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ANALYSIS OF CUSTOMER ACTIVITY, THE IMPORTANCE OF TIMING FOR EFFECTIVE MARKETING ACTIONS: CASE OF GROUP BUYING SITE, GROUPER

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Abstract
In order to achieve successful management of their sales and marketing activities companies need to monitor and analyse the activity of their customes. The goal of this study is twofold. First, an empirical investigation of customers' activitiy is conducted by using the Customer Activity measures (Kumar and Reinartz 2012), and in addition a new measure is introduced to determine when a customer ceases to be a customer and the relationship with him ends, and when a customer becomes "currently inactive" before he reactivates again. Second, by having information on the status of the customer's activity, the implementation of appropriate marketing actions is investigated. Information and results gained from this analysis can be a base for action, tools for rehabilitation of "currently inactive customers" are provided that can be used by e-shops and marketplaces. Each company, can use the Customer activitiy measures that are suitable, depending on the industry in which it operates, in order to create a comprehensive image of its customers's activity, increase their activity and make appropriate marketing decisions.

Keywords: CRM strategy, customer-centric strategy, customer retention, lifetime duration, North Macedonia

*JEL classification:*M30

INTRODUCTION

New developments in e-commerce and m-commerce technologies along with the wide adoption of mobile devices and social media have enabled companies to enhance and personalize customers' shopping experiences, their interaction with their brand anytime, anywhere and to gain insights about their customers. The issue of customer activity has gained popularity in the late 1990s and early 2000s, when the marketing field started devoting attention to customer relationship management (CRM). The analysis of customer activity is needed for decision making about the allocation of marketing resources to specific customers, evaluation of the existing CRM strategy that a company practices and for obtaining a comprehensive understanding of the company's customers. Modeling customer activity in non-contractual settings is challenging, as customer activity is unobserved, making forecasts for customer lifetime value and its components less straightforward than in contractual settings. There are various concepts and measures for evaluating customer activity. Some are based on simple observations, while others involve mathematical calculation techniques. Mitrevski and Hristoski (2014) promote a holistic approach, identifying customers as

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the most essential "subsystem" of e-commerce systems with a number of important but not so well-understood behavioral factors. The proposed taxonomy of customers (curious, focused, passionate, indecisive and picky), as well as the specification of operational profiles, are the basis for building predictive models, useful for evaluating a set of performance measures. Through a hierarchical composition of sub-models and discrete event simulation, the authors identify multiple variables in order to transform performance measures into business-oriented metrics: Buy-to-Visit quotient; Revenue Throughput and Potential Loss Throughput, as a cornerstone in the implementation of appropriate activities for capacity planning on the server side. Kumar and Reinartz (2012), on the other hand, divide measures for evaluating customer activity into two main groups: traditional and customer-focused measures. Traditional measures are market share and sales growth, which were developed when there was no customer data at the individual level. Customer-focused measures are divided into three subgroups: Customer Acquisition Metrics; Customer-Activity Metrics; and Customer-Based Value Metrics. The first set of measures is used to evaluate the activities that a company does to gain new customers: acquisition rate and cost of acquisition. This measure applies to an acquired buyer. Once a potential buyer is turned into a real buyer, the relationship building begins. The second set of measures for the analysis of customer activity allows creating a comprehensive picture of the customers of a company and includes the following five measures: Average Inter-Purchase Time, Retention rate, Survival rate, Lifetime Duration and Probability of activation. The third group of customer-based measures is measures to assess customer value and include: consumer basket size, category share and consumer basket share.

Many new variants of these “buy-till-your-die” models were developed in previous decades, building on the Pareto/NBD model (Schmittlein, Morrison and Colombo 1987), such as the BG/NBD model (Fader, Hardie and Lee 2005a). Such models provide probabilistic forecasts, like the number of future purchases, customer lifetime, or CLV as well as for the probability of making future value. While this probability is useful for customer base valuation (Fader, Hardie and Lee 2005b), the fact that it is a probability instead of a deterministic number makes it difficult to translate into a binary active/inactive decision usable in managerial decision-making. Therefore, the previous researches has suggested to 1) determine a cut-off value for P (Alive) to aid in the translation to a binary decision (Reinartz and Kumar, 2000; Wübben and Wangenheim, 2008) or 2) estimate a reactivation probability with an appropriate cut-off (Ma, Tan and Shu, 2015). However, Wübben and Wangenheim (2008) show that such cut-off approaches only capture aggregate behavior accurately, making them less suited for our intended goal of identifying individual inactive customers. Moreover, beyond determining which customers are inactive, it is also important to determine when they are inactive (Neslin et al., 2013). While cut-off- based models provide this information when customers’ probability is below the cut-off value, expensive continuous model updates are required to produce up-to date forecasts to detect the moment at which the cut-off value is reached. A different approach is thus required. Alternatives for accurately determining customer activity have been explored, aimed at modeling the time between purchases (inter purchase time, IPT). Platzer and Reutterer (2016) introduced the Pareto/GGG model, showing that including purchase timing using IPT provides additional information to improve the performance of stochastic purchase models. Using Bayesian estimation (Sarang, Kumar and Zhao, 2016) managed to infer customer’s latent budgetary constraint using only transaction information. Deployment

of marketing actions in calendar time to activate customers has been issue of investigation (Ascarza and Hardie, 2013; Dew and Ansari, 2018; Korkmaz, Kuik and Fok, 2013), specifically that of reactivation e-mails. Importantly, Ascarza' (2018) approach incorporates the idea that firms should launch such interventions at the point in time when the marketing action is most likely to be effective.

Monitoring and measuring customer activity is needed for actions that will activate inactive customers. Customer reactivation aims to stimulate customers who have reduced or ceased purchasing for some time to resume their purchases by sending them a mailing (Blömeke, Clement and Bijmolt, 2010; Pokornyik, 2017). Since e-mail which has a short lead time is used in 90% of customer reactivation initiatives (McGee, 2016), swift and efficient 5 scheduling is a requirement.

Companies should pay special attention to managing customer activity. The purpose of this paper is to show the importance of measuring customer activity in order to manage marketing activities to intervene the churn of the customers. To achieve the goal in this research we need to:

1) Examine which customers have become inactive;
2) When customer become inactive; and
3) Initiate reactivation of these customers with a reactivation e-mailing.

Kumar and Reinartz (2012) measures for customer activity are used for the first task. A new measure is as well introduced in the research, which shows the number of customers expressed as a percentage of the total number of customers from our selected group that is analyzed. The novelty of this measure that is added in the analysis indicates the importance of a company to determine when a customer ceases to be a customer and the relationship with him ends, and when a customer becomes "currently inactive" and then reactivates. Information and results gained from this analysis can be a base for action, and tools for reactivation of "currently inactive customers" are provided that can be used by e-shops and marketplaces.

The remainder of the article is organized as follows. Section 2 reviews the methodology and the dataset of variables used in this research. In Section 3 the empirical findings are presented, and the last section concludes the findings.

1. METHODOLOGY AND DATA

In daily operations, decision making and customer analysis, Grouper uses its own CRM which contains basic information for each registered user such as: personal data of the user; date of registration (when he first registered, i.e. created a user profile, which does not mean that he became a customer at the same time); number of purchases; total amount spent; number of logins; date of last login and location, i.e. IP address from where he logged in. This basic information is used to create a general picture of the user, when for example the customer care department gives him an appropriate answer to his request, question, etc. In any case, when deciding on offering a solution and compensation, Grouper has the same treatment for each customer, regardless of its history and value to the company. Additionally, Grouper management in its annual customer analysis does not include advanced customer segment level analysis, but includes group data for the current year (Grouper, 2015).

The analysis of the customers' activity in this research starts with a detailed analysis of selected segments according to the date of the first purchase of the users, i.e. the date when they first became buyers/customers and when the building of the relationship

with them began. There are various concepts and measures for evaluating customer activity. Kumar and Reinartz (2012), customer-focused measures, particularly the second set off measures; Customer-Activity Metrics are used in this research. These measures are chosen because they are the most appropriate for analysis of customer activity and creating overall picture of customer activity at the deal platform. Some of the measures are interdependent, while some can be calculated and viewed in isolation for different periods and groups of customers.

In addition, the methods for calculating the five measures that are used to measure the customer activity (Kumar and Reinartz, 2012) and the corresponding additions based on the shortcomings of some of the calculations that are the subject of this analysis are explained.

(1) Average Inter-Purchase Time (AIT)

Average time between purchases is a simple measure of how much time passes between a customer's purchases, expressed in days, weeks, months or years. It is calculated with the formula:

$$AIT = 1/NPt \quad (1)$$

Where
AIT is Average Inter-Purchase Time
NP is Number of purchases in a period t

(2) Retention Rate (Rrt) and Defection Rate (Rdt)

Retention and defection rate are interrelated and one can be inferred from the other, and, depending on the context, it is better to use one or the other metric. The retention rate in a given period t (Rrt) shows the average likelihood that the customer purchases in a given period (t), taking into account that the customer was active in the previous period (t-1) and also purchased from the company. The retention rate varies logically for different buyers, but takes into account the average retention rate of a particular homogeneous group, in our case the group consists of buyers who made their first purchase in the first quarter of 2014. There is usually no difference between the individual retention rate of a particular user in the group and the average rate of the group. The following formula is used to calculate the average retention rate of a group of customers:

$$Rrt=100*(NCtl(t-1)/TNC(t-1) \quad (2)$$

Where:
Rrt is retention rate
NCtl(t-1) is Number of customers in cohort buying in (t) being customer in (t-1)
TNC(t-1) Total number of customers in cohort buying in (t-1).

The defection rate is the opposite of the retention rate and indicates the average likelihood that a customer defects from the company in a period (t), given that the customer was purchasing up to period (t-1). It is calculated simply as follows:

$$Rdt(\%)=100-Rrt(\%) \quad (3)$$

(3) Survival Rate (SRt)

The survival rate is closely related to the retention rate. The survival rate shows the buyers who "survived" (continued to be buyers) from the beginning of the observation of these buyers until a certain period (t). Just like the retention rate, it is calculated for a cohort group of customers that the website acquired within a specified period of time. Although retention rate and defection rate provide information for a given period, the

SRt gives a summary overview of how many customers survived between the start of the formation of a cohort and any point in time afterward. SR at time t is equal to the product of the retention rate at time t and the SR during the immediately preceding period (t-1). The survival rate is calculated by the following formula:

$$SRt(\%)=100*Rrt*SR(t-1) \quad (4)$$

In this case, the initial survival rate for the first observation period is equal to the retention rate for that period.

(4) Lifetime Duration

It is sometimes unclear how long a customer has been associated with a firm in a non-contractual setting, since there is no expiration date explicitly stated by the customer. In such situations, it is important to be able to predict the lifetime duration of a customer by observing buying patterns and other explanatory factors. Knowing for how long a customer remains a customer is a key ingredient in the calculation of the customer lifetime value—a key strategic metric. Furthermore, it has implications for churn management, customer replacement, and management of lifetime duration drivers. Predicting a buyer's lifespan is a challenge for online companies that lack "buyer bonding" because it is difficult to determine when a customer will cease to be a buyer.

This measure can be calculated in two ways. The first way is to assume that the retention rate is constant for each period and average lifetime duration will be:

$$(LD)=1/(1-Rr) \quad (5)$$

But since the retention rate usually changes over time (e.g., through customer self-selection) such a calculation would be misleading. We need to weigh in the number of survived periods. For one cohort of customer the avg. lifetime duration is defined as:

$$\overline{(LD)}=(\Sigma(t=1)^T(t*\text{Number of retained customers in t}))/N \quad (6)$$

Where:
N -cohort size
t -time period
T - time horizon
(t * Number of retained customers in t) represents the number of active customer periods for the cohort at time t

In our case, calculating the average lifetime duration of a customer gives us a clear picture of how long it takes Grouper to rebuild its customer base.

(5) P (Active)

This measure applies to an individual buyer and can be useful for estimating the probability that the customer will be active in a certain period of time. It is calculated by the simple formula (Schmittlein and Morrison, 1987):

$$P(Active)= \tau^n \quad (7)$$

Where:
n - the number of purchases in a given period
τ - time of the last purchase (expressed as a fraction of the observation period).

For the analysis of the measures for the customer activity that are calculated through the analysis of certain cohorts of customers (2, 3 and 4) we choose a group of customers who became customers in a certain period. The analysis period covers 4 cohorts of customers we monitor in order to make a detailed analysis of each individual group and then make a comparison of the groups in order to see if there is a difference

in measures between certain cohorts of customers. For the first 2 cohorts, we divide the fiscal year into 4 quarters and accordingly we group the buyers according to the date when they made their first purchase, i.e. when their relationship with the company began. The first group of buyers covers 24 months, i.e. from 1.1.2014. until 31.12.2015 For this period, we analyze the segment of customers who made their first purchase in the first quarter of 2014 and measure their activity in the next 7 periods, i.e. 7 quarters until December 2015. Then we do the same for the next group of customers who became buyers for the first time in the second quarter of 2014, and observe the period of 24 months, i.e. 7 quarters until March 2016. The analysis of the other 2 groups of customers is conducted annually and includes customers from 2011 and 2012, which we follow over the next years, until the end of 2015. We follow the buyers from 2011 in 4 periods yearly, and the buyers from 2012 in the next 3 periods (years) and until the end of 2015. Then we make a comparison in the average retention and survival rate and the average life expectancy of all analyzed cohorts, i.e. a comparison of the first two groups with each other, and a comparison of the second two groups that we analyse annually.

The other two measures that are calculated on an individual customer basis (1 and 5) are calculated for each buyer in the customer segment of the first analyzed group (customers acquired in the period from January to March 2014) who remained active until the last analyzed period (from October to December 2015) in order to demonstrate the importance of the company in monitoring customer activity for better decision making.

(6) New - Addition in the analysis of the retention rate in different periods

The retention rate is calculated by taking into account the buyers from the current period that made a purchase in the previous period, i.e. were active buyers. However, there are customers who may have paused for a while and continued to shop, which is a limitation of the measure. For example, a certain customer may not have been active for one analyzed period of 3 months, and then continued to make purchases and remained an active buyer until the last period of our analysis. If we take into account the periods of inactivity of the customers who are still active buyers for 2 years, we can get a picture of the customer purchase template on the group buying platform. Therefore, in our case we introduce another measure in the research, which shows the number of customers expressed as a percentage of the total number of customers from our selected group that we analyze. The number of active customers in the current analyzed period will be as much as the number of customers who are retained as customers who bought in each subsequent period, for the number of customers who paused for a certain period. The retention rate excludes the possibility for a buyer to pause with activity for a certain period and to continue again by calculating the rate taking into account the active customers from the current period that were obligatorily active in the previous analyzed period. The novelty of this measure that we add in our analysis indicates the importance of a company to determine when a customer ceases to be a customer and when the relationship with him ends and when a customer becomes "currently inactive" and then reactivates. Information and results gained from this analysis can be base for action, and we offer tools for reactivation of "currently inactive customers" that can be used in online sales sites.

3. ANALYSIS AND RESULTS

In the case of group buying sites, the first stage a user goes through before becoming a "customer" is to subscribe or register a user profile. In any case, the registration does not mean that the user is also a customer (buyer), i.e. he/she may never become a customer. The company's relationship building with the customer begins when a registered user makes his first purchase and becomes a "customer". In the case of Grouper, at the end of 2015, out of the total number of registered users, 48% were customers with whom the company is building a long-term relationship (Grouper, 2015). The active relationship with customers varies among different industries, and it is influenced by the different interactions that the customer has with the company, such as, for example, in our case: the experience of searching for the desired products on the website, the way information is presented, the purchase process and pre-purchase customer support, post-purchase customer support, complaints management, etc.

The purpose of measuring customer activity is to examine the status of customer activity for successful management of marketing interventions, to properly allocate resources, to assess the lifestime duration of the customer and its value, in order to make the right decisions. For example, a company with a short customer lifetime duration may conclude that it needs to frequently replenish and replace its customer base in order to generate revenue growth.

The customer activity of the Grouper is analyzed with the help of five measures: average time between purchases (1); retention rate (2); survival rate (3); lifetime duration (4); and probability of activating a buyer (5).

3.1. Analysis of retention rate, survival rate and customer life time duration

The first analyzed group of customers are acquired customers who made their first purchase in the first quarter of 2014 (from 1.1 to 31.3.2014). The size of the selected group is 2589 buyers. We analyze the group of acquired customers in the next 7 periods, i.e. quarters, until the end of 2015 (Table 1).

The retention rate (Rr) for each period (t) is calculated using eq. (2) by dividing the number of active customers in period (t), who were active in the previous period (t-1), by the number of active customers in the previous period (t-1). For the first period, we calculate the retention rate by dividing the active customers in the first period, by the total number of acquired customers that we analyze (385/2589). For the first period, the retention rate is 14.87%, while for the following periods it increases, due to the large number of short-term buyers who leave in the initial periods, and the group of buyers in the following periods decreases.

Survival rate (SRr), shows the share of customers, from the initial number of customers analyzed, who survive, up to a certain period (t). In our case only 0.7% of the buyers remained active buyers until the end of period 7.

Table 1. Retention rate analysis for customers acquired in the period January-March 2014

Period since acquisition	Number of active customers who were active in the previous period	Retention rate (Rr) (%)	Survival rate (SRr) (%)	Number of active periods of retained customers	Total active buyers	Number of reactivated customers	Reactivated buyer periods	Total periods of retained and reactivated customers
1	385	14,87	14,87	385	385	0	0	385
2	124	32,21	4,79	248	289	165	330	578
3	63	50,81	2,43	189	367	304	912	1101
4	45	71,43	1,74	180	422	377	1508	1688
5	30	66,67	1,16	150	289	259	1295	1445
6	21	70	0,81	126	311	290	1740	1866
7	18	85,71	0,7	126	338	320	2240	2366

Source: Grouper, Authors' calculations.

The average retention rate in our case for the 7 analyzed periods is 56%. We can calculate the lifetime duration of buyers through the average retention rate.

The average life time duration, according to the calculation with the average retention rate, is 6.81 months (2.27 periods * 3 months). Due to the fact that the retention rate is not constant and changes for each period, we calculate the lifetime duration of the buyer by adding a weight factor to the number of surviving periods. For example, at the end of period 1 we have 385 active customer periods (385 customers * 1 period), at the end of period 2 we have 248 active periods (124 customers * 2 periods) and so on. If we add all the active periods and divide them by the total number of analyzed acquired buyers, the average lifetime duration of the customer would be 0.54 periods (1404/2589) or 1.63 months. This tells us that the group buying site needs to update its customer base every 2 months.

The above calculations of the retention rate, survival rate and average lifetime duration of the customer do not take into account the possibility that a buyer is inactive for a period of time and then reactivates and continues to be a buyer. The calculation of the retention rate is based on the customers in the analyzed period (t) who were buyers in all previous periods, i.e. if the buyer is not active for one period, it is excluded from the calculations in the following periods. Therefore, our analysis takes into account the customers who were not active for certain periods, but who remained buyers in the following periods, in order to calculate the lifestime duration of the buyer by adding weight factors to the active periods of buyers in which including those buyers who reactivated after a certain break from buying. Column 6 shows the number of total active customers for each period, including those who were not active in the previous period. The number of reactivated customers (column 7) is obtained by subtracting the active customers in the period (t) who were active in the previous period (t-1) (column 2) from the total number of active customers in the period (t), (column 6). By adding the weight factor, we calculate the active periods of the reactivated customers in the same way as in the previous case (column 8). We then express the total number of active periods, by adding the active periods of retained customers and the active periods of reactivated customers (column 9). With the new modified calculation, the average lifetime duration of the buyer is 3.64 periods (9529 total active periods / 2589 acquired buyers in the analyzed period). The survival rate with the modified calculation

in the last period, in this case, indicates that 13% of the initial number of buyers survived until the end of the seventh period, which is drastically different from the survival rate of 0.7%, which was obtained with the initial calculations.

The modified calculations point to the importance of reactivating customers who have been inactive for some time and open up a new field of research to identify "dormant" customers who may be currently inactive and who should not be considered customers who have left the company. At the same time, a big role in the calculations is played by the size of the selected time range, which should be carefully selected, depending on the frequency of purchases of the cut user.

The same analysis was performed for the second selected group of customers that Grouper acquired in the second quarter of 2014, in order to determine whether there are significant differences between the rates of the two selected groups (Table 2). The time frame for monitoring the second group is in the period from July 2014 to March 2016, i.e. 7 quarters. The number of customers in the second analyzed group is 1855 customers.

Table 2. Retention rate analysis for customers acquired in the period April-June 2014

Period since acquisition	Number of active customers who were active in the previous period	Retention rate (Rr) (%)	Survival rate (SRr) (%)	Number of active periods of retained customers	Total active buyers	Number of reactivated customers	Reactivated buyer periods	Total periods of retained and reactivated customers
1	309	16,66	16,66	309	309	0	0	309
2	123	39,81	6,63	246	309	186	372	618
3	62	50,41	3,34	186	329	267	801	987
4	39	62,9	2,1	156	256	217	868	1024
5	26	66,67	1,4	130	257	231	1155	1285
6	24	92,31	1,29	144	314	290	1740	1884
7	17	70,83	0,92	119	387	370	2590	2709

Source: Grouper, Authors' calculations.

The average customer retention rate for the second analyzed group is 57%. The survival rate in the last analyzed period is 0.92%. The average lifetime duration, according to the average retention rate, is 2.3 periods or 6.9 months (2.3 periods * 3 months), while adding the weight factor to the active periods is 0.7 periods, ie 2 months (0.7 periods * 2 months). With our modified calculation for the second group, we estimate the average lifetime duration at 4.75 periods, i.e. 14.25 months (8816 total active periods / 1855 acquired customers in the analyzed period). At the end of the analyzed period, 20.9% of the initial group of 1855 customers remained buyers, which is a big difference, compared to 0.92% of surviving customers, if we exclude those who were inactive for certain periods.

By applying the same calculations to the second analyzed group from the analysis of the first group, we notice that the obtained indicators are almost the same for the two analyzed groups, which indicates that there is no difference between users acquired in the first quarter and second quarter of 2014 and the information obtained are considered appropriate for forecasting customer activity received in future periods of operation.

For a more detailed analysis, we include an analysis of 2 more groups of customers, that we analysie on an annual bases compared to the first 2 groups that were anlysized in periods of quarters. Table 3 follows the group of customers who became customers for the first time in 2011, during the next 4 periods per year. The total number of analyzed buyers is 5491.

Table 3. Retention rate analysis for customers acquired in the period 2011

Period since acquisition	Number of active customers who were active in the previous period	Retention rate (Rr) (%)	Survival rate (SRr) (%)	Number of active periods of retained customers	Total active buyers	Number of reactivated customers	Reactivated buyer periods	Total periods of retained and reactivated customers
1	2927	2927	53,31	53,31	2927	0	0	2927
2	2389	1978	67,58	36,02	3956	411	822	4778
3	2110	1396	70,58	25,42	4188	714	2142	6330
4	2128	1133	81,16	20,63	4532	995	3980	8512

Source: Grouper, Authors' calculations.

The average customer retention rate from 2011 in the following years was 68.15%, while 20.63% of buyers survived until the end of 2015. According to the average retention rate, the average customer lifetime duration is 3.14 years, i.e. 2.84 years, according to the active periods of buyers.

Furthermore, the second group of customers that Grouper.mk gained in 2012 (Table 4 is larger and it amounts to 8455 customers. The average retention rate is 63.35%, and the retention rate at the end of 2015 is 22.98%. The average lifetime duration of the customer, according to the retention rate is similar to the previous group, which is logical at a similar average retention rate, which is 2.73 years. According to the number of active periods, the average lifetime duration is 1.8 years, which is a result of the shorter period of analyzed periods and a smaller number of periods of active customers.

Table 4. Retention rate analysis for customers acquired in the period 2012

Period since acquisition	Number of active customers who were active in the previous period	Retention rate (Rr) (%)	Survival rate (SRr) (%)	Number of active periods of retained customers	Total active buyers	Number of reactivated customers	Reactivated buyer periods	Total periods of retained and reactivated customers
1	3605	3605	42,69	42,69	3605	0	0	3605
2	2898	2898	80,39	34,32	5796	0	0	5796
3	2890	1941	66,98	22,98	5823	949	2847	8670

Source: Grouper, Authors' calculations.

If we compare the two analyzed groups, we notice that in the first periods in the first two groups that we monitor on a quarterly basis the retention rate is between 15% and 16%, while in the second groups that we monitor annually is between 43% and

53%, i.e. the dropout rate in the first period is much higher among the analyzed groups on a quarterly basis. The choice of the length of group monitoring periods is of great importance, and depends on the type of industry and the frequency of purchases by customers. For example, if analyzes are done to a company that sells everyday products, which are often purchased within a month by the buyer, a monthly or weekly analysis will be more appropriate. Because in our case it is a site for group buying with discounts through daily deals, which offers different categories of products, analysis were made according to two periods (quarterly and annually). The retention rate does not indicate the intensity of the buyer's activity, so if one buyer makes one purchase per year, in the annual analysis he will be considered a retained buyer until the end of the analyzed period, while in the quarterly analysis will be considered only in the quarter when he was active and then considered to have left the company.

The average customer lifetime duration, when analyzed on a quarterly basis, indicates that if the company wants customers who are active at least every 3 months, it should replenish the customer base every 6 months, according to the calculation with an average retention rate, i.e. every 2 months, according to the calculation with active customer periods.

The comparison indicates the importance of choosing the period for customer analysis, which is determined depending on the purpose of the analysis, the type of industry and the frequency of purchases made by customers. The analysis of the average time between purchases and the probability of activity of a customer gives a more detailed picture of the pattern of purchases and the frequency of purchases by a customer, on an individual level, which we illustrate below.

3.2 Analysis of the average time between purchases and the probability of buyer activity

The assessment of the customer activity is of great importance for the company especially for determination in terms of when the customer is currently inactive, and will reactivate (continue to shop) and when the customer stopped buying and left the company. The challenge is even greater given that the company has a variety of tools that can influence the reactivation of currently inactive customers. For example, if a company deems a customer to be inactive for a period of time, it may encourage the customer to reactivate by sending a personalized email based on their previous activity and purchases.

Advanced technologies enable the building of a personalized relationship with customers, which was missing at the time of analysis made on the group buying site, Grouper. Through the example of several analyzed buyers, we illustrate the possible application of measures when making decisions on an individual basis for a particular customer.

The analysis of the average time between purchases and the probability of customer activity is done for each retained customer until the last period of analysis by our first selected group, i.e. customers who first became customers in the first quarter of 2014 and remained active until the end of 2015 year (Table 5). Because these measures are calculated at the customer level, our goal in selecting this group is to illustrate how the company can benefit from these measures and how it can make decisions to increase customer activity. Customers who have been active during the 7 analyzed periods, from

the moment they become customers, are presumed to be the desired customers for the group buying site Grouper.

The analysis of retention rate, survival and average customer lifetime duration for the selected group does not take into account the intensity of activity or the number of purchases by customers. In Table 5 we first calculate the average time between purchases, by periods, i.e. for 8 quarters, which we analyze from January 2014 to December 2015. Then we calculate the average time between purchases, for each customer, taking into account the AIT for each individual period that we express in months, multiplied by the number of months, i.e., in our case 3 months. The average time between purchases for the selected group varies from 0.48 months to 2.13 months, i.e customer 16 on average makes a purchase every 15 days (0.48 months x 30 days), and buyer 10 every 2.13 months.

Table 5. Analysis of the average time between purchases for customers acquired in the period January-March, 2014. and remained active buyers until the end of 2015.

Buyer	Average time between purchases for each period (AIT									
	1	2	3	4	5	6	7	8	Average AIT	Months between purchases
1	1,00	1,00	1,00	0,20	0,25	0,25	0,20	0,08	0,50	1,49
2	0,33	0,33	0,33	1,00	1,00	0,50	0,50	1,00	0,63	1,88
3	0,50	1,00	0,20	0,50	1,00	1,00	1,00	0,33	0,69	2,08
4	1,00	0,33	0,33	1,00	0,50	0,33	0,50	1,00	0,63	1,88
5	0,25	0,20	1,00	0,14	0,13	0,25	0,17	0,20	0,29	0,88
6	0,07	0,14	0,25	0,50	1,00	0,50	1,00	0,20	0,46	1,37
7	0,08	0,07	0,17	0,25	0,25	0,50	0,50	1,00	0,35	1,05
8	0,33	0,25	0,50	0,14	0,20	0,13	0,33	0,20	0,26	0,78
9	0,50	0,33	1,00	1,00	0,33	1,00	1,00	0,07	0,65	1,96
10	0,17	1,00	1,00	0,50	0,50	1,00	1,00	0,50	0,71	2,13
11	1,00	1,00	0,50	0,25	0,14	1,00	0,25	0,33	0,56	1,68
12	0,50	0,50	0,33	0,50	1,00	1,00	1,00	0,50	0,67	2,00
13	1,00	0,25	0,33	0,33	0,50	1,00	0,10	1,00	0,56	1,69
14	1,00	0,33	0,33	1,00	0,50	1,00	1,00	0,10	0,66	1,98
15	0,33	0,13	0,25	0,50	0,17	0,25	0,50	0,50	0,33	0,98
16	0,11	0,25	0,20	0,11	0,08	0,08	0,25	0,20	0,16	0,48
17	0,20	1,00	0,17	0,50	0,20	0,20	0,25	0,11	0,33	0,99
18	1,00	0,33	0,33	0,33	0,20	0,14	0,11	0,50	0,37	1,11

Source: Grouper, Authors' calculations.

The group buying site may use this information at the customer level for a variety of purposes, for example: If more than one day has elapsed between the average purchases since the last purchase, it may send a personalized e-mail to this customer in order to remind him and encourage buying. Furthermore, it can introduce reward points for buyers who have less time between purchases, as a reward for regular purchases.

In addition to the average time between purchases, the probability of a customer's activity P (Active) is a measure that calculates the probability of the buyer being active, i.e. making a purchase in a certain period (t), based on his previous activity in the past period and his shopping template. For the same group of buyers we calculate the probability of buyer activity in the 9th period, i.e. in the first quarter of 2016 (Fig.1). Probability is calculated by taking into account the total number of purchases per customer, for the observed period (n), and the time elapsed since the last purchase (τ),

expressed as part of the observation period. In our case, we calculate the probability for the customer to be active in the 9th period, i.e. the first quarter of 2016, if we know that he was active in the previous 8 quarters.

$$\tau=8/9=0,888$$

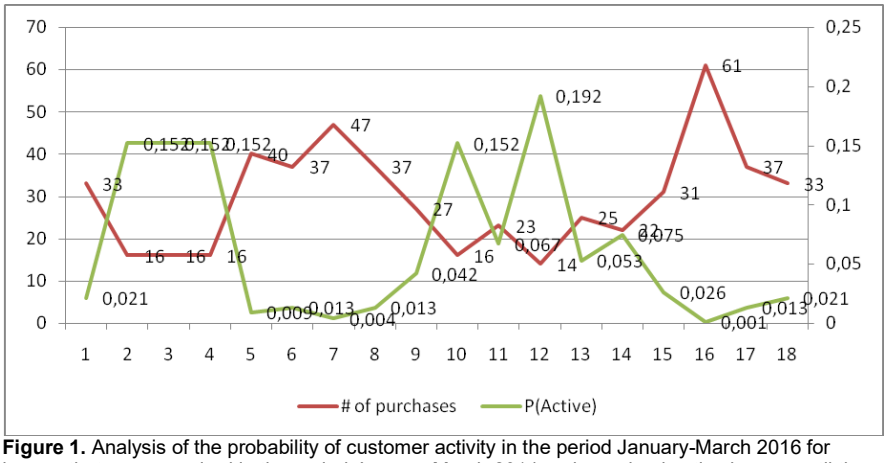

Figure 1. Analysis of the probability of customer activity in the period January-March 2016 for buyers that were acquired in the period January-March 2014 and remained active buyers until the end of 2015.
Source: Grouper, Authors' calculations

We can notice that the probability of activating a customer is higher for buyers who made a smaller number of purchases in the analyzed period (buyer 2, 3, 4 and 12). This is due to the assumption that the customer's buying pattern is constant in each period, i.e. the buyer does not change the buying habit. In our case, since this is a group buying site that constantly offers a variety of products, services and travel deals, this assumption is a limitation of the measure. For example, if we take into account the seasonal consumption, for example in summer and winter for annual trips or for certain campaign activities that can be practiced by the site of group discounts by placing different deals in different periods, we consider this measure to be too simplified to be able to find application in such a site, e-marketplace or company that offers different services and products in different periods.

CONCLUSION

The research analyzes customer activity by measuring the retention rate, survival rate and average customer lifetime duration of four groups of customers acquired in different periods from the group buying site Grouper. In the analysis of the first two groups of customers, acquired in the first two quarters of 2014, the average retention rate is 56% and 57%, respectively, while in the second two groups acquired in 2011 and 2012, it is 63% and 68%, respectively. The retention rate is lower in the initial periods because a large number of buyers leave in the first periods and increase during the following periods. The average survival rate, in the last analyzed period, for the first two groups is 0.7%, ie 0.9%, while for the second two groups it is 21% and 23%, which shows that many customers are active at least once a year, while a small number are

active at least once a quarter. The average lifetime duration of the customer, calculated according to the average retention rate, is seven months for the first two groups of buyers and 3.14, i.e. 2.7 years for the second two groups of buyers. According to the number of active periods of the buyers, the average lifetime duration of the customer is 1.63, i.e. two months for the first two groups and 3.84, i.e. 1.8 years for the second two groups of buyers. Since Grouper.mk sells various products and services at discounts that can be used more often by customers, i.e. at least several times during the year, a more appropriate analysis is the analysis conducted on a quarterly basis, which indicates that the company should make additions to the customer base, that is, to gain new customers every two months. Additional analysis at the customer level was conducted on eighteen customers who remained active customers until the last observation period of the first analyzed group of customers acquired in the first quarter of 2014. By measuring the average time between purchases, a company can increase sales and customer activity, for example by sending personalized emails to customers who have not made a purchase in a certain period, depending on the level of average time between purchases. The probability of customer activity is not considered an appropriate indicator in the case of Grouper, which offers a variety of products and services at different times, due to the assumption that each customer's purchase pattern remains unchanged over time. Each company, depending on the industry in which it operates, can use those measures of customer activity that are suitable in order to create a comprehensive image of customers, increase their activity and make appropriate marketing decisions.

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