CUSTOMER GOVERNANCE AND SEGMENTATION USING DATABASE ALGORITHM

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Abstract

The primary goal of any business is to maximize its profits. The company must have the right customers to ensure its continuous existence. This paper aims to help a company identify the right customers by developing a flow that enables them to easily do so. Customers for sure progress from one loyalty stage to the next in time, and marketing actions can help them to do so (Ngobo, 2017). The focus is on the problem of identifying the right customers based on what the company needs at that moment (the best-performing ones, the new ones, the ones who will retain, etc.). The methodology will include an analysis of data previously stored by the company. It will give technical details of how this flow is created and how is practically implemented. The existing data, is manipulated more appropriately and then passed and stored in a dedicated PostgreSQL database. This kind of database offers important techniques such as advanced indexing and high availability to build scalable, reliable, and fault-tolerant database applications (Schönig, 2020). In conclusion, the paper will give the effects of the actions taken based on the lists generated by the created logic.

Keywords: Customer, Customer Value, Segment, Cases, Database, Flow, Knowledge Management, Algorithm, Information Systems

Authors' individual contribution: Conceptualization — A.B.; Methodology — O.S. and S.X.; Writing — Original Draft — A.B. and L.B.; Writing — Review & Editing — S.X., J.I., and L.B.; Supervision — A.B.

Declaration of conflicting interests: The Authors declare that there is no conflict of interest.

1. INTRODUCTION

The purpose of this paper is to support a company in classifying customers into different groups based on their behavior towards the company. The process of classifying customers is very important. They can understand: how good is the company positioned towards competitors and what is the image customers have about it. Is the company making loyal customers through the years that operated in the market and if these loyal customers are still happy with the company's performance? Is the company getting the new customers, the ones who react better to the new products/services, etc.?

The question "Why superior customer value?" arises in today's highly competitive market environment, where organizations have equal or more possibilities to access the same resources, such as talents, technology, and information. What else does a company have to offer to its customers if not greater customer value? (McFarlane, 2013).

Customer satisfaction most probably will be translated to customer loyalty. If the customer feels that the company appreciates him and he gets from the company more value compared to products of the competitors in the same market, this will affect for sure (in a positive way) the image that the customer has for the company. Customer value theory, according to Weinstein (2012), is a holistic

and all-encompassing approach and strategy to value generation and growth in enterprises. Organizations exist to suit the needs and desires of customers while also striving to grow and prosper.

Based on the literature review, carried out under the databases, marketing tools for customer segmentation and related areas, it has been noticed the lack of sufficient deep literature and studies on issues related to marketing intelligence and customer segmentation, using database algorithm. Despite having this gap in the interdisciplinary literature, and getting useful sources, we tried to compensate for the gap with our methodology, based on a database algorithm, in order to fulfill the objectives of the article.

The methodology used in this paper goes through the following steps:

1. Identification of the right persons for this project.

2. Literature search related to database and marketing.

3. Flow generation.

4. Database (DB) implementation.

5. Analysis of the results after implementation.

According to McFarlane and Britt (2007), the market environment is constantly changing, and enterprises must react directly to be competitive. The marketing landscape has evolved drastically in recent years, and businesses must design successful methods for responding to and dealing with this shift, all while guaranteeing higher customer value and experience.

A company should identify and pay attention to the most valuable ones. That is for sure. The company must continue to make them happy with their product/service. The company should never take them for granted (McIlroy & Barnett, 2000), one mistake that often the companies make. Also should make big efforts even for the other groupings on the same time.

As perfectly stated by McFarlane (2013), business intelligence is no longer an advantage that companies can use to stay ahead because trends analyses concerning markets and economies are widely available to any company. So, the company should go a step ahead and differ from the competitors to be at the top of the market.

This project came into life due to some questions that were raised and to whom, the company, which is taken into consideration in this paper, should answer:

RQ1: Which ones are the ones appropriate to be the target?

RQ2: In which group should they be categorized?

RQ3: What should we target them for?

RQ4: Which is the right approach to have with them?

RQ5: When is the right time to deal with them?

These questions are applicable almost in every marketing activity and for sure are applicable even in this project.

By following the designed methodology related to the different groups of customers the company would fulfill the main aim: a better approach to the customers so it will benefit in the number of loyal customers and total company revenue. At the same time, a second aim will be fulfilled to manage the customers dynamically.

The first step through which this project will begin is the creation of a flow. Through that, the company can identify different groups. We will design the flow to pass through and the parameters to take into consideration in this process.

If we want to go through a good and detailed analysis, we take into consideration much more steps than only the sales. The identification of the right variables to take into consideration is the most important part of the analysis.

However, of course, customers chosen for a type of action can be not the same for another type of action.

The flow presented is like a flowchart, with steps, requirements, analysis, stats, and transitions for each consisting step.

The flowchart works with the filters specified since the design of this project, e.g., cases of offering a new product (based on loyal customers' needs), cases of offering promoters to the next best group, cases of increasing the revenues from commissions based on a new service offered, etc. All the scenarios at the end will generate a list of customers that pass through the specified filters. Of course, customers can be part of more than a list at the same time.

According to Brynjolfsson (2003), IT makes little direct contribution to the overall success of a firm or the economy until it's joined with supporting the market in work practices, human capital, and organizational reorganization.

The design process involved people from different groups within the company:

– The marketing team specified the cases in which they are interested.

– The analysis team put under analysis the info that exists in the company. They identified the right filters to consider.

– The database and IT team gave suggestions related to hardware and database type to use.

– The filtering team, the ones that made the match between the cases defined by a marketing team and the filters provided by the analysis team, generates the final list of customers.

– In the end, a software developer can make it possible for this list to pass through a dashboard presentation, in order not to have only a plain list, but also other statistical stuff related to the customers in the list. This software development's main purpose is the customer experience optimization level. So, even without a full list of customers, they can create a general idea of the persons to which they are dedicating this effort.

Since the company has a lot of information collected and stored, a big part of the project was already concluded. The info utilized for this project was the one that the company already stored.

To make all the processes simpler and with a fast response, it was decided to create a dedicated database within the company for this project. The filtering process is much more easy and simple to use.

The conceptual framework is focused on theories developed for studying IT adoption (Tornatzky & Fleischer, 1990) and innovation diffusion (Rogers, 1995).

Theories created for researching IT adoption and innovation dissemination (Tornatzky & Fleischer, 1990) are crucial to the conceptual framework

(Rogers, 1995). Innovation diffusion theory investigates how essential innovations are in a business that operates in a highly competitive market. According to Tornatzky and Fleischer (1990), the decision to embrace a technical innovation is influenced by aspects of the organizational and environmental surroundings, as well as the technology's qualities. Relative advantage, compatibility, complexity, trialability, and observability are five criteria highlighted by Rogers (1995) as having an impact on the speed of acceptance of an innovation.

In the end, after the analysis was done, the flow was created, and the DB performing, up and running the company had a good review related to the project. It was well developed so the questions in the first were answered in the best of ways.

In summary, the sessions listed below will produce a flow-through that will allow the listing of clients who meet the defined inputs. After that, the entire flow will be generated in a dedicated environment. The information used will be the same as that stored for other purposes by the organization, but it will be mirrored in the new specialized environment PostgreSQL DB.

For sure, this article contributes to a greater knowledge related to the topic, both in customers care and database fields. The other part of the article is structured as follows. Section 2 presents an overview of the relevant literature. Section 3 introduces the methodology that has been used to conduct the research in this paper. Section 4 reveals the results of the research paper. Section 5 includes a discussion of all the project realization, and Section 6 presents the conclusions reached.

2. LITERATURE REVIEW

Analysts have been involved for a long time in approaches to market segmentation and grouping (Young, Ott, & Feigin, 1978). Numerous studies have reported the significance of this mechanism (La Barbera & Mazursky, 1983; Ranaweera & Prabhu, 2003).

The company that we are going to consider made lots of analysis before, and realized that all this project which includes an *ad hoc* development for customer segmentation is less costly than engaging employees every time to analyze by themselves from the beginning. The customer segmentation and identification process is one of the most important, is stated that it cost 25 percent more to recruit new customers than to retrain the existing ones (Zairi, 2000).

This paper is important and the analysis made in it even more. The value of customer analysis and grouping has been the subject of several studies that reveal a link between customer satisfaction and the profitability of a company. The organization will suffer too many disadvantages if it does not pay attention to client dissatisfaction (Hoyer & MacInnis 2001).

All this importance related to the analysis can be seen in Coldwell (2001) who states that comparing a satisfied customer, generates 2.6 times the revenue of a somehow satisfied customer and 17 times the revenue of a dissatisfied customer.

Turning customers into loyal is the biggest aim of companies. But loyalty is driven by industry and market factors, such as competitiveness and shifting expenses (Ngobo, 2017).

Customers who are dissatisfied with your service will abandon using it and will tell others not to use or buy your products (Aunkofer, 2018).

Even loyalty can be understood on a deeper level like reasoned loyalty, critical loyalty, inherited loyalty, routinized loyalty, compulsive loyalty, and ideological loyalty (Närvänen, Kuusela, Paavola, & Sirola, 2020).

3. METHODOLOGY

The company has made a previous analysis through which compared the complexity of the new project with the advantages that will take from the implementation. It was considered that the generating of the list by just choosing the desired output based on predefined cases was much more time effective than making all the time research on what to do, involving employees repeatedly in the same process but with tiny changes. So, on time and cost efficiency, the company considered this project much more productive than the actual working flow that they use.

This paper will give a general overview related to a development that will give the right persons the ability to process the real-time data minimizing the involvement of technical persons every time that it will be necessary to make an analysis. The project is based on cases, which means that we flow predefined since the project designation will provide certain information based on the predefined filters.

Choosing the right case will be the initialization of all the rest of the back-end analysis and will end with the generation of the full list. All the process is done based on the below steps:

1. The creation of this project involved different teams from marketing to IT.

2. A comprehensive literature search encompassing both database marketing and mainstream marketing was done.

3. Description of the flow that will be necessary to understand how the data will be retrieved and stored in a new DB.

4. Is given a full description of how exactly this new DB will connect with the existing ones and how they operate.

The analysis and the data collection are done on a PostgreSQL DB. PostgreSQL database offers the possibility to store data. In our case, it uses structured data. PostgreSQL is a free, open-source product. The company based on the expertise of the IT team, considering how it will affect other actual working processes, took a decision and decided it more appropriate to include the variables to take into consideration during the analysis under the same schema, even though on different tables grouped based on their similarities.

All of the flow is determined by a thorough examination of the company, its products, and its customers. All three major fields are thoroughly examined. After that, it was much easier to understand the criteria to evaluate, which were unquestionably correct.

In an alternative to what is used in this paper and this project so all DB implementation and all the flow and scenarios could be made by first conducting some questionnaires to the customers if the company wouldn't want to use the existing information.

An alternative way for this step (the first analysis) would be the use of the Delphi techniques, which usually involve steps like choosing a panel of specialists; tasks/challenges for forecasting are assigned and dispersed among them, forecasts and feedback. All the data retrieved in this way could be analyzed not by the company's employees like in our case, but with different data analysis techniques.

Also, instead, the PostgreSQL DB could be used with different technology like Oracle or SQL.

4. ANALYSIS

The project described below in detail was implemented in the company. For two months members of different teams made tests to understand if any possible wrong flow would generate a wrong grouping of customers. After that, the marketing team begin to use it as a fully developed product.

All their analysis are made through this flow. It was seen as a better approach toward the customers. Especially, this project gave its best contribution to identifying loyal customers to a product. So, the company began to adopt new products based on the generated groups.

From the surveys made before and after the implementation of this project was seen that the customers were happier with the approach that the company was having towards them. Another decision, which the company made and gave big changes in her productivity, was that every month were generated customers, which were more active toward new products, and they were awarded some simple free similar products.

The customers noticed this approach and for the first three months that the company operated based on the groups generated through this project, it was noticed an increase of interest of 3% in new products that the company launched.

The comparison was made based on the results of the same period (since the conditions for every three quarters are similar to each other and no major changes were noticed).

The table below (Table 1) gives a summary of customer approach in two consequent three quarters and two three quarters of the same time but of different years.

Table 1. Customer approach

Period/Approach toward the company	Compared to the first quarter (2021)	Compared to the same quarter a year before (2020)
Perception of the company	+1%	+3%
Loose percentage of customers	-0.5%	-1.3%

In the survey, the group prechosen is a mix of new customers and the ones who need major effort. The loyal ones were excluded to get a net overall opinion. All of them had a better perception of the company. Also from the list of potential customers to leave the company was seen to decrease on their attempts to do so as per values on Tab.1.

So these projects gave a new boost to the company to understand better their customers and react based on their needs.

4.1. Environment creation flow

All the flow that is created needs preparatory processes that will make it possible to pass to further steps. The process of customer categorization passes in two steps.

The first one relates to the identification of variables to include in the analysis.

Info provided from marketing and analysis employees:
– Variables that should be included in the analysis.
– Data classification. For this project, the company has classified the data as per Table 2.

We have two main groups of data, the general info and the info that has to do with how the customer interacts with the company, so the info that generates from customer behavior. All this information collected from the actual data is passed to this newly created database as per the categorization done in Table 1. Since the company that we are considering is a company that generates a very large amount of data at a time, the data is replicated at the same time even

in the PostgreSQL database that is used for segmentation or grouping of customers.

All this data will be taken into consideration in different cases or scenarios, for example, if the company needs to pay attention to the newly added customers with ages less than 25 years will consider customer information like age and years loyal to the business (general customer info and data from customer interaction).

The information expressed in form of data takes into consideration data stored for the last 2 years.

The 2-year period is considered the most appropriate one because the customer behavior is analyzed for a relatively long period (more than that would be not relevant because the company operates in a very fast-changing industry). For this period, the data is generated easily directly from the company systems. The data in the new database is often not included in the simplest way (raw data) but manipulated and passed more appropriately for the project. Complex data is a set of simple data which is connected by logical operators (& — "and"; || — "or"). Since the data is replicated in the new tables of the dedicated database in a complex way, the process of calculating and retrieval will be much faster.

The second step is the technical part. Designation of tables, schema, and DB population. Primary keys and relations between tables.

During this step, different discussions of how it would be the best approach to follow are made. To use the data directly in the first source or to dedicate a new environment (database). The company, as mentioned before, generates but

also retrieves a lot of data for its normal daily operative work. For this reason, querying or including also this process in the actual databases would cause delays in the company processes. Fixing one thing will cause many delays in other jobs.

But also, it is simpler to work on the dedicated DB, so in the future can be easily added other related flows but also the live system is not affected or overloaded by this process.

So, the flow that data will follow is as follows:
– The data will be taken from the information which already exists in the company, so no need to make extra expenses for this analysis.
– The employees of reporting team and DBA are the ones, which should be included in this step.
– Data replication in new PostgreSQL DB.
– Backup and recovery policy.
– Access rights to the specified users.

Table 2. Customer approach

	Demographic info
Customer general info	Name
	Age
	Customer categorization
	Years loyal to the business
	Contract
	Status
Data from interactions with the company	Payment commitment and corrects
	Range of products requested
	Personalized or standardized products
	Discounts requested
	Product quantity
	Request periodicity

4.2. Database schema creation

The database team went through a long process. During it, they submitted different options. One of the first requests for this project was that its service is online and generates real-time data at any moment to have flexibility and stability.

The company had a vast range of database choices for the project, so they made a full analysis and decided based on the advantages and disadvantages of each of them. The first one that was taken into account was an Oracle database technology. The best one from Oracle architecture, in the analysis, was considered the Real Application Clusters (RAC) database with data guard technology. This would give the availability of the services to be always online and in case one of the databases crashes, the other databases that run on other RAC servers will continue running without any problem.

The data guard technology is used in case of disaster issues like fire, earthquake, etc., the databases that run in data guard are always synchronized with primary RAC databases but are read-only databases until when all the services are switched from the primary side to the disaster site. This architecture would perform also in RAC physical server in the company data center or Cloud Oracle Infrastructure managed directly by Oracle. The last Oracle version is 21c.

Another type of database considered during the analysis was the Microsoft SQL Server (MSSQL), which can use failover technology to use one server online and another standby in case of an issue on the primary side. In the case of choosing this technology, the version suggested to use was the MSSQL 2019.

The list of analyses went through another database type, it was taken into consideration MySQL which was opted for the possibility to use the same infrastructure as the Oracle DB.

The analysis was quite detailed and accompanied by the time needed to implement, the cost analysis, and maintenance complexity after its installation.

After all the analysis the company opted for the usage of an open-source database that is having wide usage nowadays, in most IT companies. In Albania, the major part of significant companies that operates in the IT sector is opting for PostgreSQL databases. In this project, the company decided to use the last version of PostgreSQL DB 13. It is used with RAC technology and with a data guard as in Oracle database. The performance of this DB is very good and nearly to the Oracle/MSSQL DBs, and what is most important they do not need to get a license for it. PostgreSQL is an ORDBS (object-relational database system). It is an open-source system and its usage is being widely spread in the last years even though it has over 30 years of active development. Below is the PostgreSQL database infrastructure. It is implemented in a Linux 7 operating system (Red Hat).
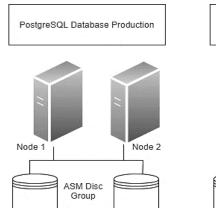
Figure 1. A schematic view of PostgreSQL databases of production and disaster were created

In Figure 1, we can easily see in a schematic way how the PostgreSQL database is created and how it operates.
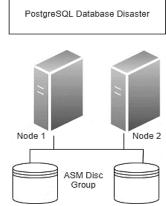
After all the process of determining the data to include in the analysis, how it will be stored, and where it will be stored, we can describe last but not least. We will describe how all the processes described before connect. A schematic view is given to express better all the flow.

Figure 2 gives a generalized overview of all the process creation flow. It begins with the info for each case from the marketing employees. Then, the IT employees, that decide which is the best approach to follow, are. They will decide which info from which databases will be loading info to the newly created database.

The other step, the third one, relates to how to store all the info. Which are the tables to create, how the data will be distributed among them, and how they connect through mapping tables with each other.

In this way, the searching time will be reduced; the info, which is needed for the analysis, is saved on a centralized database that is updated regularly so that we will be sure that the info provided will give the right customers list.

Figure 2 is expressed in detail all the technical information that the info will pass through to become useful for the newly created process. After all the process described in Figure 2 has finished successfully then we can pass through the explanations related to the generation of the list of customers based on their groups or subgroups.
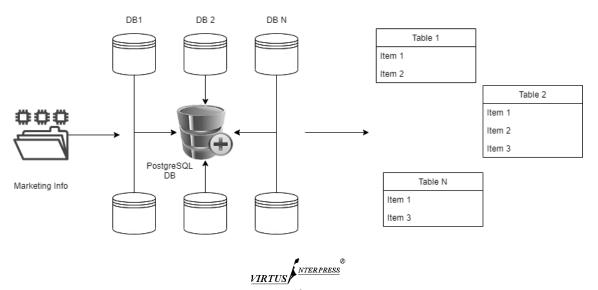
The workflow of Figure 3 gives a general view of the way how customer generation list is made based on the user input choice. So, the aim was to generate a list of customers who belong to a certain group or segmentation (e.g., we have named them best customers, next best, and major effort). But, as we have mentioned, this was only one of the big groups to be displayed. Many other groups would be generated through this flow and process.

The first step is the authorized person who will choose the case. The end-user will choose a case based on the list of customers that he wants to generate, e.g., the best-performing customers. The user puts case 1. After that, the DB will be extracted info related to this case.

Then, the analysis will begin with the customer classification, all of them that pass the first classification will continue to the second filter, the third one, and so on until the last filter of this case. In the end, it will generate a list of the customers that fulfill all the filters of the prechosen case.

One question that rises to the end of the project is if it would be flexible. The persons that were going to make further analysis of the generated list were a bit skeptical related to how flexible this system would be. Since the market is in continuous change, the analysis that was needed in a moment would be worthless for a second time. For this reason, IT gave the possibility to not only use the predefined cases but also to easily create new ones only by giving the right filters.

Figure 2. Data analysis, selection, extraction, and storage in the new database
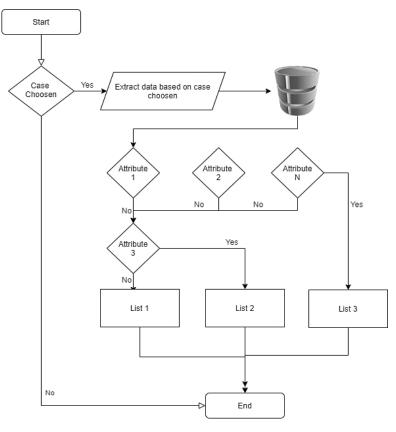
Figure 3. Flow describing the generating list of the prechosen case

5. DISCUSSION

Customers are more than just enthusiastic and complicated clients of the organization. Customers must be recognized as the most significant long-term strategic partners for businesses. Organizations must realize that customer value is more than a strategy or a short-term goal; it is a way of doing business that requires a grasp of the dynamics of business value drivers and how they combine to achieve long-term profitability and success. Value over time is what creates market drivers and leaders, as well as strong and long-lasting businesses.

So, through all this paper was made possible for a company to create a flow related to customer identification. The customer list which is the aim at the end of this process is based on the inputs that are given in this flow. All the information through this process works based on the actual information stored in the company databases. But, for this project, a new environment is created with new databases that are in PostgreSQL technology. After all the flow is created and the technology is put into work there are seeing real results. The company will for sure benefit from this new technology implemented. In the future, for the company, it is suggested to make deeper and longer comparisons with the situation before and after implementation. Only through this will be seen the profitability for a long period.

The company had used other products even before this project attempting to identify a different group of customers. These products never worked for the company. The creation of this *ad hoc* product gave the company a boost and lead to other analyses. Another project that could be realized as the one discussed in this paper is being under discussion and consideration.

One improvement that the company aims to make related to it, is to make it more user-friendly. The next phase would be the creation of a dashboard and the development of an interface, which will make it easier for the end-user to make himself the data retrieval based on the predefined cases or even to create new cases or summary statistical views.

6. CONCLUSION

This paper focused on identifying customer groups within a company. Then the process would continue with analyzing customers based on their behavior. The identification of customers who gives the most contribution to the main goal of the company, profit maximization, is of great importance for each company. As we all know, customers are one of the biggest assets for the company. But identifying and grouping them among different analyses is of crucial importance.

It was taken under analysis by a company that made a project that involved different teams within the company to group customers based on given characteristics.

Through the flow which is created to generate the appropriate list of customers, the company can then take the related actions (like giving discount products) to make this customer more loyal, to adopt new products and services based on their needs so the sales and profits will benefit.

Since, as stated in the paper, the data updated are real-time data, so the comparison of the analysis

from time to time can be done easily. It will show also the effects of the actions taken if the campaign has been successful or if the company should update it.

Of course, we are aware that the findings of this research are based on the experiences of a corporation that took the risk of implementing something new. Based on this, we can state that this paper's results have limitations. Nevertheless, it does provide a broad overview that incorporating something linked to customers is a smart practice, even for other businesses.

This should also serve as a reminder to businesses of the 80–20 rule, which states that 80% of sales originate from 20% of consumers, with this 20% (Koch, 1999) representing repeat customers who are devoted to your brand because of the excellent customer value they perceive. Customers must now be measured by an organization's capacity to please them, meet their expectations, and keep them.

This work adds to the following areas in addition to the main research topic and effective contribution:
– a suggestion for a database targeting or segmentation flow and design;
– proposal for a transferring DB process;
– a proposal of how to use existing data for a new scope within the company;
– proposal of how competitive and well-positioned in target can a company be with the right processes.

The study offered here can be seen as a contribution to a greater knowledge of the topic. Future studies can also be built based on this project, which can be developed further and used to improve marketing procedures.

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