviour all company activities can be classified into four categories: customer acquisition, customer retention, customer churn and win back. To support each line company can use different marketing tools and research methodology. From the moment when a customer gets into the view of a company, when he becomes a client and finally when he churns – each step of the relationship is reach in data stored in company databases and can be analysed and predicted using this data. All the data available for customer analysis can be divided into internal and external based on the source. Thus, sales and CRM system data are examples of internal sources while customer surveys are the example of external one. When company makes a use of this unstructured data, it can be turned into knowledge that allows to improve strategic decision-making process and company-customer relationship bringing customer satisfaction to a new level alongside with company revenues. This paper concentrates on one of four types of customer behaviour – customer attrition. It investigates causes and consequences of churn and describes statistical methods of customer data analyses used to understand main reasons for customer churn in a chosen industry and ways to avoid it.

Case study presented in this research utilizes statistical techniques used to work with customer attrition surveys such as charts, contingency tables and hypothesis testing, cluster analysis and ordinal and multinomial logistic regression to analyse categorical data and provide some insights on the influential power of service factors that affect customer satisfaction and customer churn.

Keywords: Customer relationship management (CRM), customer attrition, ordinal logistic regression, cluster analysis, predictive modelling.

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Introduction

XXI century is without a doubt an age of a new business culture. As a competition in every market has become international and an amount of information grows exponentially every day, it is increasingly harder to reach a targeted customer. The concepts of mass production and mass marketing that were created during Industrial Revolution are no longer applicable due to informational avalanche that is a part of a daily routine of each person. Thus, today it is a knowledge of the targeted customer and a connection on a personal level that form a successful brand. This idea lies in the very core of a client relationship management (CRM) concept.

Mobile communication services are a dynamic, highly competitive and innovative market, where service providers have to fight for customers and develop unique ways to attract them, retain them and win them back when customer has already taken a decision to change a service provider. This industry is very sensitive to contemporary trends in technology, fashion, other industries, and on top of that – to customer satisfaction. Business decisions of mobile network operators after millennium have to take into account variety of social, technological, mass media and personal phenomena, such as constantly upgrading hardware technologies, movement towards bigger, smarter devices with higher capacity, evolving Internet connection technologies, social network and content sharing applications, such as YouTube, Instagram, Spotify etc, counting in billions of users, that want to stay updated over the phone. Mobile service providers have to catch up with every mass-consumption trend in order to stay up to date, maintain their professional image and retain their client database.

Work with customers is a never-stopping process that goes on many business levels. It takes completely separate set of specialist and different strategies to follow the customer on every step of one's lifecycle. Separate business lines deal with attraction, on-boarding, maintaining, seeing off and winning back a customer. Even though mobile service providers have some unique and well-developed methods to lock-in the customer and minimize customer attrition, nevertheless, subscribers are still changing providers. Thus, it is important to understand, which particular factors of customer loyalty and customer satisfaction, as well as which socio-demographical factors, have the biggest impact on customer decision to leave the company. This thesis paper is going to focus on these

factors in terms of the case study of customer satisfaction survey of mobile service subscribers from Belarus. Belarusian market of mobile communication services has its own specifics, that will be described further in this paper. By the end of the case study we are planning to obtain some insights on the most powerful factors that are driving customer attrition in Belarus.

1. Objectives and Methodology

1.1 Objectives

The main purpose of this thesis is to identify the factors that cause churn behaviour of mobile connection services consumers and have the biggest impact on customer satisfaction. To reach this final aim various techniques will be utilized to survey customers, build statistical models based on their answers and to compare those models in order to identify the one that gives better results in explaining the customer attrition behaviour. Our focus will be in using predictive modelling tools to make a prediction on the future churn behaviour of the customers and to evaluate different models' prediction power.

1.2 Methodology

To carry out thesis research a survey on churn and satisfaction of Belarusian mobile services customers is held. Main aims of the questionnaire are to define level of customer satisfaction, customer loyalty, service value to a customer and basic usage characteristics and to maintain general knowledge of customer demographics. Based on the gathered data all the mentioned factors will be compared and evaluated according to their impact on customer attrition behaviour and a prediction model of a customer intention to churn in the near future will be built. All the gathered data will be divided into a training and testing set.

The thesis begins with a review of some basic and contemporary literature sources covering CRM organisational issues, methodology and key factors of success of a CRM strategy. It concentrates on the customer attrition issues, giving an answer to the questions of churn causes and consequences to a company and which methods business can use to manage customer attrition. Several statistical techniques for descriptive and predictive modelling such as cluster analysis, ordinal and multinomial logistic regression and others are described in the literature review and later on some of them are utilized in the practical part.

In the first step of the practical part the survey building process will be described alongside with some general information about the gathered data. On the next step quality of the

dataset will be evaluated: data will be cleaned, if needed, and checked for possible relationship among variables. After that modelling process will follow.

As the dataset has only categorical variables, two algorithms of statistical modelling will be applied: cluster analysis and logistic regression. At the end of the modelling quality of each model will be evaluated. All the procedures will be performed in SAS software and Gretl.

2. Theoretical context

1.3 What is Client Relationship Management?

The relationship between a company and its customers is a constantly developing process. For any company it starts long before a customer makes a first purchase. It begins with market analysis, identification of potential clients, research on customer needs and development of targeted marketing strategy and continues throughout the time of actual trading relationship until the moment the customer leaves. Thus client-company relationship is an object of a continues management – CRM.

Customer relationship management (CRM) refers to a customer focused business strategy. The concept itself is not new and it in fact is a natural development of another leading concept – relationship marketing. Relationship marketing is about forming long-term relationships with customers. Rather than trying to encourage a one-time sale, relationship marketing tries to foster customer loyalty by providing exemplary products and services. According to business authors Emmett C. Murphy and Mark A. Murphy, acquiring a new customer can cost five times as much as retaining an existing one. Same authors state that a 2% increase in customer retention can decrease costs by as much as 10%. Understanding of this statistic inspires companies to refine the way they do business in order to maximize the value of company-customer relationship for the customer. (Marketing-Schools, 2012)

Customer relationship management as an applied concept of the relationship marketing mainly involves an improvement of internal operations and customer data collection and analysis. These properties of CRM are defined in Berson and Smith article, who state that CRM refers to the practice of collecting, storing, and analysing customer-level information, and incorporating the results into the decision-making process of a firm. This also involves automating, enhancing, and integrating core business processes such as production, operations, sales, marketing, and finance, among others. (Kumar and Peterson, 2012)

Another good definition that widens our understanding of subjects of CRM was given by Injazz and Karen in their article “Understanding customer relationship management”. It is as follows: “CRM is a coherent and complete set of processes and technologies for

managing relationships with current and potential customers and associates of the company, using the marketing, sales and service departments, regardless of the channel of communication”. (Chalmeta, et al., 2006) From this definition we can conclude that a special approach is developed not only for current clients, but also for the potential clients and company associates.

To secure a sustainable growth of one’s profitability it is important for companies to apply CRM approach. Identification of CRM determinants relates to the nature of the organization. Knowledge of the determinants can help to boost quality of service and thus to increase a level of customer satisfaction. People, culture, relationship management process, knowledge management, IT, organization, customer and value are the valuable elements and power indicators of CRM (Fig. 1). Those elements have direct impact on CRM factors (Shamsuddoha, Tasnuba and Alamgir, 2011).

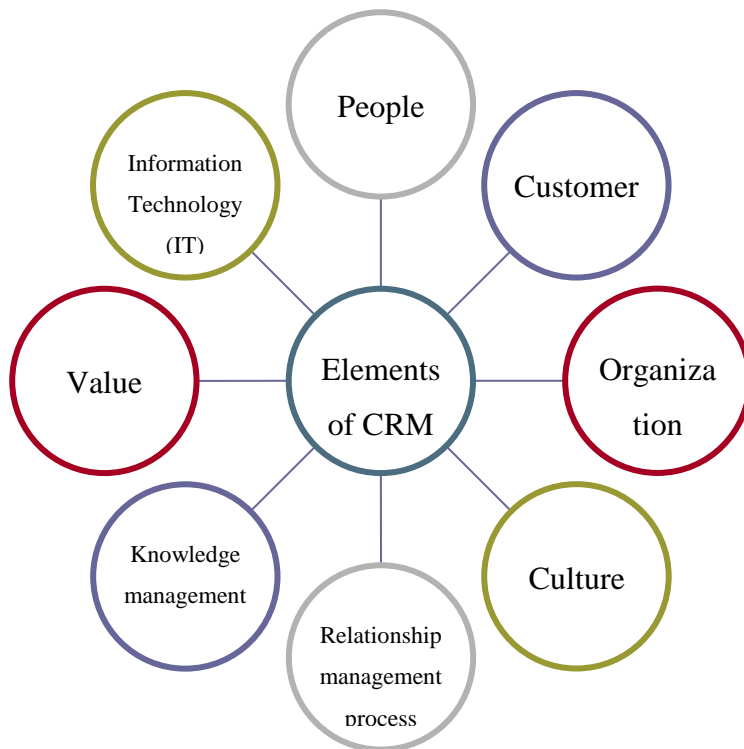


Figure 1 Elements of CRM [Source: own]

Multiple CRM factors approaches by different researchers includes: reliability, responsiveness, commitment, customization and customer orientation, long-term relationship, customer attraction, retention and acquisition, information technology (IT), knowledge management and web enabled customer service, competitive advantage,

consumer buying behaviour, customer satisfaction and customer value etc. (Kamrul Islam Shaon, Rahman, 2015) Some of these factors further are going to be explained in detail.

Relationship between a company and a client might include various outcomes. Based on those possible customer behaviour scenarios all CRM activities can be divided into the four following categories:

1. *Customer acquisition*: it is a process of acquiring new customers. This activity can be evaluated as a major one.
2. *Customer retention*: is a process of preserving and developing relationships with already acquired customers.
3. *Customer churn*: an activity of managing the rate of existing customers leaving the company. It is also sometimes referred as customer attrition.
4. *Customer win-back*: it is a process of returning customers who had left the company through the customer churn. (Kumar and Peterson, 2012)

In other literature sources, same CRM activities are classified in a slightly different way, focusing more on the existing relationship and ignoring activities that follow possible customer churn. Thus Swift, Parvatiyar and Sheth and Kracklauer, Mills, and Seifert divide all CRM activities into four dimensions:

1. Customer Identification;
2. Customer Attraction;
3. Customer Retention;
4. Customer Development. (Ngai, et al., 2009)

But what is the practical meaning of the possible customer behaviour outcomes to the firm and how to evaluate its monetary value? To have a clearer practical understanding of the financial value of a relationship with a client to the company *customer value* is estimated. It can be expressed as a contribution margin or a net profit of the particular client relationship. Customer value is often used to evaluate company's marketing efforts. But as an index it doesn't carry any time margin. It can be decided, for example, to use a timeframe of an exact marketing campaign. Therefore, in order to generalize the customer value and make the index more particular in the means of time, *customer lifetime value (CLV)* can be calculated. CLV considers the economic value of a trading relationship between the company and the customer during a whole customer lifetime. Customer

lifetime lengths is decided based on an industry specific – some goods are bought less frequent than the others. Commonly used period is three years. (Kumar and Peterson, 2012)

CRM consists of guidelines, procedures, processes and strategies which provide organizations the ability to merge customer interactions and keep track of all customer-related information. (Soltania, 2016) Thus CRM includes relationship (interaction) itself and the analysis of it. These parts can be referred as (Tolidi, et al., 2012):

- Analytical CRM
- Relational CRM

Analytical CRM gets, stores, extracts, interprets and reports the customer data. Nowadays it totally relies on IT. It combines various data technologies such as data storage, management systems for databases, data exploration tools and commercial analysis software. Analytical CRM aims to provide decision support for strategical marketing planning.

Relational CRM includes all various means of communication and collaboration with client, customer support and education, interactive sales. Among the tools for relational CRM are phones, email, fax, web pages, project management and project collaboration tools, e-learning systems for clients, broadcasting, chat and instant messaging applications. On the contrary with analytical CRM which can be considered a set of internal processes, relational CRM includes external interactional processes.

Both analytical and operational CRM are aiming to achieve the same goals:

- To create customer satisfaction through offering better services;
- To increase income;
- To increase number of customers securing customer loyalty by reorganization and computerization of customer relationship life-cycle processes (sales, marketing, customer support);
- Thus, to decrease sales and distribution costs;
- To minimize customer supporting costs;
- Achieve better knowledge of customers;
- Monitor sales and marketing information in real time to support decision making process. (Bergeron, 2001)

Methodology used to achieve those goals is described in the following part.

1.3.1 Methodology of CRM

In terms of company organizational structure all CRM technologies can be divided into 3 general categories (Tolidi, et al., 2012):

1) Operational CRM

In this method, all the processes of communication with customer from marketing and sale stage till after sales services and receiving feedback is entrusted to a person in a way that retailers and service engineers can access to each customer's record without referring to this person. SFA (sales force automation) is one of the operational CRM tools methods that is responsible for all related operations of contact management, stock and sales department management. CSS (customer service software) is another tool of operational CRM that utilizes various means of communication such as internet, fax, face to face communication and special kiosks instead of phone communication.

2) Analytic CRM

Analytic CRM utilizes tools and techniques for analysis of data obtained from operational CRM. Results of this analysis are making direct impact on commercial performance management. Moreover, analytic and operational CRM are in a bilateral interaction: operational data serves as a source of analytical activities followed by management decisions that are adopted again by operational department. All the customers are categorized and segmented with analytical CRM tools and that provides company with an opportunity to diversify its marketing strategy focusing on each special segment of customers.

3) Cooperational CRM

In this method, the easiest and direct tools of communication to customers are used, such as phones, cell phones, fax and personal eye-to-eye communication. Cooperational CRM is aimed to establish relationship on a personal level that will cause customer to visit again because he can choose both method of communication and most of the applied processes.

General methods used in CRM are drawn above, but to launch a successful CRM project it is essential to have an *overall integrated methodology*. It begins with considering and

defining company strategy utilizing tools like SWAT analysis and process-oriented analysis for marketing, financial and information technologies separately. (Hoffberg, 2003)

To solve the problem of lack of integration between CRM methods and tools, a group of scientists from Universitat Jaume I in Castelló'n, Spain, has been developing a "CRM-Iris methodology" since year 2000. The program development and deployment of CRM system proposed by researchers in the CRM-Iris methodology can be summarized in the following sections (Chalmeta, 2006):

1. Project management and prerequisites.

Before the project begins, objectives are defined alongside with the vision of what the results should be. Project plan is built and approved, and management is familiarized with it. When the project is in process, monitoring is carried out, resistance to change is prevented, staff is motivated, and results are accessed. (Chalmeta, 2006)

2. Definition of the company's organisational framework.

On this step, current company's objectives (mission, vision and strategy) and its culture (policy and values) are analysed. If the analysis detects that some of the mentioned elements are not defined well or are incompatible with CRM approach, then they get revised. By the end of this step the Vision, Mission, Organisational Strategies and Company Aims are identified. (Chalmeta, 2006)

3. Definition of a customer strategy.

This step includes: *customer identification* – who are the customers and behaviour of which of them is a subject of company's control; *analysis of customer profitability* – customer segmentation, customer-based cost modelling, calculation of customer value; *customer objectives definition* – definition of short, medium and long-term strategies per segment and/or per individual customer. (Chalmeta, 2006)

4. Designing a customer relationship assessment system.

Construction of a measurement system fed by information, part of which will come directly from the customer (mechanisms of customer feedback are developed) and part will be extracted from the company's databases. System of indicators is chosen according to quality dimensions extracted from customer feedback, indicator's weight and measurement criteria are the subject of a careful consideration and comparison with systems used by competitors. (Chalmeta, 2006)

5. *Process map.*

It's a step of reengineering existing business process according to the objectives, values and strategy designed on previous steps. It begins with accessing current situation (the AS-IS) interviewing employees and building process map. A "process map" visually describes the flow of activities of a process. (Chalmeta, 2006) Process maps come in many different forms but they all tend to use a SIPOC format and a standard UML for symbols. The most common process map types include: High-Level Process Map, Process Flow Chart, Cross Functional Process Map, Work Flow Diagram etc. After the process map is built the next step is designing how the processes should be (TO-BE). To measure the improvements made it is best to have a reference model. (Anderson, 2017)

6. *Human resources organisation and management.*

Company employees go through education and team reorganization during this step of CRM project. They are conveyed an idea of importance of customer oriented approach and briefed through the outline of the project. Alongside with changing the company culture, the CRM project requires a restructuring of company's organizational diagram, as "customer teams" of staff from different departments are to be built up. (Chalmeta, 2006)

7. *Construction of the information system.*

This step of the project ensures that company owns all the right technologies for automating and improving business processes related to management of relations with customers, such as sales, marketing and after-sales service software. Without it is impossible to truly implement the CRM change. All activities carried out with customers must be stored in company databases. (Chalmeta, 2006) The key to designing a company CRM computer system is the intelligent integration of technological and functional components that allows a connection between the *front office* (sales, marketing and customer service) and *back office* (financial, logistics, warehousing, accounting, human resources, and so forth) systems (Strauss and Frost, 2002).

8. *Implementation.*

This stage supposes actual migration of the company from AS IS to TO BE state. It is supposed to go according to a Total Quality Plan and all the result are controlled in accordance with it. The main project can be broken down into a series of shorter and easier controlled sub-projects that are prioritized, and the value of investment needed is

estimated. Proper management of change and prompt communication between project teams is crucial on this step. (Chalmeta, 2006)

9. Monitoring.

Monitoring step is simultaneous with the actual project implementation phase. It is conducted using indicators that have been defined on the first four stages of the project development. In addition, a quality assurance method must be established to check that the desired changes have been implemented effectively. (Chalmeta, 2006)

All the activities in different steps of Iris-CRM methodology are dependent on one another but not carried out sequentially. Relationship between them is shown in the Fig. 2.

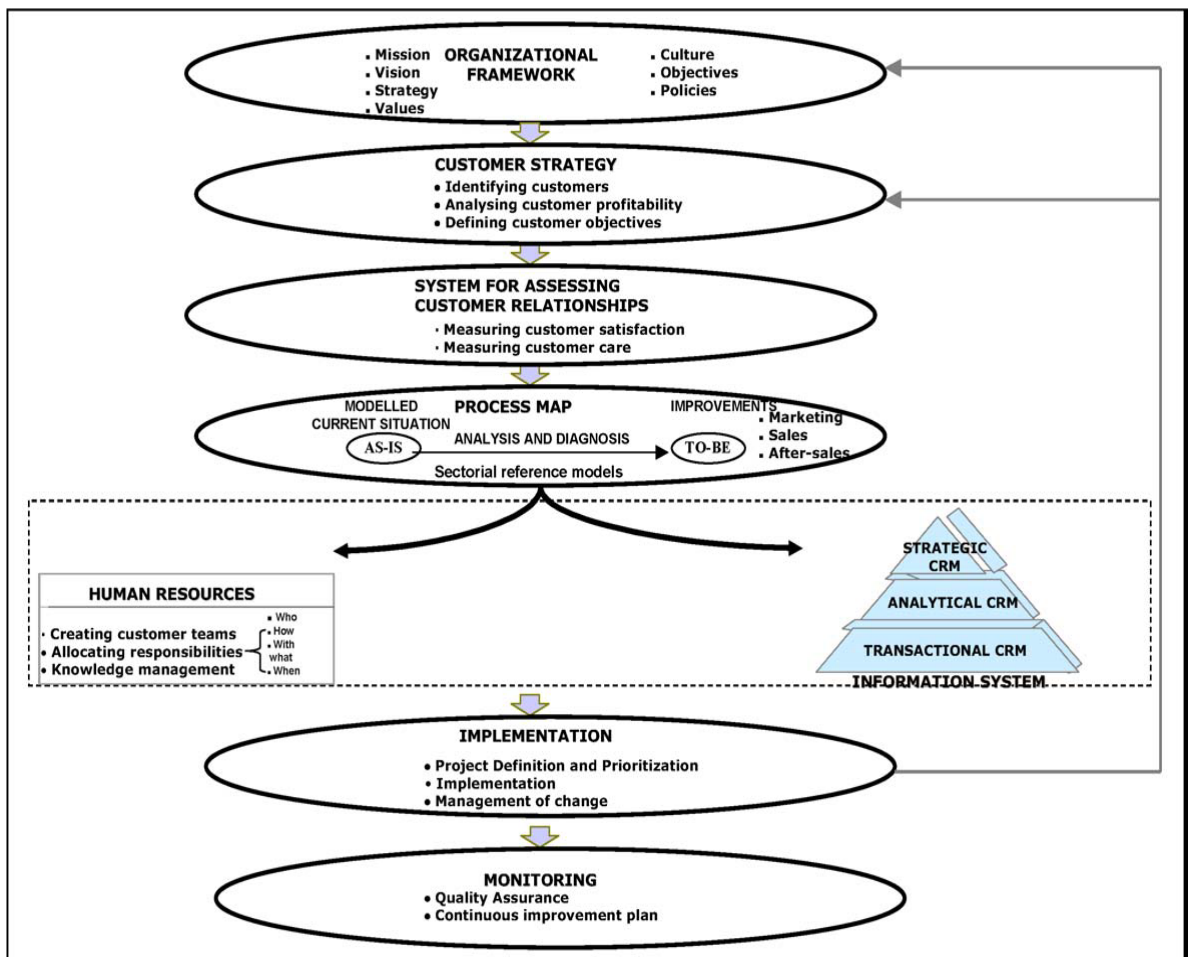


Figure 2 CRM-Iris methodology [Source: Chalmeta, 2006]

1.3.2 Factors of success of CRM strategy

Creating an efficient CRM strategy is a challenging task for management, and many companies fail to thoroughly plan it or to properly execute every part of the strategy. Graph below represent data about CRM strategy failure rate, gathered by different research projects starting from year 2001 and up 2014. From the graph we can see, that just 15 years ago at least each second CRM project was not successful. And though since that time situation has improved, chances that CRM strategy won't work are still too high.

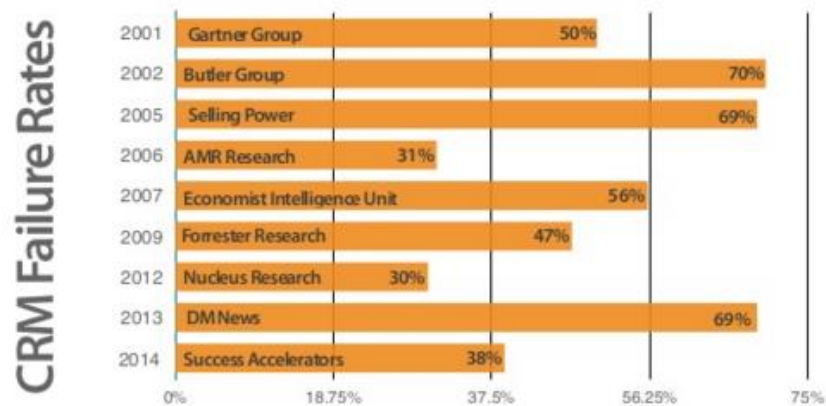


Figure 3 CRM Failure Rates Statistical Reporting [Source: Squid, 2015]

Considering these statistics and the evidence of the importance of having a close relationship with the customer for the companies' future, it is crucial to measure impacts and handle every element related to CRM with careful attention. It is very important to identify factors of success and failure of CRM project and define the ways to access and monitor those factors inside the organisation.

As follows from the research performed in University of Simon Bolivar, Venezuela, these success factors cover the three key aspects of every CRM strategy: *human factor*, *processes*, and *technology* (Mendoza, Marius, Pérez, & Grimán, 2007). This division correlates well with the 3 of the main steps of CRM-Iris methodology described earlier, more precisely with process mapping, human resources management and construction of information system steps.

In their research Mendoza et. al. has offered and accessed using featured survey analysis *13 critical success factors* of a CRM project which are as follows:

Table 1 CSFs classification according to human factor, processes and technology [Source: Mendosa et al, 2006]

ID	CSF	Human factor	Processes	Technology
1	Senior management commitment	X		
2	Creation of a multidisciplinary team	X	X	
3	Objectives definition	X		
4	Inter-departmental integration	X	X	
ID	CSF	Human factor	Processes	Technology
5	Communication of the CRM strategy to the staff	X	X	
6	Staff commitment	X		
7	Customer information management			X
8	Customer service		X	X
9	Sales automation		X	X
10	Marketing automation		X	X
11	Support for operational management		X	X
12	Customers contacts management			X
13	Information systems integration			X

Just as any other tool, CSF's must always be updated, revised and adapted to the environment where they are to be applied.

Table 2 Main causes of the failure of CRM strategy [Source: Strauss and Frost, 2002]

No	Cause of strategy failure	Reasons explained
1	<i>Thinking that technology is the solution</i>	CRM is considered as being another new technology instead of being a new business approach. But technology only brings value after business objectives have been thoroughly reconsidered.
2	<i>Lack of management support</i>	Company management doesn't understand or lack knowledge about CRM integrated approach and the value it can create for a company thus initiatives get stuck.

3	<i>There is no “passion for the customer” in the organization’s culture</i>	Company culture was not revised before implementation of customer-oriented approach.
4	<i>Lack of vision and strategy</i>	CRM is being implemented unsystematically without a well-defined strategy and measurable business goals.
5	<i>Not redefining processes</i>	As CRM strategy includes few layer referring to different activities inside an organization, to achieve targeted results it is important to redefine business processes in all departments simultaneously.
6	<i>Poor quality data and information</i>	Leads organization to drawn wrong conclusions from analytical CRM.
7	<i>Not managing the change properly</i>	Proper management of change and of the organizational culture is crucial for finalizing successfully the process of change.
8	<i>Not involving the final users in designing the CRM solution</i>	When the process of system development doesn’t involve end-users, the ready solution might bring more problems than benefits and create obstacles for existing processes.

Lack of user adoption, according to Forester Research, is responsible for 70% of failed CRM projects. (Maxie, 2015)

1.3.3 Information technology for CRM

A CRM IT solution combines the acquisition of customer information from the company with the application of a series of technologies for managing that information and converting it into business knowledge. Examples of such technologies are life chat, customer self-service, multi-channel management software (Borowski, 2016), data warehousing/OLAP, data mining, statistical analysis, and others. (Chalmeta, 2006)

A company uses CRM in the field of research methodology, technology and e-commerce in order to manage customer relationships (Foss and Stone, 2001). This definition

emphasizes ability of CRM to utilize IT and apply them to the customer relationship domain.

According to Chalmers, all information technologies for CRM can be divided in 4 main categories:

- Transactional (operational) CRM applications
- Analytical CRM applications
- Strategic CRM applications
- e-CRM applications

One of biggest challenges today is to build CRM information systems, realizing that they are not isolated from another internal systems of the business, and should be integrated with them and between one another.

Main types of information systems that serve for different CRM purposes are described as follows:

1. *Information systems (IS)*

To offer a solution that allows managing the flow of information between the different types of systems, organizations have introduced *enterprise systems*. These systems incorporate client data from all the departments.

2. *Software for CRM*

These are multi-functional solutions, directed at consolidating the management of information and the automation of client-interaction processes – such as marketing, field sales, and call center sales and services.

3. *Sales force automation (SFA)*

Sales force automation (SFA) software is a type of program that automates business tasks such as inventory control, sales processing, and tracking of customer interactions, as well as analyzing sales forecasts and performance.

4. *Data warehouse and data mining*

Established repository of the data generated by the systems of a company, making them accessible and easy to read to other people and systems.

5. Help desk

Can be built with an inward approach – to support employees, or with an outward approach – to provide support for customers. Both are equally important, though inward help desks are often underestimated by company management and neglected.

6. Internet influence

Special team, often a *contact center*, that works on creating company presence online.

7. Call centers

External or internal customer support centers that specialize in responding to customer-related issues (such as complaints, inquiries, product warranty concerns etc.). (L.E. Mendosa, 2007)

1.4 Customer attrition management in details

1.4.1 Customer attrition: causes and consequences

When it comes to the reasons of why a customer would decide to leave a company he or she has been dealing with, attrition does not necessarily mean that it is due to the change in the client's point of view regarding that company and the product it offers. Sometimes it could simply be an involuntary customer attrition, and in cases like that, there is almost nothing that company can do to manage this situation. The client could be deceased or even dead, or simply has decided to move to another county, where that company doesn't operate.

Analysing voluntary customer attrition is not a simple task, but this analysis has to be performed in order to keep market positions. Thus, the Voluntary attrition is the main point of discussion and research, as it reflects the relationship between the client and the company.

Mobile Network Operators (MNO) gain revenue mainly through Calls, short text messages (SMS), Media Text Messages (MMS), Voice Mails, Internet services and others. With the wide spread of the internet, it makes it easier for people to communicate with each other. Online instant messaging solutions has offered tremendous benefits for the users, such as ability to send emojis, conduct Real time video chatting, share links, group conversations, built in custom effects to a client's photo and more. Meanwhile if a client would send an

SMS he or she would only be limited to send a basic text message that is also bottlenecked by the maximum amount of characters to be sent per SMS. (Gibbs, 2008)

With the rise of Mobil instant messaging and companies such as Skype, Whatsapp, Viber, arrival of the new service has causes a wave of voluntary customer attrition. (e.g., Dialog Consult & VATM, 2014; Ofcom, 2014). MNO were dealing with a decline or an average revenue per user, while Cisco had to handle swelling mobile applications data traffic. Room for raising prices was limited, and MNO were forced to “prey” from the subscribers of their competitors. (Gerpott, Ahmadi, 2015) Today being able to offer users the service of mobile Internet connection on a competitive level is a market requirement for MNO.

And still, there are alternative ways to get connected to the internet without the need to deal with MNOs. It could be done by connecting to WiFi, which leads customers to deal with Internet Service Providers (ISP); or simply by connecting to a Free WiFi hotspot, though availability of such free access depends a lot on the city where one lives.

The second major cause of Voluntary attrition is switching to another competitor in the same industry. Providing a high level of service quality is very important for service providers to compete with other competitors (Bharati & Berg, 2005; Kemp, 2005; Yoo & Park, 2007). (Gerpott, Ahmadi, 2015)

According to Anderson et al., Customer Satisfaction can be defined as an overall evaluation depending on the purchase and consumption experience made by the customers of a good or service over time. (G.R. Diaz, 2017) Thus, customer can be unsatisfied with one’s current MNO and would like to join another, due to for several reasons such as high cost of services, poor network quality, unfriendly customer support and reclamation management or bad social image of the MNO.

To conclude, it is legit to say, that reasons of customer attrition can be divided based on company internal, subscriber personal and external market cause. Decrease in service quality or variety and unsatisfactory customer support service can be listed as major internal reasons. Constantly evolving fluid market, where new possibilities and services are appearing frequently, can be considered the major external cause of voluntary customer attrition. And apart from that, customer might have personal circumstances that force him to switch a service provider without changing opinion about their services.

1.4.2 How to manage customer churn?

Customer switching behaviour can be defined as the behaviour of a customer who is not satisfied with the current services and therefore changing to the subscription of services from another provider (Calvo-Porrall & Levy-Mangin, 2015). Changing mobile service provider has not only benefits, but also disadvantages, such as switching costs, psychological cost while being accustomed to the new company culture and services, time costs and many more aspects. While companies are increasing their efforts into designing strategies to create more switching barriers for the customers, it is not possible to control the factors that increase the switching intention.

According to Lu et al. (2011) one of these factors is the availability of *attractive alternatives* in the market. It can be defined as the estimate that customer makes about the availability of other providers which will be able to give a likely satisfaction level or higher. Assumingly customer considers the reputation of competitor company, quality of service that will be offered to substitute the current one, and the overall image of competitor, from which the customer predicts that one would benefit more. The bigger is the market, the more competing market participants it contains – the more attracted the customer will be to alternative options, and consequently the higher will be the intention to switch the current MNO.

Managing customer attrition can be also called retaining customers. Studies suggests, that MNOs often use two approaches to develop customers' retention: first, increasing customer satisfaction so that customers are willing to stay; and second, making any switch or defection difficult for the customer by increasing switching barriers (Jones et al., 2000; Balabanis et al., 2006; Lu et al., 2011) (Calvo-Porrall et al, 2017)

When a company achieves a high customer retention, it is rewarded with higher sales revenue, and with the more retained clients that are more difficult for competitors to pressure on them to switch. (Diaz, 2017)

Another common way that has already been mentioned in this chapter is putting on customer increased switching costs. Switching Cost can be defined as the cost which occurs due to switching from one provider or operator to another. High switching costs have been considered as a key discouraging factor influencing customers' decision to remain in the relationship with a current service provider. (C. Calvo-Porrall et al, 2017)

The contract, or subscription, with a mobile services company may be maintained involuntarily because a customer is prevented by switching costs from changing provider. That is, even though some customers are not satisfied with their mobile communication providers, they do not wish to terminate the contractual relationship due to switching costs, becoming captive customers (Gerpott et al., 2001). Therefore, the higher the switching costs, the more customers are forced to remain with their current mobile services' providers. Finally, high switching costs may influence customer satisfaction, since consumers will perceive high switching costs as negative, and reducing their flexibility to switch providers (J.P. Levo-Mangin, C Calvo-Porrall 2015).

Another common way that MSP apply is to offer mobile devices at a low price or even for free, when customers subscribe a contract with a long-term permanence compromise. In turn, providers require to sign a long-term subscription contract, in order to make up what they have invested in the mobile device that was given for free (Gerpott et al., 2001). This way customers, who would like to benefit from a free or discounted mobile device offer, are forced to enter a long-term contractual relationship with the MSP, for at least 24 months or sometimes longer. This type of subscriptions is also called lock-in contracts, because the long-term agreement restrains customer from switching the provider. This practice also aims to lower the barrier for new customers entering the mobile services' market; but meanwhile insuring client base of MSP. (J.P. Levo-Mangin, C Calvo-Porrall 2015)

However, the last defense line of mobile service providers. when the preventive measures do not prevent customer from declaring decision to terminate their contracts, MNOs can additionally call their customers in the period between application and actual termination. Once provider has received a request for contract termination, it starts the win-back period before the termination takes place and becomes effective. The purpose behind this approach is to find out the reasons why the customer decided to leave, evaluate it, and then make a new offer, trying to convince the customer to withdraw their termination request. (Geprott, 2015)

3. Practical Part

1.5 Research background

Mobile communications are a relatively new market. Its development was depending on many social, economic and political factors and varied in different sides of the world. In Belarus it has begun in 1994, with the 320 users of mobile communications registered in the whole republic. This number has increased and reached 10 thousand by the year 1998. (TUT.BY, 2010) Number of mobile service clients in Belarus by the beginning of 2017 was exactly 11 439 866 people, which makes 120.4% of overall country population of 9 505 thousand people leaving in the country. Out of that number of clients, 5 115 781 people (44,7% of users) are using Internet connection from their mobile devices. According to the same report, 98.2% of the country territory is currently under mobile network coverage. (The Ministry of Communications and Informatization of the Republic of Belarus, 2016) (National Statistical Committee of the Republic of Belarus, 2016)

Thus 120 people out of 100 are using mobile services, which, according to the World Bank statistics, brings Belarus on the level of developed countries (128 people out of 100), while in developing countries number of mobile network users is 89 people out of 100. In comparison, Czech Republic had 115 users per 100 people in 2016 according to the same World Bank statistics. (World Bank, 2016) (Uniter, 2015)

There are three mobile service providers (MSP) in Belarus: MTC, Velcom and Life. According to market analysts, MTC is controlling up to 48% of the market, while Velcom is following close behind with 45% market share, and Life controls a small share of 7%. (Investment Company Uniter, 2015)

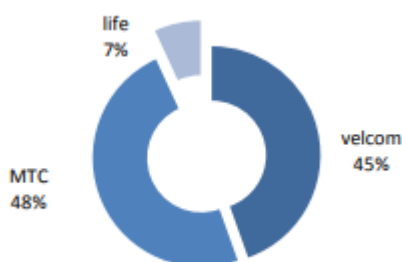


Figure 4 Market Share of Belarussian Mobile Service Providers, 2015 [Source: Uniter, 2015]

	MTC	velcom	life
ARPU	4,6	4,5	3,3

Figure 5 Average Revenue Per User Per MSP, euro [Source: Uniter, 2015]

All Belarusian MPS offer only prepaid subscription contracts. According to a service agreement, deduction of a monthly calculated service fee is conducted on a daily basis. It mostly ensures their income, but the negative side of that contract policy is that Belarusian users don't have to notify MSP in advance about their decision to cancel the client relationship. Thus, it's very important to identify the factors that lower client loyalty and satisfaction as well as if there is a relation between socio-demographical and service usage factors and likelihood of churn intention. Survey performed for this thesis paper identifies customers with the intention to churn before they have cancelled their contract.

1.6 Building a survey questionnaire

As it was mentioned in previous chapter, churn rate is the percentage of customers who have stopped using company's product within a chosen period of time. The main way to fight churn is to ensure that the value of the product to a customer remains on the same level. It can be done by different means such as improving services and re-evaluating company's marketing strategy. But before taking any action company should find an answer to the key question – what exactly makes customer unhappy and causes attrition. The most certain way to get this knowledge is to hear an opinion from the first hand – to conduct a customer survey.

To get useful and applicable results from a survey, company should have a very clear idea of the goal and objectives of the research. Thus, a first step of preparation for any survey is to define a clearly stated goal. A well-defined goal can be easily transformed into research questions. Research questions are very general, broad and statistically non-testable. Their aim is a further development of the research goal and formulation of hypotheses and null hypotheses to be tested. On the next step research questions serve as a basis for writing survey questions. (Walonick, 2012)

The objective of the survey is to research customer level of satisfaction with mobile connection services and their usage characteristics and discover which factors have the strongest impact on customer attrition decision.

For this thesis research, the investigation on the factors influencing customer's churn in the mobile communication services market of Belarus was based on the collection on 447 opinion-based answers from current mobile subscribers of all providers. The survey was conducted

online and offline during a period of one-week. Those methods of data collection were mixed to allow a higher reachability for users, to reach both common Internet users and people who don't spend much time online. Partly surveys were handed out in hospitals and universities, partly posted online and promoted in social networks. The questionnaire contains only multiple-choice questions.

The survey was open for a vast auditory, in majority of the cases there was no direct contact or personal relation between respondents and organizer of the survey. Thus, survey contained the introduction part, that has clearly stated the motivation behind the survey and the fact that all the gathered data will only be used for academic study purposes, won't be commercialized or passed over to any company or authority, and that information respondents have provided is confidential and as such, will not be used in any way to violate their privacy and anonymity. The survey questions were designed to be as clear and straightforward as possible, and an additional explanation was provided in the few questions with confusing terms, to assist users with a different level of topic understanding and technology proficiency.

The survey consisted of the four main sections:

- I. The first section investigates respondents' level of satisfaction and loyalty to their current mobile service provider through various questions that offer to evaluate user's level of agreement with a statement in 5-point Likert scale (with 1 – strongly agree to the statement and 5- strongly disagree to it).
- II. The second section of questions is designed to understand better the relationship of the customer with their service provider. It includes items on the service quality in terms of the connection and of the customer support services provided by the operator
- III. In the third section respondents are asked to evaluate the importance of different service factors and express their attitude to competing mobile service providers and their actual intention to switch the provider.
- IV. Questions in the section four draw a portrait of the survey respondent demography-wise through variables such as gender, age, occupation and education, and in terms of mobile service usage habits. Users provided information about their

average consumption and nature of calls, short text messages, mobile internet data, as well as the average monthly expenses on these services.

The full structure of the questionnaire is provided further. All questions were translated in Russian from English to make response collection possible, but in this paper original English version is provided.

1.6.1 Survey Questionnaire

Table 3 Customer Survey Questionnaire [Source: own]

No.	Question	5	4	3	2	1
Section I. Customer Loyalty and Service Satisfaction						
Customer Loyalty						
1	How likely is it that you recommend your provider to friends and acquaintances	Very likely	Likely	Neither likely or unlikely	Unlikely	Not likely at all
2	My provider has a good social image	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
Customer Satisfaction						
3	The decision to contract this company was wise	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
4	I receive service that I've expected	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
5	My needs are fully covered by the service	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
Service Value						
6	My provider's services have affordable price	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
7	My company offers good value for the money	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
Section II. Customer Service Quality and Customer Relationship						
Service Quality and Complaint Management						
8	Connection in the network of my provider is always available and of a good quality	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
9	I am completely satisfied with customer services in	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree

	provider's shops					
10	My complaints are always resolved in a prompt and friendly manner	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
11	Provider's shops are well located and have convenient working hours	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
12	Billing process is transparent, and bills consist no mistakes	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
Section III. Service Factors Evaluation and Churn Intentions						
13. Please rate factors listed below according to their influence on your decision to stay with your provider?						
1	Service quality	Extremely important	Very important	Moderately important	Not so important	Not important
2	Service development	Extremely important	Very important	Moderately important	Not so important	Not important
3	Customer support services	Extremely important	Very important	Moderately important	Not so important	Not important
4	Range of services	Extremely important	Very important	Moderately important	Not so important	Not important
5	Price	Extremely important	Very important	Moderately important	Not so important	Not important
Switching intention and competitor attractiveness						
14	I have intention of switching my mobile company soon	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
15	I think that another provider can satisfy my needs as well as current one	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
16	Other service providers are as good as mine	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
Section IV Demographics and Service Usage Characteristics						
Customer characteristics						
17	Gender	Male	Female			
18	Age	<18	19-26	27-34	35-42	43+
19	Education (highest level completed or currently pursuing)	High School	Bachelor	Master	PhD	
20	Occupation	Student	Entrepreneur	Employee	Retired	Unemployed
21	Personal average monthly income	< 200 BYN	200 – 400 BYN	400 – 800 BYN	> 800 BYN	Prefer not to answer

Characteristics of services used:						
22	My mobile network operator is:	Velcom	MTC	Life :)	Two of these	Other
23	I came to this company as:	New subscriber	From another provider			
24	I have been with this company for:	< 1 year	1 – 3 years	3 – 5 years	5 years +	
25	My service plan is:	Private customer plan	Corporative plan of my employer			
26	On average, monthly I make phone calls for:	<60minutes	60-120min	120-180min	180+	
27	Majority of my calls are:	Private calls	Working calls			
28	On average, monthly I send sms a total of:	0 – 60 sms (<2sms/day)	60-120sms (2-4sms/day)	120-180sms (4-6sms/day)	180+	
29	On average, monthly I consume Internet data:	0 – 500 MB	500 – 1GB	1GB +		
30	I use internet applications for calling (Skype, Viber, Facebook Messenger, Whatsapp)?	Yes	No			
31	The amount of my calls using internet applications is:	I don't use them	I use them only for texting, not for calling	Less than mobile network calls	More than mobile network calls	
32	On average, in a month, I spend for mobile services:	<5 BYN	5 – 10 BYN	10 – 15 BYN	>15 BYN	

The collected data sample is *cross-sectional*: all observations for multiple variables were collected at a single point in time for all the observed individuals of the sample. Even though the process of collecting survey data took one week, in terms of the researched topic this time period is very short term and can be considered as a single point.

To determine the necessary sample size, Krejcie – Morgan table was applied. According to their research, for every population of a known size over one million individuals, the sample size must consist of 384 data entries and further increase of the sample size doesn't bring a significant benefit. (Krejcie & Morgan, 1970)

The respondents in the study sample were *randomly* chosen, representing all age groups, occupation statuses and educational levels. More importantly, they are customers of all the mobile services providers, part of them is a client of more than one, which enables to measure the overall level of customer satisfaction with mobile services in Belarus and discover some consumption behaviour patterns, as well as determine, which of the factors tend to effect intention to churn the most.

1.7 Descriptive Analysis

Survey questionnaire consists of 32 questions that are represented in 36 variables in total. Out of these, 7 variables are quantitative data transformed into categorical, where respondents were asked to evaluate and place themselves in one of the proposed quantity categories. 9 more variables are qualitative variables, both nominal and ordinal. The rest 20 variables are responses to Likert scale questions. These variables are considered by different scientists to be either ordinal or interval variables. The major point of concern is the distance between categories on the scale: it is considered questionable if it is indeed equal, as it is presumed. The legitimacy of assuming an interval scale for Likerttype categories is an important issue, because the appropriate descriptive and inferential statistics differ for ordinal and interval variables, and if the wrong statistical technique is used, the researcher increases the chance of coming to the wrong conclusion about the significance (or otherwise) of his research. (Susan Jamieson, 2004) As in terms of this research we have used 5-option scale, which is considered to be symmetrical and more or less balanced in terms of the distance between responses, we are going to further treat Likert-scale variables as ordinal categorical variables.

1.7.1 Nominal Variables

In the survey data there are 8 nominal variables, which are as follows: gender, occupation, mobile services provider, new/churned subscriber, private/corporative service plan, private/work calls prevail, usage of Internet calling applications (binomial) and amount of Internet calls. Further we provide descriptive analysis of these variables, some of them in combination with ordinal variables from the next part of the chapter.

Variables: Gender. Gender and Amount of Calls

Among 447 participants of the survey there was 268 women (59.96%) and 179 men (40.06%). According to the official statistics, in year 2017 in Belarus the proportion of opposite sex is 53.47% female to 46.53% male (World Population Review, 2017). Thus, the sex proportion of respondent in the survey with a moderate overbalance of female respondents over male is explainable and can be considered realistic.

It is often stereotyped that women talk over the phone more than men. Thus, in the following step we've decided to pair gender statistics with the statistics about average amount of time spent talking on the mobile phone per month.

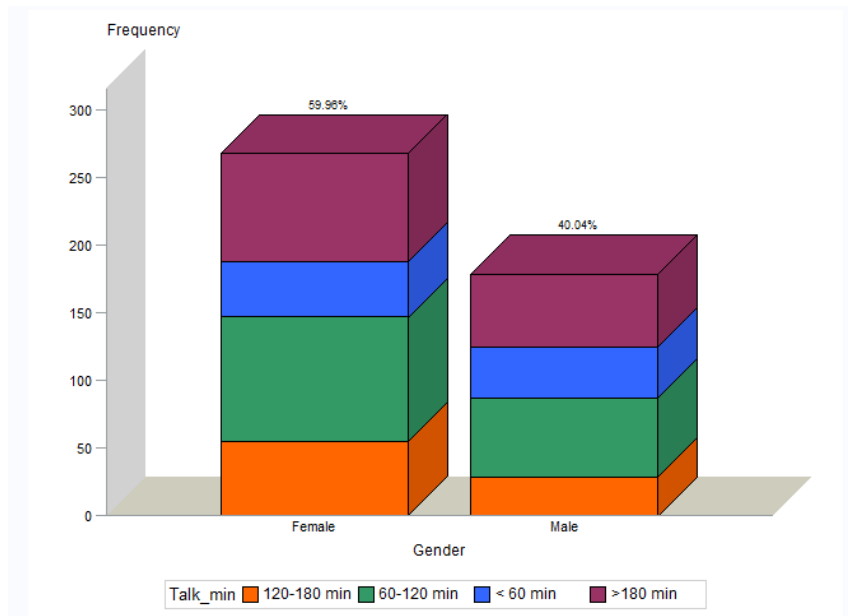


Figure 6 Amount of calls per month (min) based on gender [Source: own]

Table 4 . Average monthly calls, min grouped by Gender [Source: own]

Table of Gender by Talk_min						
		Talk_min				Total
		120-180 min	60-120 min	< 60 min	>180 min	
Female	Frequency	55	92	41	80	268
	Row Pct	20.52	34.33	15.30	29.85	
	Col Pct	65.48	61.33	51.90	59.70	
Male	Frequency	29	58	38	54	179
	Row Pct	16.20	32.40	21.23	30.17	
	Col Pct	34.52	38.67	48.10	40.30	
Total	Frequency	84	150	79	134	447

From this graph and table, we can see, that for both genders it is more common to spend either from 1 to 2 hours or more than 3 hours per month talking over mobile phone. It is

also worthy of note, that percentage of people who talk more spend talking than 3 hours per month is almost the same between genders – 30 % of all respondents.

Variables: Occupation. Occupation and Education

The next table is going to provide some insight on respondents’ social background.

Table 5 Respondents’ occupation grouped by education level [Source: own]

		able of Occupation by Edu				Total
		Edu				
		Bachelor	High School	Master	PhD	
Employee	Frequency	215	16	35	8	274
	Row Pct	78.47	5.84	12.77	2.92	
	Col Pct	70.49	17.98	77.78	100.00	
Entrepreneur	Frequency	28	7	6	0	41
	Row Pct	68.29	17.07	14.63	0.00	
	Col Pct	9.18	7.87	13.33	0.00	
Retired	Frequency	19	5	2	0	26
	Row Pct	73.08	19.23	7.69	0.00	
	Col Pct	6.23	5.62	4.44	0.00	
Student	Frequency	25	56	1	0	82
	Row Pct	30.49	68.29	1.22	0.00	
	Col Pct	8.20	62.92	2.22	0.00	
Unemployed	Frequency	18	5	1	0	24
	Row Pct	75.00	20.83	4.17	0.00	
	Col Pct	5.90	5.62	2.22	0.00	
Total	Frequency	305	89	45	8	447

From this table we can draw the following observations:

- Only 5.84% employees that took part in the survey didn’t have a degree;
- 75% of unemployed respondents have a bachelor degree, 4.17 % more have a master degree;
- 62.92% of participants with a high school diploma are currently students, and only 17.98% are working after school;
- Among older generation that has already retired percentage of people with only school education is higher and reaching 19.23%.

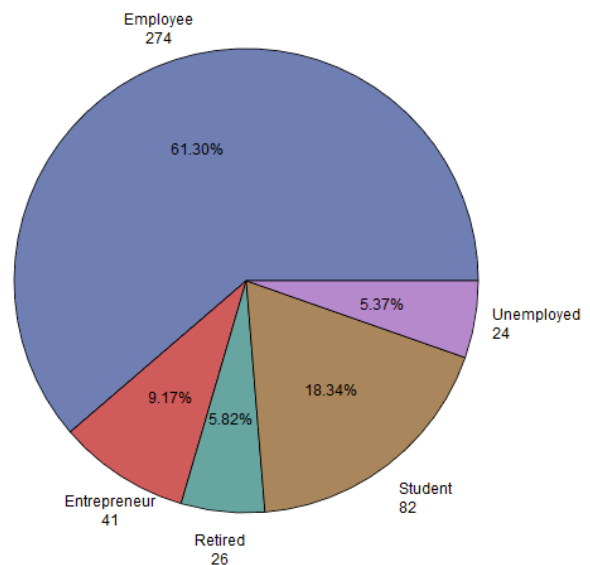


Figure 7 Occupation Chart [Source: own]

Variables: Mobile Service Provider

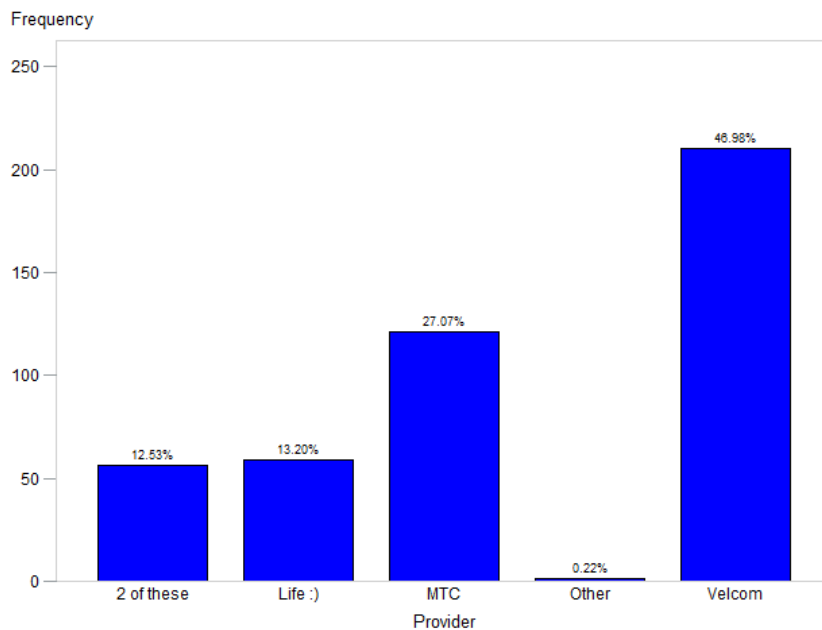


Figure 8 Bar chart of Mobile Service Providers (MSP) Frequency [Source: own]

As it was mentioned earlier, according to market analysis report from 2015, Belarussian market of mobile communication services is divided between 3 MSP in the following proportion: MTC is controlling up to 48% of the market, Velcom is following close behind with 45% market share, and Life controls a small share of 7%. But this data doesn't reflect the fact that many subscribers in Belarus have more than 1 sim card from different providers, mostly because calls to the network of the different provider were always unreasonably costly. In the survey questionnaire we've had an option "2 of these providers", which ended up getting 12.53% of responses. Answer "Other" represent 1 respondent, who stated that uses services of all 3 providers.

As we can see, percentage of subscribers for Velcom and MTC among survey participants varies significantly from the market data of year 2015. At least 46.98% subscribers are using Velcom, and that is without counting subscribers of 2 MSP simultaneously. Thus, we should test these results to check if they can be approximated on population level.

We have performed one-sample testing of proportion with the null hypothesis: the real proportion of people in Belarus using services of Velcom MSP only is not different from 46.98% using an 95% level of confidence.

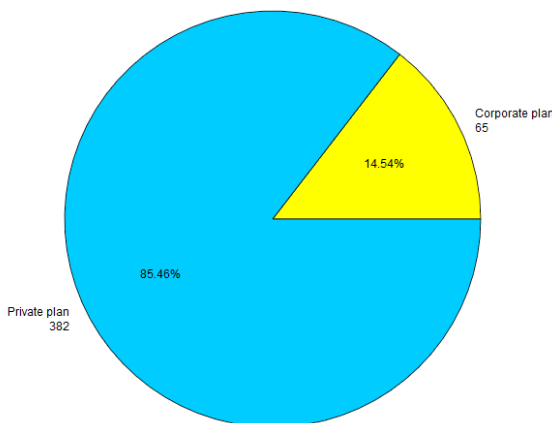
H_1 is: the real proportion of Velcom-only subscribers is different from 46.98%.

Binomial Proportion Provider = Velcom		Test of H0: Proportion = 0.4698	
Proportion (P)	0.4698	ASE under H0	0.0236
ASE	0.0236	Z	-0.0001
95% Lower Conf Limit	0.4235	One-sided Pr < Z	0.5000
95% Upper Conf Limit	0.5161	Two-sided Pr > Z	1.0000
Exact Conf Limits		Exact Test	
95% Lower Conf Limit	0.4227	One-sided Pr >= P	0.5185
95% Upper Conf Limit	0.5173	Two-sided = 2 * One-sided	1.0000

Figure 9 One Sample Frequency test for Ho

After performing the test in SAS, we compare the generated p-value=0.5185 with our alpha level of 0.05. P-value is greater than the alpha level, thus the null hypothesis can be accepted. It confirms that with 95% confidence, the proportion of people subscribed to only Velcom MSP in Belarus is not statistically different from 46.98%. We can see that their market share has increased since year 2015.

Variables: Private / Corporate Service Plan



As we can see on the pie chart, majority of 85.46% of respondents are using private standard service plan, while 14.54% have access to corporative customized service plans, which are mostly include some benefits that are not available to basic users, such as free calls inside company network and extended roaming options.

Figure 10 Private / Corporate Service Plan [Source: own]

Variable: New/Churned Subscriber

In this question we've asked respondent to indicate if they have come to their current provider as a first-time service subscriber, or they were already using mobile services with a different service provider and changed the MSP. As follows from the picture below, survey results have shown that 76.96% of respondents have never changed their MSP before, while 23.04 % did change.

New_Churn	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Churned subscriber	103	23.04	103	23.04
New subscriber	344	76.96	447	100.00

Figure 11 New and Churned Service Subscribers [Source: own]

On the next step we would need to find out, if the same proportion can apply for the population of Belarus. We have performed one-sample testing of proportion with the null hypothesis: the real proportion of people in Belarus who have changed their MSP before is not different from 23.04% with a 95% level of confidence.

H_1 is: the real proportion of people who have changed their service provider is different from 23.04%.

Binomial Proportion		Test of H0: Proportion = 0.2304	
New_Churn = Churned subscriber		ASE under H0	0.0199
Proportion (P)	0.2304	Z	0.0013
ASE	0.0199	One-sided Pr > Z	0.4995
95% Lower Conf Limit	0.1914	Two-sided Pr > Z	0.9990
95% Upper Conf Limit	0.2695		
Exact Conf Limits		Exact Test	
95% Lower Conf Limit	0.1922	One-sided Pr >= P	0.5179
95% Upper Conf Limit	0.2723	Two-sided = 2 * One-sided	1.0000

Figure 12 One-sample frequencies test results [Source: own]

As we can see from the results of test performed in SAS, p-value=0.5179 is higher than our alpha level of 0.05. That means, the null hypothesis can be accepted and with 95% confidence we can state, that 23.04% of Belarussian population has changed their mobile service provider before.

Variable: Usage of Internet Applications for Calling

The survey contained 2 complementary question asking if people were using mobile applications for Internet message exchange and calling, such as Skype, Viber, Facebook Messenger, Whatsapp etc. While first question was asking if respondents ever use it, the second one was clarifying details about on usage habits. Following table and graph represent responses to those questions.

Apps_Call_YN	Frequency	Percent	Apps_Call_Amm	Frequency	Percent
No	77	17.23	I don't use them	106	23.71
Yes	370	82.77	Only texts, no calls	123	27.52
			less than mobile network	181	40.49
			more than mobile network	37	8.28

Figure 13 Usage of Application: Yes/No and Purposes of use [Source: onw]

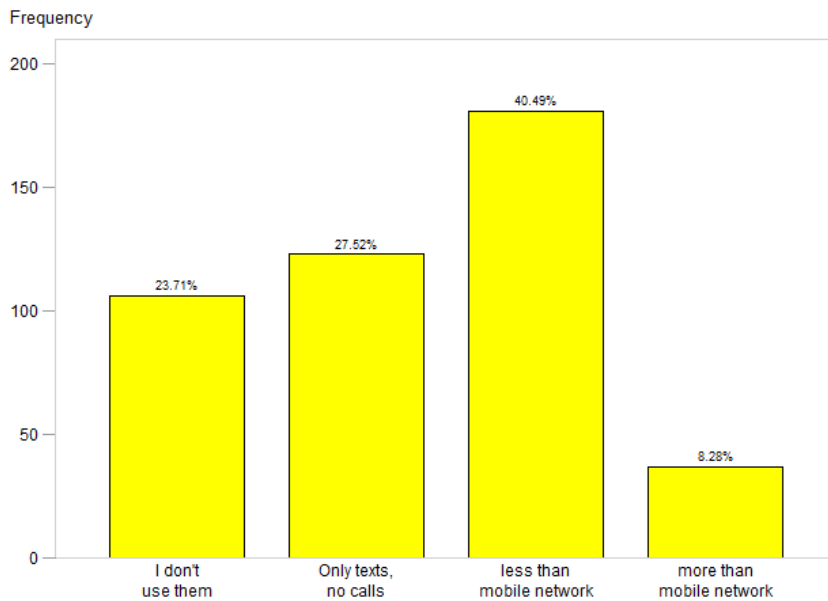


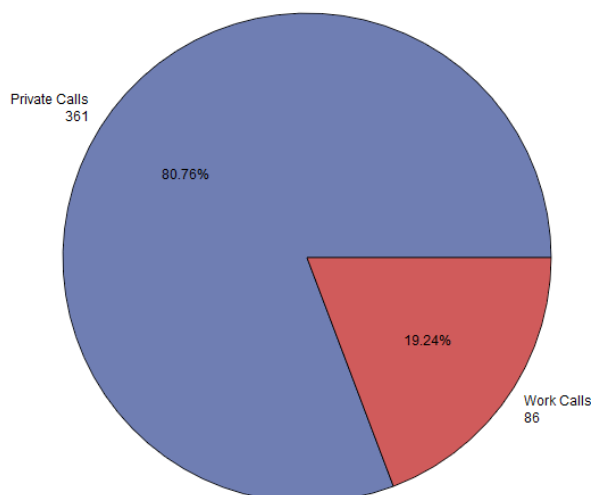
Figure 14 Purpose of Use of Mobile Applications for Calling and Messaging [Source: own]

As we can see from the tables, there were 17.73% of people, who stated, that they don't use mobile applications for calls. But later, already 23.71% said, that they don't use applications. Perhaps, this difference can be explained as a difference between people who don't have them installed and who do have apps, but don't use them.

There's also 8,28% of respondents, who use Internet application for calls more often than a regular mobile network.

Variable: Private/Work Calls Prevail

Next pie chart represents distribution of people by main purpose of their calls. Respondent were asked to indicate if majority of their calls has business or personal nature.



As we can see on the chart, 19.24% of people make more calls due to work-related issues. But majority of respondents, 80.76%, call mostly for personal reasons.

Figure 15 Main Purpose of Calls [Source: own]

1.7.2 Ordinal Variables

Just like nominal variables, ordinal variables have two or more categories. However, unlike nominal variables, ordinal variables can also be ordered or ranked (i.e., they have levels).

In the survey data there are 8 ordinal variables, which are as follows: age, education, personal average monthly income, average monthly service expenditure, monthly data consumption, monthly amount of SMS, monthly amount of calls and years being client of the same MSP. All these variables are ordinal, because they include levels that can be easily ordered based on the increase of amount. Education is also considered to be an ordinal variable, as it has levels that follow one another based on the number of years needed to obtain a next degree.

Age and Data Consumption.

The following pie chart represent age distribution of respondents between the following categories: before 18 years old, 19-26 years old, 27-34 years old, 35-42 years old, older than 42.

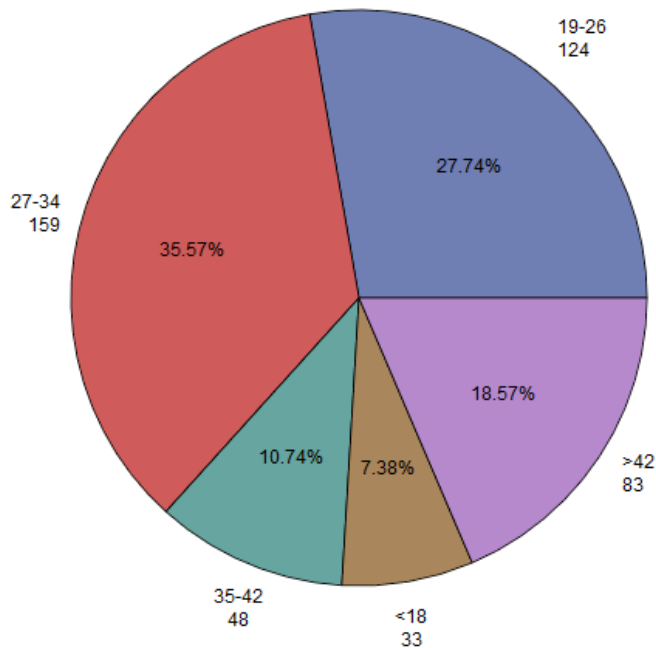


Figure 16 Age Distribution of Respondents [Source: own]

As we can see from the chart, all the age categories are represented in survey results. Nevertheless, majority of responses belongs to people with age below 34 years. That can be considered a specific of online surveys. Though only half of all the responses was collected online, the majority of active Internet users are of younger age, which has affected the overall proportion.

Following this idea, as our next step we have built a 5x3 contingency table of age and average monthly

data consumption, aiming to check if there is a dependency between the age of subscribers and amount of Internet data consumed monthly.

Data consumption is represented in survey data in 3 diapasons:

- 0 – 500 MB
- 500 – 1GB
- 1GB +

Contingency table of these 2 variable and test results are as follows.

		Table of Age by Data_Tr				
		Data_Tr			Total	
		0-500 mb	500 mb - 1 Gb	> 1 Gb		
Age	19-26	Frequency	25	22	77	124
	Expected	34.121	29.96	59.919		
27-34	Frequency	23	45	91	159	
	Expected	43.752	38.416	76.832		
35-42	Frequency	13	17	18	48	
	Expected	13.208	11.597	23.195		
<18	Frequency	11	6	16	33	
	Expected	9.0805	7.9732	15.946		
>42	Frequency	51	18	14	83	
	Expected	22.839	20.054	40.107		
Total	Frequency	123	108	216	447	

Statistic	DF	Value	Prob
Chi-Square	8	79.5111	<.0001
Likelihood Ratio Chi-Square	8	77.9024	<.0001
Mantel-Haenszel Chi-Square	1	59.0853	<.0001
Phi Coefficient		0.4218	
Contingency Coefficient		0.3886	
Cramer's V		0.2982	

Statistics for Table of Age by Data_Tr

Figure 17 Contingency Table and Tests for Age x Monthly Data Consumption

We want to check if there is relationship between customer age and monthly amount of Internet data consumption, or is there a possibility to predict customer's monthly traffic simply by knowing the age of a customer. As number of observations in our sample is more than 40 and no expected frequencies are less than 5, we shall employ **Chi-Square test**, and define null and alternative hypothesis as follows:

- H_0 : There is no relationship between Monthly Data Consumption and age, at $\alpha=0.05$.
- H_1 : There is a relationship between Monthly Data Consumption and age, at $\alpha=0.05$.

The calculated Chi-square value is 79.5111, which is greater than the theoretical chi-square value of 15,507 for 8 degrees of freedom; therefore, H_0 is rejected. In addition, the P-value 0.0001 is less than our alpha value 0.05 meaning H_0 is rejected. Thereby we prove the dependency of monthly data consumption from the customer age.

Power of Dependency (Coefficient of Association): Co-efficient of Association 0.4218 shows a moderate level of dependence.

Statistic	Value	ASE
Gamma	-0.4042	0.0545
Kendall's Tau-b	-0.2877	0.0406
Stuart's Tau-c	-0.2962	0.0421
Somers' D C R	-0.2651	0.0373
Somers' D R C	-0.3123	0.0443
Pearson Correlation	-0.3640	0.0451
Spearman Correlation	-0.3279	0.0459
Lambda Asymmetric C R	0.1602	0.0320
Lambda Asymmetric R C	0.0972	0.0284
Lambda Symmetric	0.1252	0.0281
Uncertainty Coefficient C R	0.0830	0.0181
Uncertainty Coefficient R C	0.0594	0.0130
Uncertainty Coefficient Symmetric	0.0692	0.0151

Figure 18 PRE Measures for Age x Monthly Data Consumption

On the next step we shall analyze proportional reduction of errors (PRE) measures to learn if age of a customer can contribute in explaining monthly data consumption. As data consumption is ordinal variable, we shall use Goodman-Kruskal Gamma. Kendall's Tau-b and Somers' D. Our dependent parameter is in columns; thus, it will be Somers' D C|R.

Gamma coefficient ranges between 1 and -1. The closer you get to a 1 (or -1), the stronger the relationship. In our case, Gamma is -0.4042, which indicates, that there is a moderate negative dependency between age and data consumption: the higher goes age, the lower goes data consumption.

Meanwhile, values of Somers' D C|R and Kendall's Tau-b are closer to zero, indicating that age wouldn't be a good factor to predict monthly data consumption in other datasets.

Years with Same MSP / MSP

Next picture shows results for the question about length of customer relationship with the

CR_Length	Frequency	Percent
5 years +	307	68.68
3 – 5 years	67	14.99
1 – 3 years	48	10.74
< 1 year	25	5.59

same MSP in years. As we can see, majority of surveyed subscribers – 68,68% - have stayed with the same service provider for over 5 years.

Figure 19 Length of Customer Relationship With the Same MSP, years [Source: own]

We shall test, if this proportion will hold on the level of Belarussian population.

Binomial Proportion		Test of H0: Proportion = 0.6868	
CR_Length = 5 years +		ASE under H0	0.0219
Proportion (P)	0.6868	Z	0.0000
ASE	0.0219	One-sided Pr > Z	0.5000
95% Lower Conf Limit	0.6438	Two-sided Pr > Z	1.0000
95% Upper Conf Limit	0.7298		
		Exact Test	
Exact Conf Limits		One-sided Pr <= P	0.5178
95% Lower Conf Limit	0.6416	Two-sided = 2 * One-sided	1.0000
95% Upper Conf Limit	0.7296		

Figure 20 One Sample Tests for Length of Customer Relationship [Source: own]

H_0 is: the real proportion of people in Belarus using services of the same MSP for over 5 years is not different from 68.68% with a 95% level of confidence.

After performing the test in SAS, we compare the generated p-value=0.5178 with chosen alpha level of 0.05. P-value is greater than the alpha level, meaning that the null hypothesis can be accepted. It confirms that with 95% confidence, the proportion of people subscribed to the same MSP for over 5 years in Belarus is not statistically different from 68.68%. It shows that Belarusian market of mobile communications is quite stable, and customers tend to stay with the same provided for a very long time.

On the next step we have built a contingency table of length of customer relationship and MSP statistics. Our aim is to discover if there is any dependency between those two, meaning, if there is a provider that has more stable customers, than others.

		Table of CR_Length by Provider					Total
		Provider					
		2 of these	Life :)	MTC	Other	Velcom	
CR_Length							
1 – 3 years	Frequency	1	14	27	0	6	48
	Expected	6.0134	6.3356	12.993	0.1074	22.55	
3 – 5 years	Frequency	9	21	8	0	29	67
	Expected	8.3937	8.8434	18.136	0.1499	31.477	
5 years +	Frequency	45	15	82	1	164	307
	Expected	38.461	40.521	83.103	0.6868	144.23	
< 1 year	Frequency	1	9	4	0	11	25
	Expected	3.132	3.2998	6.7673	0.0559	11.745	
Total	Frequency	56	59	121	1	210	447

Figure 21 Contingency Table of Customer Relationship Length, years, to MSP [Source: own]

As we can see from the table, majority of respondents, who have long-term client relationship with their provider are clients of Velcom: 164 users, which is twice more than same category of users subscribed to their main competitor – MTC.

H_0 for this contingency table is that there is no dependency between length of customer relationship and particular MSP, at $\alpha=0.05$.

Over 30% of expected frequencies in the table are less than 5, thus we can not use Chi-Square test to evaluate our null hypothesis. Instead, we should use p-value of Fisher test.

P-value of Fisher test is less than our confidence level of 0.05, thus we can reject null hypothesis and accept H_1 that there is a dependency between between length of customer relationship and particular mobile service provider

On our next step, we shall check measures of proportional reduction of errors to see, if knowing the provider of mobile services can contribute to predicting the length of customer relationship between subscriber and service provider.

Statistic	Value	ASE
Gamma	0.2218	0.0611
Kendall's Tau-b	0.1376	0.0388
Stuart's Tau-c	0.1055	0.0299
Somers' D C R	0.1611	0.0452
Somers' D R C	0.1176	0.0336
Pearson Correlation	0.1583	0.0402
Spearman Correlation	0.1597	0.0450
Lambda Asymmetric C R	0.0886	0.0231
Lambda Asymmetric R C	0.0429	0.0419
Lambda Symmetric	0.0716	0.0207
Uncertainty Coefficient C R	0.0869	0.0161
Uncertainty Coefficient R C	0.1151	0.0210
Uncertainty Coefficient Symmetric	0.0990	0.0181

Figure 22 PRE Measures for Length of Customer Relationship and MSP

As we can understand from the values of Goodman Kruskal Gamma of 0.2218 and Somers' D R|C of 0.1176, that knowledge of mobile service provider can not be used to predict length of customer relationship.

From all the above observations we can conclude that event though there is a specific pattern in the current market situation, generally knowledge of the MSP can not be used for prediction of the

customer relationship length.

Personal Average Monthly Income

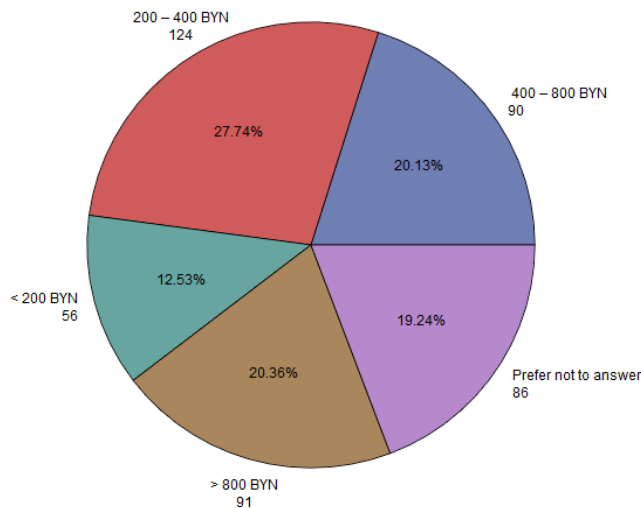


Figure 23 Personal Average Monthly Income of Respondents, BYN [Source: own]

This pie chart represents answers to the question about average personal monthly income in BYN.

According to observations of National Statistical Committee of Belarus, average monthly salary in Belarus in March 2017, when survey data was gathered, was 770,6 BYN. (MyFin.by, 2017)

in March 2017 was 7,49 BYN to 100 CZK, which means, that average monthly income in Belarus was approximately 10,288 CZK (National Bank, 2017).

As we can see from the pie chart, 60.4 % of respondents have indicated their monthly income to be less or equal to republic average. Meanwhile, 20.36% of respondents have

Average exchange rate of Belarussian Ruble (BYN) to Czech Koruna (CZK)

earnings higher than average in the country. 19.24% of respondents have chosen not to disclose their income.

Average Monthly Mobile Services Expenditure / Occupation

It seems quite logical to assume that knowledge of subscriber’s occupation might be useful for prediction of the service consumption level, and that means – of average monthly expenditure for mobile communications. Developing this idea, certain professions and types of occupation, such as sales or consultancy, definitely effect expenditure level. But would that be applicable to generalized categories such as we have in the survey data: an employee, an entrepreneur, an unemployed person, a student, a retired person?

We have tested possible dependency between occupation and expenditure in the following contingency table and PRE measures analysis.

		Table of Expenc by Occup						
		Occup						
		Employee	Entrepreneur	Unemployed	Student	Retired	Total	
Expenc	10-15 BYN	Frequency	80	8	4	45	7	144
	Expected	88.268	13.208	7.7315	26.416	8.3758		
> 15 BYN	Frequency	142	29	8	15	4	198	
	Expected	121.37	18.161	10.631	36.322	11.517		
< 5 BYN	Frequency	13	0	3	3	3	22	
	Expected	13.485	2.0179	1.1812	4.0358	1.2796		
5-10 BYN	Frequency	39	4	9	19	12	83	
	Expected	50.877	7.613	4.4564	15.226	4.8277		
Total	Frequency	274	41	24	82	26	447	

Figure 24 Contingency Table of Service Expenditure and Occupation [Source: own]

As we can see in the table, the biggest part of subscribers with the highest expenditure level above 15 BYN is represented by employees – 71,7% of all the respondents with the highest spending. But that represents only 51,8% of all responded employees. Meanwhile 70,7% of all the entrepreneurs also indicated the highest level of expenditure. Thus, in our sample we have a numeric confirmation of the fact, that running a business provokes higher mobile expenditure.

On the next step we shall test a null hypothesis that *there is no dependency between mobile services expenditure and occupation*, with the $\alpha=0.05$.

Over 30% of expected frequencies in the table are less than 5, thus we cannot use Chi-Square test to evaluate our null hypothesis. Instead, we should use p-value of Fisher test.

Fisher's Exact Test	
Table Probability (P)	<.0001
Pr <= P	.

Figure 25 Fisher test for Expenditure and Occupation [Source: own]

P-value of Fisher test is less than our confidence level of 0.05, thus we reject null hypothesis and accept H_1 that there is a dependency between occupation and level of expenditure.

Statistic	Value	ASE
Gamma	0.0295	0.0732
Kendall's Tau-b	0.0191	0.0475
Stuart's Tau-c	0.0157	0.0391
Somers' D C R	0.0178	0.0442
Somers' D R C	0.0205	0.0509
Pearson Correlation	0.0902	0.0541
Spearman Correlation	0.0220	0.0533
Lambda Asymmetric C R	0.0000	0.0000
Lambda Asymmetric R C	0.1566	0.0356
Lambda Symmetric	0.0924	0.0211
Uncertainty Coefficient C R	0.0714	0.0154
Uncertainty Coefficient R C	0.0694	0.0153
Uncertainty Coefficient Symmetric	0.0704	0.0153

Moving forward, using PRE measures, we shall check, if occupation can be used for prediction of expenditure level. As our values are ordinal, we will use Gamma, Somers' D R|C (our dependent variable is in rows) and Kendall's Tau-b measures, which are 0.0295, 0.0205 and 0.0191 correspondingly.

Figure 26 PRE Measures for Monthly Expenditure and Occupation [Source: own]

Values such as these mean that despite the dependency, occupation does not contribute to prediction of customer expenditure level.

Amount of SMS. Amount of Calls

Talk_min	Frequency	Percent	SMS	Frequency	Percent
>180 min	134	29.98	<2 sms per day	373	83.45
< 60 min	79	17.67	2-4 sms per day	42	9.40
60-120 min	150	33.56	4-6 sms per day	15	3.36
120-180 min	84	18.79	>6 sms per day	17	3.80

Figure 27 Talk (min) and SMS monthly Consumption [Source: own]

Figure below is providing information about frequency of respondents' responses to questions about their monthly amount of calls and sms sent. Respondents evaluated the number of sms based on daily amount sent and the amount of calls in monthly total. As it follows from the figure, majority of respondents don't send from 0 to 2 sms per day. Average monthly mobile conversation time tends to be either between 1 and 2 or more than 3 hours – these categories are almost equally popular.

Moving further, we have decided to combine consumption statistics in the group of graphs.

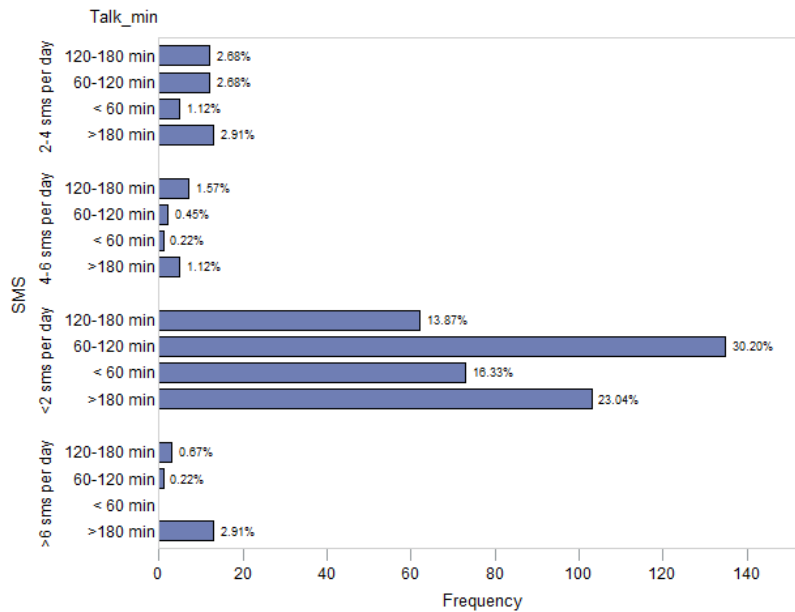


Figure 28 Monthly Amount of Calls (min) and SMS (daily)

Though it is quite obvious that SMS are not a popular type of service among surveyed users, from this graph we can also see that among those people, who use SMS actively, sending more 6 messages per day, majority of users also tend to talk more than others.

1.7.2.1 Likert Scale Variables

As it was mentioned before, there is no generic approach to treating Likert scale data in contemporary Statistics science. Thus, in terms of this research we have chosen to treat Likert scale responses as regular ordinal qualitative parameters.

Following table provides frequencies and percentages of responses to Likert scale questions from the survey. Answers are coded from 1 to 5, where 1 is strong agreement, 3 is neither agreement nor disagreement, and 5 is a strong disagreement. Mode column recaps, which answer was the most popular among respondents.

Table 6 Likert Scale Variables' Frequencies

Question	Frequency of the answer					Mode
	1	2	3	4	5	
Recommend your provider to friends	16	38	103	173	117	4
	3,58%	8,50%	23,04%	38,70%	26,17%	
Provider has a good social image	12	34	95	197	109	4
	2,68%	7,61%	21,25%	44,07%	24,38%	

Question	Frequency of the answer					Mode
	1	2	3	4	5	
Wise Decision to become a subscriber	9	29	66	210	133	4
	2,01%	6,49%	14,77%	46,98%	29,75%	
Service meets expectation	10	41	103	198	95	4
	2,24%	9,17%	23,04%	44,30%	21,25%	
Needs are fully covered with provided service	14	42	96	179	116	4
	3,13%	9,40%	21,48%	40,04%	25,95%	
Affordable price	22	56	121	169	79	4
	4,92%	12,53%	27,07%	37,81%	17,67%	
Quality meets price	13	52	121	175	86	4
	2,91%	11,63%	27,07%	39,15%	19,24%	
Always a good quality of connection in the network	14	49	128	180	76	4
	3,13%	10,96%	28,64%	40,27%	17,00%	
Quality of customer service in shops is satisfactory	11	38	110	172	116	4
	2,46%	8,50%	24,61%	38,48%	25,95%	
Complaint management is efficient and friendly	6	26	83	197	135	4
	1,34%	5,82%	18,57%	44,07%	30,20%	
Shop location is convinient	8	35	105	157	142	4
	1,79%	7,83%	23,49%	35,12%	31,77%	
Billing process is transparent and contains no mistakes	34	56	120	137	100	4
	7,61%	12,53%	26,85%	30,65%	22,37%	
Importance of factors of service						
Service quality	1	1	26	169	250	5
	0,22%	0,22%	5,82%	37,81%	55,93%	
Service development	8	21	87	214	117	4
	1,79%	4,70%	19,46%	47,87%	26,17%	
Customer support services	13	15	65	206	148	4
	2,91%	3,36%	14,54%	46,09%	33,11%	
Service range	11	23	81	200	132	4
	2,46%	5,15%	18,12%	44,74%	29,53%	
Price	1	1	28	136	281	5
	0,22%	0,22%	6,26%	30,43%	62,86%	

Question	Frequency of the answer					Mode
	1	2	3	4	5	
Intention to churn	176	86	106	37	42	1
	39,37%	19,24%	23,71%	8,28%	9,40%	
Competitor can satisfy needs as well as current provider	75	74	163	96	39	3
	16,78%	16,55%	36,47%	21,48%	8,72%	
Competitors are as good as current provider	35	77	192	96	47	3
	7,83%	17,23%	42,95%	21,48%	10,51%	

As we can see from the frequencies table, in total 17,68% (79 respondents) have indicated moderate or strong intention to churn in the near future.

New/Churned Subscriber and Intention to Churn.

If the customer has joined the new service provider, leaving the previous provider behind, does that make the new customer relationship more stable, or on the contrary, is it in the nature of this client to be more flexible and inclined to churn again? The following contingency table and PRE measures analysis is meant to answer this question.

		New_Churn		Total	
		1	2		
1	Frequency	137	39	176	
	Expected	135.45	40.555		
2	Frequency	64	22	86	
	Expected	66.183	19.817		
3	Frequency	77	29	106	
	Expected	81.575	24.425		
4	Frequency	30	7	37	
	Expected	28.474	8.5257		
5	Frequency	36	6	42	
	Expected	32.322	9.6779		
Total		Frequency	344	103	447

In this contingency table there is no expected frequencies below 5, thus we should use Chi-square test to evaluate null hypothesis.

H_0 is that there is no dependency between customer's intention to churn and the fact if this customer is a new subscriber of if he joined from a competitor mobile network.

Results of Chi-Square test are as follows. Table has 4 degrees of freedom.

Figure 29 Contingency Table of Intention to Churn to New/Churned Subscriber

Statistic	DF	Value	Prob	Pearson Chi-Square Test	
Chi-Square	4	3.6745	0.4518	Chi-Square	3.6745
Likelihood Ratio Chi-Square	4	3.8461	0.4272	DF	4
Mantel-Haenszel Chi-Square	1	0.4623	0.4965	Asymptotic Pr > ChiSq	0.4518
Phi Coefficient		0.0907		Exact Pr >= ChiSq	0.4553
Contingency Coefficient		0.0903			
Cramer's V		0.0907			

Figure 30 Chi-Square Test for Contingency Table of Intention to Churn x New/Churned Subscriber

Calculated Chi-Square value is 3.6745, while table value for 4 DF is 9,488, and p-value of 0.4518 is higher than 0.05. Thus we accept our null hypothesis that there is no dependency between the fact if customer has churned before and current intention to churn.

Statistic	Value	ASE
Gamma	-0.0287	0.0814
Kendall's Tau-b	-0.0147	0.0414
Stuart's Tau-c	-0.0150	0.0423
Somers' D C R	-0.0102	0.0287
Somers' D R C	-0.0211	0.0596
Pearson Correlation	-0.0322	0.0441
Spearman Correlation	-0.0161	0.0454
Lambda Asymmetric C R	0.0000	0.0000
Lambda Asymmetric R C	0.0000	0.0000
Lambda Symmetric	0.0000	0.0000
Uncertainty Coefficient C R	0.0080	0.0079
Uncertainty Coefficient R C	0.0030	0.0029
Uncertainty Coefficient Symmetric	0.0043	0.0043

PRE measures – Gamma, Kendall’s Tau-b and Somer’s D R|C show very weak negative dependency between current intention to churn and previous history of churn., showing that the fact that customer has changed provider earlier can not help to estimate if the customer wants to churn again.

Figure 31 PRE Measures for Intention to Churn and New/Churned Subscriber

1.7.3 Cluster Analysis

In order to extend our analysis of Intention to Churn parameter, we have decided to apply cluster analysis. For the purpose of cluster analysis, we have converted all categorical variables into numerical. Likert-scale variables are also treated in terms of this analysis as interval numerical variables. We have selected K-means method and decided about number of clusters based on the predictive power of the clusters for intention to churn. At the same time, we wanted to stop at the number of clusters that would provide us with information about subscribers with a strong intention to churn, placed in one or two clusters. Thus, our K-means cluster analysis was performed with overall of 20 clusters. This number of clusters had the best tested R-Square coefficient for Intention to Churn:

Statistics for Variables				
Variable	Total STD	Within STD	R-Square	RSQ/(1-RSQ)
Int_to_Churn	1.31411	0.84803	0.601296	1.508128

Figure 32 Statistics of Variables for Intention to Churn

It means, that our clusters explain up to 60% of variability of the parameter.

Following is resulting cluster summary statistics.

Cluster Summary						
Cluster	Frequency	RMS Std Deviation	Maximum Distance from Seed to Observation	Radius Exceeded	Nearest Cluster	Distance Between Cluster Centroids
1	28	0.7553	6.1559		6	3.1276
2	7	0.7577	5.1784		3	4.6926
3	29	0.7129	6.7429		9	2.7874
4	10	0.8032	5.2096		3	4.6758
5	9	0.7940	5.2959		6	4.0455
6	43	0.7837	6.2856		1	3.1276
7	21	0.7291	5.0406		3	3.5772
8	9	0.8375	5.5744		1	4.0027
9	53	0.7029	6.0601		15	2.6849
10	18	0.7165	5.5993		1	3.6424
11	21	0.7488	5.2934		15	3.3105
12	13	0.8193	5.8776		19	3.9684
13	47	0.7677	5.7543		3	3.2275
14	9	0.8179	5.1599		3	3.5316
15	65	0.7144	6.3929		9	2.6849
16	4	0.7713	5.0683		10	6.1062
17	4	0.8221	4.9244		6	4.5931
18	2	0.7265	3.0822		10	6.6699
19	33	0.8222	6.5449		15	3.7745
20	22	0.6821	5.4429		15	3.5582

Figure 33 Cluster Summary Statistics [Source: own]

As we can see, the biggest clusters are clusters 15 and 9, which are also the closest to one another. But for our further research we have selected only 2 small clusters – numbers 10 and 16. These clusters contain respondents that have indicated the strongest intention to change their service provider. As it was mentioned earlier in this chapter, 79 respondents in total has given response 4 (agree) and 5 (strongly agree) to this question. Out of these 79 respondents, clusters 10 and 16 contain those who share most common features.

Following we provide a table of cluster means for the clusters 10 and 16. The closer the value is to 5, the stronger is subscriber’s agreement. Value close to 3 indicates neutral attitude, and the closer values get to 1, the stronger is respondent’s disagreement with the statement.

Table 7 Cluster Means for the Clusters with the Highest Churn Intention [Source: own]

Variable	10	16	Variable	10	16
Likert-Scale Variables			Categorical Variables		
Recommend your provider	2.556	3.250	Gender	1.222	1.000
Good Social Image	2.722	1.250	Age	2.556	3.250
Wise Decision	2.056	1.000	Education	1.833	2.250
Service Meets Expectations	1.778	1.000	Occupation	3.222	2.250

Service Covers Needs	1.944	1.000	Avg Monthly Income	2.167	4.250
Price is Affordable	2.778	1.500	M.S. Provider	1.667	2.250
Quality of Service Meets Price	2.833	1.500	New/Churned Subscriber	1.056	1.250
Always Good Connection	3.000	1.250	Length of Customer Relationship, years	2.778	2.500
Quality of Customer Service	2.833	1.250	Private / Corporate Service Plan	1.000	1.000
Customer Service in Shops (Staff)	3.222	1.250	Amount of Talk, min/month	2.167	4.000
Shop Location	3.056	1.250	Nature of Talks	1.111	1.750
Transparent Billing	2.500	1.250	Amount of SMS, daily	1.000	2.000
Loyalty: Service Quality	4.611	4.500	Internet Data Consumption	2.667	3.000
Loyalty: Service Development	4.556	4.500	Applications for Calls: Y/N	1.278	1.000
Loyalty: Customer Support	4.389	5.000	Applications for Calls: Amount of Usage	1.722	2.750
Loyalty: Service Range	4.444	5.000	Expenditure	3.611	4.000
Loyalty: Price	4.611	5.000			
Intention to Churn	4.500	5.000			
Competitor would cover needs	4.389	5.000			
Competitors are as good as current provider	4.500	4.000			

There is quite a significant difference between how respondents with very strong intention to churn and a moderate intention evaluate such service factors as network connection, customer service in providers' shops, shop location and price of services, but generally every parameter's evaluation varies from very negative to negative or sometimes neutral. Now to the categorical values, clusters describe subscribers with intention to churn as follows:

- They are mostly men aged between 27 and 34 years old with bachelor education, employees or entrepreneurs;
- Majority of them were planning to leave MTC;
- Almost all of them were new subscribers, when joining their current provider, and have been their clients for around 3 years average;
- All of them use private service plan;

- They don't talk over the phone more than 2 hours per month, but consume 1Gb and more of mobile data, actively using mobile applications for texting and making calls;
- Majority of them spend 15 BYN and more for mobile services monthly, which corresponds to most expensive service plans with higher amount of included traffic.

1.8 Statistical Models

1.8.1 Ordinal Logistic Regression

When the response categories are ordered, as in our case with Likert scale responses, and there are more than 2 categories for the dependent variable, it possible to apply for prediction a multinomial regression model. However, the disadvantage of that choice is that the information about the ordering of data is disregarded, as multinomial logistic regression is treating variables as nominal. Instead, an *ordinal logistic regression model*, alternatively called the *proportional odds model*, preserves that information.

In the Proportional Odds Model, the event being modeled is not having an outcome in a single category, as is done in the binary and multinomial models. Rather, the event being modeled is having an outcome in a particular category or any previous category. Possible events for this model are defined as follows: “variable falls into the group 1” or “variable falls into the groups 1 or 2”. (The Analysis Factor, 2017) Proportional Odds Model assumes, that the coefficients for each level are the same.

To build an ordinal logistic model for our research we have used statistical software Gretl. In the initial model we have included all 35 variables and proceeded with model optimization, judging the model by the power of regression coefficient, excluding variables, that do not contribute to the model. We have also been comparing models by Schwarz criterion (Bayesian information criterion – BIC) and number of correctly predicted cases, searching for the one with the lowest BIC and highest predictive power.

The final version of the model that we have selected, was able to correctly predict 243 out of 447 cases (54.4%) and had calculated Chi-square test value for 15 degrees of freedom equal 374.172 [p-value 0.0000], which is higher than a table value.

The model configuration is as follows from the figure below.

Model 6: Ordered Logit, using observations 1-447

Dependent variable: Int_to_Churn

Standard errors based on Hessian

	coefficient	std. error	z	p-value	
Wise_Dec	-0.512029	0.137989	-3.711	0.0002	***
Cov_Need	-0.282664	0.122559	-2.306	0.0211	**
Qua_Meet_Prc	-0.442618	0.132693	-3.336	0.0009	***
Al_Good_Con	0.405665	0.130498	3.109	0.0019	***
Qua_Cust_Ser	0.428411	0.148757	2.880	0.0040	***
Stuf_Att_Eff	-0.666342	0.171552	-3.884	0.0001	***
Shop_Loc	-0.282570	0.126415	-2.235	0.0254	**
Transp_Bill	0.169510	0.108172	1.567	0.1171	
Loy_Cust_Supp	0.355993	0.119357	2.983	0.0029	***
Loy_Ser_Range	-0.154620	0.115121	-1.343	0.1792	
Comp_cov_needs	0.951337	0.104550	9.099	9.09e-020	***
CR_Length	-0.455966	0.111697	-4.082	4.46e-05	***
Priv_Corp	-0.820217	0.279625	-2.933	0.0034	***
SMS	0.308627	0.126369	2.442	0.0146	**
Apps_Call_YN	1.25541	0.263068	4.772	1.82e-06	***
cut1	-2.65444	1.02978	-2.578	0.0099	***
cut2	-1.42481	1.02288	-1.393	0.1636	
cut3	0.538820	1.01826	0.5292	0.5967	
cut4	1.74659	1.02731	1.700	0.0891	*
Mean dependent var	2.290828	S.D. dependent var	1.314111		
Log-likelihood	-496.9929	Akaike criterion	1031.986		
Schwarz criterion	1109.934	Hannan-Quinn	1062.717		

Number of cases 'correctly predicted' = 243 (54.4%)

Figure 34 Ordinal Logistic Regression of Intention to Churn

In the model, 2 insignificant explanatory variables have been kept, as they became insignificant only in this model configuration and in fact were contributing to the model predictive power and BIC.

As we can see from the figure, that 11 out of 15 variables in the regression are Likert-scale variables. Important part in identifying the customer's intention to stay or to churn are playing responses given to the following questions and service factors:

- The decision to contract this company was wise;
- My needs are fully covered by the service;
- My company offers fair value for the money;
- Network always has a good connection;
- Quality of customer service;

- Complaints are resolved quick and friendly – complaint management – one of the highest coefficients;
- Shop location;
- Transparent billing for services;
- Customer support – this factor corresponds with the quality of customer service;
- Service range;
- Competitor provider can cover all my needs – *attractive alternatives* – the strongest factor in the model;
- Length of customer relationship – the power of habit or benefits for loyal clients?
- Private/Corporate service plan – strong factor that does not fully depend on a customer;
- Amount of SMS daily;
- Usage of mobile applications for calls -the most influential factor. It is not surprising, that with the current situation with excessive development of online communication of all kinds, satisfying this factor is what keeps mobile clients from attrition.

The final model specification is as follows:

$$\begin{aligned}
 Int_to_churn = & -0.512029 \times Wise_Decision - 0.282664 \times Cov_Needs - 0.442618 \times \\
 & Qua_Meets_Price + 0.405665 \times Alw_Good_Connection + 0.428411 \times Qua_Cust_Serv - \\
 & 0.666342 \times Stuff_Att_Eff - 0.282570 \times Shop_Loc + 0.169510 \times Transp_Bill + 0.355993 \\
 & \times Loy_Cust_Support - 0.154620 \times Loy_Service_Range + 0.951337 \times \\
 & Competitor_Cov_Needs - 0.455966 \times CR_Length - 0.820217 \times Priv_Corp_Plan + \\
 & 0.308627 \times SMS + 1.25541 \times Apps_For_Calls_YN + u
 \end{aligned}$$

$$Pr(y = 1) = Pr(Int_to_Churn < -2.65444)$$

$$Pr(y = 2) = Pr(-2.65444 < Int_to_Churn < -1.42481)$$

$$Pr(y = 3) = Pr(-1.42481 < Int_to_Churn < 0.538820)$$

$$Pr(y = 4) = Pr(0.538820 < Int_to_Churn < 1.74659)$$

1.8.2 Multinomial Logistic Regression

It was mentioned earlier throughout this paper, Likert scale variables are controversial in terms of interpretation in contemporary statistical theory. If it is not certain, whether

dependent variable is truly ordered, you have an options to ignore the ordinality and use multinomial logistic regression. The negative side is, that if multinomial model is used for data that is truly ordered, you could overestimate the number of parameters — increasing the risk of missing a statistically significant result. (S. Glen, 2014) Thus, in terms of our research we have decided to apply multinomial logistic regression to prediction of intention to churn and compare model fitness.

Assumptions of multinomial logistic regression include:

- The model is specified correctly with no extraneous variables.
- Cases are independent.
- There is no multicollinearity between the independent variables. (S. Glen, 2017)

Thus on the first step we had to check for multicollinearity by building and analyzing a correlation table for all survey variables (appendix 1). We have discovered that few of the variables have very high correlation coefficients. Mostly these were variables from the same sections or with the close meaning, beggining of the survey questionnaire, such as „I would recommend my provider to friends“ and „My MSP has a good social image“, or „Service covers my needs“ and „service meets my expectations“.

On the first step we’ve built a general model, that included all the variables. Then we have proceeded with ommiting all the variables that were correlating and all the variables of no statistical significance.

In th multinomial logistic model same variables are included in all the estimated equations, thus some of the variables are significant only for one particular equasion and do not contribute to the prediction in other equations. That is why, the final virsion of our model still includes 18 variables, which contribute to the prediction of specific groups depedning on their churn intention. It has a power to correctly predict 62.0% of cases. The full model specification can be found in Appendix 2.

As in terms of this case study we are particularly interested in the category of users with a strong decision to leave their current provider, that will be the only equasion from the model, that I will specify as follows on the next page:

$$\text{Logit } (y=5) = 13.9326 + 1.10702 \times \text{Rec_Ur_Provider} - 1.76989 \times \text{Wise_Decis} - 0.458776 \times \text{Cov_Need} - 0.655718 \times \text{Qual_Meet_Price} + 1.82631 \times \text{Alw_Good_Conn} +$$

$$\begin{aligned}
& 0.614736 \times \text{Qua_Cust_Serv} - 1.47662 \times \text{Stuf_Att_Eff} - 0.579077 \times \text{Shop_Locat} + \\
& 0.686230 \times \text{Loy_Serv_Qua} + 3.11013 \times \text{Competitor_Cov_Needs} - 0.905128 \times \text{Edu-} \\
& 0.238495 \times \text{Occup} - 0.03995 \times \text{Income} - 0.532923 \times \text{CR_Lenght} - \\
& 22.3183 \times \text{Private_Corp} + 0.816395 \times \text{SMS} + 2.40558 \times \text{Apps_Call_YN} - \\
& 0.282653 \times \text{Expences}
\end{aligned}$$

We shall proceed with interpretation of these results in the next chapter.

4. Results and Discussion

In terms of this case study we have built two different logistic models, that were treating our survey data in a different context. Prediction power of the models also varied: while ordinal logistic regression was able to predict 54.4% of cases correctly, multinomial logistic regression was able to get 62.0% of correct predictions.

Both models shared common predictors, but on the next step we will compare them, to define which have the most certain prediction power against Intention to Churn.

Table 8 Comparison of Logistic Regression Model Specifications

Ordinal logistic regression	Multinomial logistic regression
$-0.512029 \times Wise_Decision$	$-1.76989 \times Wise_Decis$
$-0.282664 \times Cov_Needs$	$-0.458776 \times Cov_Need$
$-0.442618 \times Qua_Meets_Price$	$-0.655718 \times Qual_Meet_Price$
$+0.405665 \times Alw_Good_Connection$	$+1.82631 \times Alw_Good_Conn$
$+0.428411 \times Qua_Cust_Serv$	$+0.614736 \times Qua_Cust_Serv$
$-0.666342 \times Stuff_Att_Eff$	$-1.47662 \times Stuf_Att_Eff$
$-0.282570 \times Shop_Loc$	$-0.579077 \times Shop_Locat$
$+0.951337 \times Competitor_Cov_Needs$	$+3.11013 \times Competitor_Cov_Needs$
$-0.455966 \times CR_Lenght$	$-0.532923 \times CR_Lenght$
$-0.820217 \times Priv_Corp_Plan$	$-22.3183 \times Private_Corp$
$+0.308627 \times SMS$	$+0.816395 \times SMS$
$+1.25541 \times Apps_For_Calls_YN$	$+2.40558 \times Apps_Call_YN$
$+0.169510 \times Transp_Bill$	$+1.10702 \times Rec_Ur_Provider$
$+0.355993 \times Loy_Cust_Support$	$+0.686230 \times Loy_Serv_Qua$
$-0.154620 \times Loy_Service_Range$	$-0.905128 \times Edu$
	$0.238495 \times Occup$
	$-0.03995 \times Income$
	$-0.282653 \times Expences$

Even though the left model is used for prediction of all intervals with the same coefficients, while the multinomial model is written only with coefficients for an answer 5 – strong decision to churn, we can still see significant similarity. Majority of the independent

variables in both models match. But multinomial logistic regression seems to be stronger, as it relies not only to responses on the Likert-scale part of the questionnaire, but also on categorical data about a customer, such as Average Monthly Income, Monthly Expenditure, Education and Occupation.

From comparing these models we can derive the following conclusions:

- If customer believes, that it was a wise decision to get a contract with the current MSP and thinks that the service fully covers his needs, quality of service is good shops are located conveniently, that will lower one's intention to churn;
- If customer has a long story of customer relation with the MSP or using a corporate service plan, it is also lowering the probability of one's churn.
- If customer is consuming a lot of SMS and Internet data per month and actively using Internet calling and messaging applications, all this is increasing the probability of such customer to change the provider. It might be explained by the fact that such person can be in a search of a better data plan and is not attached to one's phone number that much.
- Higher education and lower occupation status are driving the churn possibility to increase.
- Higher average monthly income and monthly expenditure are also pushing customers to consider different providers.

5. Conclusion

Customer relationship management (CRM) was always challenging, especially in the business to customer (B2C) sector. Today, when technology and trends are changing so rapidly, mobile communication companies need to understand their customer needs and priorities more than ever, as that had become a crucial survival necessity.

In the conditions of constant competition and fight for the same market and basically the same people over and over again, it is important to know what exactly can increase customer loyalty. Many mobile service operators are regularly conducting data research on their sales and service usage data. However, surveying customers directly is not that common. Thus, in our research we have focused on exploration of customer opinion based on the survey data of mobile service subscribers from Belarus. The explanation of the market situation there was provided alongside with the results of the survey. A wide range of questions related to customer characteristics, services consumption as well as their opinions on services of their current provider were included. Most importantly, customers were asked, if they have an intention to switch their current provider.

Descriptive analysis of the sample has shown that majority of the responded customers were between 26 and 34 years old, had a bachelor degree, were working as employees or were self-employed. They talked over the phone either less than 2 or more than 3 hours per month, consumed 1+ Gb of mobile data and didn't use SMS that much. 46.98% of Belarusian population is using services of Velcom. 23.04% of population has switched to another provider at least once. But that, in fact, does not effect their current intention to churn in any way.

Conducted cluster analysis has drawn us the following portrait of the customers with an intention to churn:

- They are mostly men aged between 27 and 34 years old with bachelor education, employees or entrepreneurs;
- Majority of them are planning to leave MTC service provider;
- Almost all of them were new subscribers, when joined their current provider, and have been their clients for around 3 years on average;
- All of them use private service plan;

- They don't talk over the phone more than 2 hours per month, but consume 1Gb and more of mobile data, actively using mobile applications for texting and making calls;
- Majority of them spend 15 BYN and more for mobile services monthly, which corresponds to most expensive service plans with higher amount of included traffic.

On the next stage of our research we have built 2 different logistical regression and found that:

- if customer is consuming a lot of SMS and Internet data per month and actively using Internet calling and messaging applications, all this is increasing the probability of such customer to change the provider. It might be explained by the fact that such person can be in a search of a better data plan and is not attached to one's phone number that much.
- Higher education and lower occupation status are driving the churn possibility to increase.
- Higher average monthly income and monthly expenditure are also pushing customers to consider different providers.

As a recommendation to mobile operators of Belarus, it could be suggested that they pay more attention to the customer service at their shops and location of the shops themselves, as customers are paying close attention to that. Secondly, it would be reasonable to pay close attention to the mobile Internet services provision, as all the active customers are searching for opportunities related to their consumption habits.

6. References

- V. Kumar and J. Andrew Petersen. 2012.** *Statistical Methods in Customer Relationship Management*, First Edition. John Wiley & Sons, Ltd. 2012.
- Z. Soltania, N. J. Navimipour. 2016.** *Customer relationship management mechanisms: A systematic review of the state of the art literature and recommendations for future research*. *Computers in Human Behaviour*. Volume 61, 2016. p. 667–688
- Marketing-Schools.org.** *Relationship Marketing. Explore the Strategy of Relationship Marketing*. 2012 [Online] [Cited: 24.03.2017]
<http://www.marketing-schools.org/types-of-marketing/relationship-marketing.html>
- Chris Anderson.** Bizmanualz. *Make a Process Map. What is a Process Map* [Online] [Cited: 24.03.2017]
<https://www.bizmanualz.com/make-a-process-map/what-is-a-process-map.html>
- H. Tohidi*, M. M. Jabbari. 2012.** *CRM in Organizational Structure Design*. *Procedia Technology* 1, 2012. p. 579 – 582
- H. Tohidi*, M. M. Jabbari. 2012.** *The Necessity of Using CRM*. *Procedia Technology* 1, 2012. p. 514 – 516
- Hoffberg, K., Frei, B., Corcoran, K., 2003.** *Firing Up the Customer: Aligning Brand, Strategy and Technology to Deliver the Extraordinary Customer Experience*, first ed. McGraw-Hill Trade.
- Bergeron, B., 2001.** *Essentials of CRM: Customer Relationship Management for Executives*. John Wiley & Sons.
- M. Stone, B. Foss, 2001.** *Successful customer relationship marketing*. Kogan, London, United Kingdom, p. 3-20.
- S. M. Kamrul Islam Shaon, H. A. Rahman, 2015.** *Theoretical Review Of Crm Effects On Customer Satisfaction And Loyalty*. *Prague Economic Papers*, Vol. 4, No. 01. 2015

C. Borowski, Softwareadvice, 2016. *Customer Service or CRM Software: Which Do You Need?* [Online] [Cited: 17 March 2017]

<http://www.softwareadvice.com/resources/customer-service-vs-crm-software/#trends>

Squid. E. Maxie, 2015. *Top 5 reasons CRM projects fail.* [Online] [Cited: 20 March 2017]

<https://www.skuid.com/blog/top-5-reasons-crm-projects-fail/>

L. E. Mendoza, A. Marius, M. Pérez, A. C. Grimán, 2006. *Critical success factors for a customer relationship management strategy.* *Information and Software Technology* 49, 2007. p. 913–945.

Zhaohua Deng, Yaobin Lu, Kwok Kee Wei, Jinlong Zhang, 2010. *Understanding customer satisfaction and loyalty: An empirical study of mobile instant messages in China.* *International Journal of Information Management* 30, 2010, pp. 289–300

T. J. Gerpott, N. Ahmadi, 2015. *Regaining drifting mobile communication customers: Predicting the odds of success of winback efforts with competing risks regression.* *Expert Systems with Applications* 42, 2015, 7917–7928

Calvo-Porrá, Levy-Mangin. 2015 *Smooth operators? Drivers of customer satisfaction and switching behavior in virtual and traditional mobile services.* Elsevier, June 2015, ESIC & AEMARK, pp. 124-138.

Calvo-Porrá, A. Faiña-Medín, M. Nieto-Mengotti. 2017 *Satisfaction and switching intention in mobile services: Comparing lock-in and free contracts in the Spanish market.* *Telematics and Informatics* Volume 34, Issue 5, August 2017, Pages 717-729

G.R. Diaz, 2017. *The influence of satisfaction on customer retention in mobile phone market.* *Journal of Retailing and Consumer Services*, Volume 36, May 2017, Pages 75-85

The Ministry of Communications and Informatization of the Republic of Belarus.

Report on the Development of Mobile Networks for the IV quarter of year 2016. [Online] 2016. [Cited: 25.03.2017]

http://www.mpt.gov.by/sites/default/files/o_razvitiia_sotovoy_podvizhnoy_elektrosvyazi_4_kvartal.pdf

Helena Solovyova, Dmitry Umpirovich, Alexander Polosmak, TUT.BY. *History of Prestigious Attributes of the Near Past.* [Online] 2010. [Cited: 10.11.2017]

<http://news.tut.by/kaleidoscope/172905.html>

National Statistical Committee of the Republic of Belarus. *Report on Size and natural increase of population (beginning of the year).* [Online] 2016. [Cited: 25.03.2017]

http://www.belstat.gov.by/ofitsialnaya-statistika/solialnaya-sfera/demografiya_2/g/chislennost-i-estestvennyi-prirost-naseleniya/

Investment Company Uniter. *Telecommunication Sector 2015.* March 2015 [Online] [Cited: 10.11.2017]

<http://investinbelarus.by/docs/Telecom.pdf>

World Bank. *Mobile cellular subscriptions (per 100 people).* 2016 [Online] [Cited: 10.11.2017]

<https://data.worldbank.org/indicator/IT.CEL.SETS.P2>

D. S. Walonick, Ph.D. *Steps in Designing a Survey.* 2005-2012 [Online] [Cited: 17.03.2017]

<http://www.statpac.com/survey-design-guidelines.htm>

R. V. Krejcie, D.W. Morgan. 1970. *Determining Sample for Research Activities.* Educational and Psychological Measurement. 1970, Vol. 30, pp. 607-610. [Online] [Cited: 01.03.2017]

https://home.kku.ac.th/sompong/guest_speaker/KrejcieandMorgan_article.pdf

World Population Review. *Belarus Population.* 2017 [Online] [Cited: 10.11.2017]

<http://worldpopulationreview.com/countries/belarus-population/>

Susan Jamieson. 2004. *Likert Scales: How to (Ab)use Them.* Medical Education, Vol. 38, pp.1217-1218. [Online] [Cited: 10.11.2017]

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.474.608&rep=rep1&type=pdf>

MyFin.by *Average Salary in Belarus (based on data of National Statistical Committee of Republic of Belarus)*, 2017. [Online] [Cited: 20.11.2017]

<https://myfin.by/info/srednyaya-zarplata-v-belarusi>

National Bank of the Republic of Belarus. *Official Exchange Rate of the Belarusian Ruble Against Foreign Currencies Set by the National Bank of the Republic of Belarus on a Daily Basis.* 2017 [Online] [Cited: 20.11.2017]

<http://www.nbrb.by/engl/statistics/rates/ratesDaily.asp>

Karen, The Analysis Factor. *Logistic Regression Models for Multinomial and Ordinal Variables*, 2017 [Online] [Cited: 20.11.2017]

<http://www.theanalysisfactor.com/logistic-regression-models-for-multinomial-and-ordinal-variables/>

S. Glen, Statistics How To. *Ordered Logistic Regression; Ordinal/Ordered Logit*, 9 Dec. 2014. [Online] [Cited: 20.11.2017]

<http://www.statisticshowto.com/ordered-logistic-regression/>

S. Glen, Statistics How To. *Multinomial Logistic Regression: Definition and Examples*, 26 Jan. 2017. [Online] [Cited: 20.11.2017]

<http://www.statisticshowto.com/multinomial-logistic-regression/>

J. Strauss, R. Frost, 2002. *Customer Relationship Management.* E Marketing, second ed. Prentice Hall, New York, 2002.

7. Appendix 1. Correlation Table of All Survey Variables

Correlation coefficients, using the observations 1 - 447

5% critical value (two-tailed) = 0.0928 for n = 447

Table 9 Correlation Table for All Survey Variable [Source: own]

Rec_Ur_Prov	Good_Soc_Img	Wise_Dec	Meet_Exp	Cov_Need	
1.0000	0.6410	0.5723	0.5198	0.4144	Rec_Ur_Prov
	1.0000	0.5298	0.4445	0.3732	Good_Soc_Img
		1.0000	0.7197	0.5957	Wise_Dec
			1.0000	0.7090	Meet_Exp
				1.0000	Cov_Need

Prc_Aff	Qua_Meet_Prc	Al_Good_Con	Qua_Cust_Ser	Stuf_Att_Eff	
0.3409	0.3942	0.3860	0.3710	0.3585	Rec_Ur_Prov
0.2483	0.3328	0.4313	0.4469	0.4043	Good_Soc_Img
0.4863	0.5266	0.4592	0.4273	0.4992	Wise_Dec
0.5167	0.6210	0.5016	0.3814	0.4439	Meet_Exp
0.5067	0.5390	0.4514	0.3825	0.4090	Cov_Need
1.0000	0.6624	0.3446	0.2617	0.3283	Prc_Aff
	1.0000	0.5474	0.4002	0.4299	Qua_Meet_Prc
		1.0000	0.5080	0.4419	Al_Good_Con
			1.0000	0.6931	Qua_Cust_Ser
				1.0000	Stuf_Att_Eff

Shop_Loc	Transp_Bill	Loy_Ser_Qua	Loy_Ser_Devel	Loy_Cust_Supp	
0.2617	0.4467	0.0198	0.0195	-0.0036	Rec_Ur_Prov
0.3779	0.4349	0.0433	-0.0262	0.0167	Good_Soc_Img
0.3708	0.4529	0.1038	-0.0278	0.0040	Wise_Dec
0.3346	0.4329	0.0680	-0.0430	0.0068	Meet_Exp
0.3379	0.3523	-0.0171	-0.0930	-0.0177	Cov_Need
0.2511	0.3907	-0.0727	-0.0624	-0.0293	Prc_Aff
0.3337	0.4607	-0.0407	0.0164	-0.0057	Qua_Meet_Prc
0.4346	0.3800	-0.0596	0.0039	0.0145	Al_Good_Con
0.5301	0.4614	0.0190	0.0316	0.0600	Qua_Cust_Ser
0.5676	0.5164	0.1065	0.1326	0.1270	Stuf_Att_Eff
1.0000	0.5074	-0.0072	0.0110	0.0424	Shop_Loc
	1.0000	-0.0573	0.0743	0.1301	Transp_Bill
		1.0000	0.2538	0.3275	Loy_Ser_Qua
			1.0000	0.5232	Loy_Ser_Devel
				1.0000	Loy_Cust_Supp

Loy_Ser_Range	Loy_Price	Int_to_Churn	Comp_cov_needs	Comp_are_Good	
0.0386	-0.0432	-0.2510	-0.2820	-0.1652	Rec_Ur_Prov
-0.0063	-0.0180	-0.2135	-0.1899	-0.1241	Good_Soc_Img
-0.0279	0.0148	-0.4309	-0.3433	-0.2375	Wise_Dec
-0.0329	0.0021	-0.3677	-0.2967	-0.1762	Meet_Exp
-0.0651	-0.0342	-0.3339	-0.2139	-0.1244	Cov_Need
-0.0413	-0.0778	-0.3228	-0.2260	-0.1165	Prc_Aff
-0.0329	0.0163	-0.3310	-0.3102	-0.1146	Qua_Meet_Prc
-0.0119	0.0123	-0.1560	-0.2163	-0.1098	Al_Good_Con
0.0996	0.0213	-0.2032	-0.2329	-0.1351	Qua_Cust_Ser
0.0820	0.0722	-0.3734	-0.2943	-0.1789	Stuf_Att_Eff
0.0057	-0.0394	-0.2838	-0.1972	-0.0792	Shop_Loc
0.0803	-0.0858	-0.2114	-0.2118	-0.1603	Transp_Bill
0.2024	0.3906	0.0008	0.0700	0.0530	Loy_Ser_Qua
0.5033	0.2454	0.0524	-0.0362	-0.0155	Loy_Ser_Devel
0.4645	0.1949	0.0948	0.1029	0.0469	Loy_Cust_Supp
1.0000	0.3177	0.0164	-0.0503	0.0798	Loy_Ser_Range
	1.0000	0.0209	-0.0362	-0.0656	Loy_Price
		1.0000	0.5418	0.3079	Int_to_Churn
			1.0000	0.5364	Comp_cov_needs
				1.0000	Comp_are_Good

Gender	Age	Edu	Occup	Income	
0.0085	0.1704	0.1239	0.0718	0.0447	Rec_Ur_Prov
0.0790	0.1107	0.0616	0.0672	-0.0131	Good_Soc_Img
0.1204	0.0738	0.0623	-0.0148	0.0128	Wise_Dec
0.0940	0.0260	0.0399	-0.0532	-0.0118	Meet_Exp
0.0817	0.0990	0.0404	-0.0323	0.0186	Cov_Need
0.0720	0.0172	0.0903	-0.0031	0.0131	Prc_Aff
0.0976	-0.0045	-0.0042	-0.0485	-0.1020	Qua_Meet_Prc
0.0097	0.0402	-0.0520	0.0039	-0.0550	Al_Good_Con
0.0578	0.0327	0.0277	0.0018	0.0172	Qua_Cust_Ser
0.1385	0.0430	0.0680	-0.0128	-0.0109	Stuf_Att_Eff
0.1461	-0.0148	-0.0131	-0.0215	-0.0127	Shop_Loc
0.0782	0.1704	0.1039	0.0890	0.0559	Transp_Bill
-0.0022	-0.1730	0.0099	-0.0552	-0.0245	Loy_Ser_Qua
-0.0226	-0.1031	-0.0217	-0.1705	0.0363	Loy_Ser_Devel
0.0910	-0.0518	0.0114	-0.0164	0.1036	Loy_Cust_Supp
-0.0443	-0.0663	0.0048	-0.1388	-0.0148	Loy_Ser_Range
-0.0191	-0.0477	-0.0486	-0.0703	-0.0526	Loy_Price
-0.1563	0.0415	-0.1149	0.0747	-0.0681	Int_to_Churn
-0.0621	0.0409	-0.0004	0.1252	0.0273	Comp_cov_needs

-0.0727	-0.0397	-0.0011	0.0287	-0.0619	Comp_are_Good
1.0000	-0.0513	-0.0619	-0.0792	-0.0870	Gender
	1.0000	0.2803	0.5747	-0.0404	Age
		1.0000	0.3367	0.1610	Edu
			1.0000	0.0469	Occup
				1.0000	Income

Provider	New_Churn	CR_Length	Priv_Corp	Talk_min	
-0.0706	-0.0135	0.0585	-0.0000	0.2023	Rec_Ur_Prov
-0.1473	-0.0339	0.1252	-0.0383	0.0836	Good_Soc_Img
-0.0393	-0.0444	0.0969	-0.0093	0.1591	Wise_Dec
-0.0604	-0.0074	0.0184	0.0881	0.0768	Meet_Exp
-0.0705	-0.0081	0.0207	0.0209	0.0529	Cov_Need
-0.0093	0.0332	-0.1077	0.0355	0.0466	Prc_Aff
-0.0820	-0.0261	-0.1128	-0.0257	-0.0087	Qua_Meet_Prc
-0.1583	-0.1160	0.0346	0.0059	-0.0036	Al_Good_Con
-0.1310	-0.0542	0.0824	-0.0190	0.0589	Qua_Cust_Ser
-0.1397	-0.0339	0.1240	-0.0026	0.0962	Stuf_Att_Eff
-0.1381	0.0113	0.1261	-0.0424	0.0649	Shop_Loc
0.0092	0.0938	0.1318	0.0751	0.1262	Transp_Bill
-0.0311	-0.0039	0.0338	-0.0980	0.1262	Loy_Ser_Qua
-0.0921	-0.0399	-0.0593	-0.0267	0.1697	Loy_Ser_Devel
0.0003	-0.0184	0.0655	-0.0138	0.1306	Loy_Cust_Sup P
0.0039	-0.0647	-0.0446	-0.0330	0.1299	Loy_Ser_Range
0.0428	-0.0674	0.0158	-0.1093	0.0081	Loy_Price
0.0685	-0.0322	-0.1845	-0.0962	-0.0725	Int_to_Churn
0.0575	-0.0473	-0.0417	-0.0093	-0.0269	Comp_cov_nee ds
-0.0171	-0.0499	-0.0952	-0.0798	-0.0161	Comp_are_Goo d
-0.0623	0.0460	0.1261	0.0522	0.0432	Gender
-0.0143	0.0199	0.2221	0.1465	0.1038	Age
-0.0079	0.0916	0.1614	0.0426	0.1255	Edu
0.0578	0.0379	0.1996	0.0129	0.0591	Occup
0.0083	-0.0089	0.1332	-0.0188	0.0582	Income
1.0000	0.0367	-0.1164	-0.0406	0.0388	Provider
	1.0000	-0.1257	0.1360	0.0930	New_Churn
		1.0000	0.1108	0.2347	CR_Length
			1.0000	-0.0041	Priv_Corp
				1.0000	Talk_min

Talk_nat	SMS	Data_Tr	Apps_Call_YN	Apps_Call_Amount	
-0.0317	0.0221	-0.0686	0.0564	-0.0353	Rec_Ur_Prov
-0.1197	-0.0397	-0.0385	0.0695	-0.0369	Good_Soc_Img

-0.0636	-0.0035	-0.0936	0.0006	0.0487	Wise_Dec
-0.0288	0.0165	-0.1393	0.0041	0.0274	Meet_Exp
-0.0307	0.0005	-0.1274	0.0072	0.0101	Cov_Need
-0.0459	-0.0192	-0.1511	-0.0061	0.0435	Prc_Aff
-0.0880	-0.0189	-0.1119	0.0155	-0.0087	Qua_Meet_Prc
-0.0915	0.0410	-0.0851	0.0480	-0.0435	Al_Good_Con
-0.1588	-0.0210	-0.0514	0.0103	0.0175	Qua_Cust_Ser
-0.1086	-0.0245	-0.0065	-0.0769	0.0158	Stuf_Att_Eff
-0.2147	-0.0706	-0.0056	-0.0836	0.0767	Shop_Loc
-0.1388	-0.0580	-0.0677	0.0765	-0.1220	Transp_Bill
0.0433	-0.0013	0.0931	-0.1647	0.1209	Loy_Ser_Qua
0.0757	0.0602	0.0991	-0.0848	0.0323	Loy_Ser_Devel
0.0383	0.0380	0.1334	-0.0597	0.0473	Loy_Cust_Sup p
0.1220	0.0493	0.0999	-0.0698	0.0008	Loy_Ser_Range
0.0732	-0.0210	-0.0642	-0.0528	0.0013	Loy_Price
0.0216	0.0636	-0.0182	0.1968	-0.1823	Int_to_Churn
-0.0500	-0.0411	0.0615	0.0634	-0.1295	Comp_cov_ needs
0.0093	-0.0659	0.1231	-0.0697	-0.0419	Comp_are_ Good
-0.1339	-0.0178	-0.0311	-0.0383	0.1016	Gender
0.0685	0.0224	-0.3019	0.2628	-0.2042	Age
0.1534	-0.0173	0.0298	-0.0506	0.0291	Edu
-0.0778	-0.1389	-0.1334	0.2035	-0.1157	Occup
0.0206	-0.0516	0.0728	-0.1239	-0.0310	Income
0.0641	0.1051	0.0087	-0.0437	0.0023	Provider
0.0294	-0.0479	-0.0215	0.0177	0.0668	New_Churn
-0.1283	-0.0694	0.0104	-0.0133	-0.0692	CR_Length
0.0563	-0.0170	-0.2216	0.2152	-0.1002	Priv_Corp
0.1221	0.2241	0.1969	-0.1142	0.1524	Talk_min
1.0000	0.2448	0.0477	-0.1024	0.1182	Talk_nat
	1.0000	0.1407	-0.1195	0.1747	SMS
		1.0000	-0.3504	0.2137	Data_Tr
			1.0000	-0.5722	Apps_Call_YN
				1.0000	Apps_Call_Am ount

				Expenceses	
				-0.0658	Rec_Ur_Prov
				-0.0400	Good_Soc_Img
				-0.0802	Wise_Dec
				-0.1263	Meet_Exp
				-0.1306	Cov_Need
				-0.0911	Prc_Aff
				-0.1077	Qua_Meet_Prc
				-0.0138	Al_Good_Con

				0.0208	Qua_Cust_Ser
				-0.0168	Stuf_Att_Eff
				-0.0745	Shop_Loc
				-0.1347	Transp_Bill
				0.0754	Loy_Ser_Qua
				0.1195	Loy_Ser_Devel
				0.0530	Loy_Cust_Sup p
				0.0908	Loy_Ser_Range
				-0.0638	Loy_Price
				-0.0393	Int_to_Churn
				0.0636	Comp_cov_nee ds
				0.0621	Comp_are_Goo d
				-0.0386	Gender
				-0.0898	Age
				0.1545	Edu
				-0.0303	Occup
				0.0524	Income
				-0.0433	Provider
				-0.1031	New_Churn
				0.1197	CR_Length
				-0.1513	Priv_Corp
				0.3338	Talk_min
				0.1227	Talk_nat
				0.1936	SMS
				0.5152	Data_Tr
				-0.3128	Apps_Call_YN
				0.1814	Apps_Call_Am ount
				1.0000	Expences

8. Appendix 2. Multinomial Logit Model of Customer Intention to Churn

Model: Multinomial Logit, using observations 1-447

Dependent variable: Int_to_Churn

Standard errors based on Hessian

Int_to_Churn = 2					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>	
const	5.5821	2.06847	2.6987	0.0070	***
Rec_Ur_Prov	-0.125793	0.181077	-0.6947	0.4872	
Wise_Dec	-0.377563	0.258564	-1.4602	0.1442	
Cov_Need	-0.033614	0.194112	-0.1732	0.8625	
Qua_Meet_Prc	-0.48572	0.215815	-2.2506	0.0244	**
Al_Good_Con	-0.0801721	0.201668	-0.3975	0.6910	
Qua_Cust_Ser	0.247513	0.225116	1.0995	0.2716	
Stuf_Att_Eff	-0.667876	0.256499	-2.6038	0.0092	***
Shop_Loc	-0.0549512	0.188783	-0.2911	0.7710	
Loy_Ser_Qua	-0.248252	0.241661	-1.0273	0.3043	
Comp_cov_needs	0.230836	0.147363	1.5664	0.1172	
Edu	0.401455	0.26751	1.5007	0.1334	
Occup	-0.0310822	0.172606	-0.1801	0.8571	
Income	-0.202261	0.119441	-1.6934	0.0904	*
CR_Length	-0.134223	0.185163	-0.7249	0.4685	
Priv_Corp	-0.456017	0.416061	-1.0960	0.2731	
SMS	0.55585	0.220941	2.5158	0.0119	**
Apps_Call_YN	1.12268	0.453099	2.4778	0.0132	**
Expenc	-0.144819	0.180685	-0.8015	0.4228	
Int_to_Churn = 3					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>	
const	6.3478	2.13043	2.9796	0.0029	***
Rec_Ur_Prov	-0.0151088	0.194189	-0.0778	0.9380	
Wise_Dec	-0.381853	0.258856	-1.4752	0.1402	
Cov_Need	-0.467582	0.198923	-2.3506	0.0187	**
Qua_Meet_Prc	-0.719056	0.213773	-3.3636	0.0008	***
Al_Good_Con	0.24606	0.209995	1.1717	0.2413	
Qua_Cust_Ser	0.26371	0.234253	1.1258	0.2603	
Stuf_Att_Eff	-0.495736	0.268081	-1.8492	0.0644	*
Shop_Loc	-0.384192	0.193436	-1.9861	0.0470	**
Loy_Ser_Qua	-0.381158	0.256678	-1.4850	0.1376	
Comp_cov_needs	0.864364	0.164377	5.2584	<0.0001	***
Edu	-0.18996	0.297075	-0.6394	0.5225	
Occup	-0.12924	0.179717	-0.7191	0.4721	
Income	-0.299912	0.12166	-2.4652	0.0137	**

CR_Length	0.11967	0.203403	0.5883	0.5563	
Priv_Corp	-0.405556	0.405902	-0.9991	0.3177	
SMS	0.660808	0.229921	2.8741	0.0041	***
Apps_Call_YN	1.43902	0.455307	3.1606	0.0016	***
Expenc	-0.211605	0.188166	-1.1246	0.2608	
Int_to_Churn =4					
const	10.0384	3.37491	2.9744	0.0029	***
Rec_Ur_Prov	-0.429836	0.270583	-1.5886	0.1122	
Wise_Dec	-0.930894	0.350952	-2.6525	0.0080	***
Cov_Need	-0.311323	0.289254	-1.0763	0.2818	
Qua_Meet_Prc	-0.660936	0.29137	-2.2684	0.0233	**
Al_Good_Con	0.315971	0.321994	0.9813	0.3264	
Qua_Cust_Ser	0.824724	0.37208	2.2165	0.0267	**
Stuf_Att_Eff	-1.14482	0.406487	-2.8164	0.0049	***
Shop_Loc	-0.361166	0.293045	-1.2325	0.2178	
Loy_Ser_Qua	-0.0891593	0.39242	-0.2272	0.8203	
Comp_cov_needs	1.46761	0.267973	5.4767	<0.0001	***
Edu	-0.154729	0.422253	-0.3664	0.7140	
Occup	0.0557403	0.251205	0.2219	0.8244	
Income	-0.225104	0.176736	-1.2737	0.2028	
CR_Length	-0.520873	0.2587	-2.0134	0.0441	**
Priv_Corp	-2.524	1.13558	-2.2226	0.0262	**
SMS	0.755802	0.330614	2.2861	0.0223	**
Apps_Call_YN	1.11163	0.754206	1.4739	0.1405	
Expenc	-0.705923	0.299226	-2.3592	0.0183	**
Int_to_Churn = 5					
const	13.9326	16982.4	0.0008	0.9993	
Rec_Ur_Prov	1.10702	0.427609	2.5889	0.0096	***
Wise_Dec	-1.76989	0.496605	-3.5640	0.0004	***
Cov_Need	-0.458776	0.384592	-1.1929	0.2329	
Qua_Meet_Prc	-0.655718	0.362612	-1.8083	0.0706	*
Al_Good_Con	1.82631	0.502796	3.6323	0.0003	***
Qua_Cust_Ser	0.614736	0.522215	1.1772	0.2391	
Stuf_Att_Eff	-1.47662	0.514097	-2.8722	0.0041	***
Shop_Loc	-0.579077	0.430085	-1.3464	0.1782	
Loy_Ser_Qua	0.68623	0.5049	1.3591	0.1741	
Comp_cov_needs	3.11013	0.461665	6.7368	<0.0001	***
Edu	-0.905128	0.544735	-1.6616	0.0966	*
Occup	-0.238495	0.310492	-0.7681	0.4424	
Income	-0.039995	0.215964	-0.1852	0.8531	
CR_Length	-0.532923	0.336552	-1.5835	0.1133	
Priv_Corp	-22.3183	16982.4	-0.0013	0.9990	
SMS	0.816395	0.377486	2.1627	0.0306	**

Apps_Call_YN	2.40558	0.880326	2.7326	0.0063	***
Expenc	-0.282653	0.395085	-0.7154	0.4743	

Mean dependent var	2.290828	S.D. dependent var	1.314111
Log-likelihood	-441.7762	Akaike criterion	1035.552
Schwarz criterion	1347.347	Hannan-Quinn	1158.476

Number of cases 'correctly predicted' = 277 (62.0%)

Likelihood ratio test: Chi-square(72) = 416.156 [0.0000]