

## Illustration of Customer Analytics in Public Procurement

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### Abstract

According to European Commission and OECD, the share of public procurement in national economies (GDP) is 14% in EU countries and 12% in OECD countries. This rate is an important policy tool in Turkey is 7%. Public procurement is essentially made under the Public Procurement Act 4734. Besides, exceptions have been arranged for some institutions and organizations in order to meet the needs quickly and on-site. At this point, the State Supply Office appears as a central purchasing institution based on the role of intermediary between suppliers and public institutions. The aim of the study is to determine the profiles and purchasing tendencies of the customers who buy from the State Material Office by catalog method within the framework of customer analytics. In this context, customer segments based on value and behavior were created through analytical marketing methods RFM (recency, frequency and monetary) analysis. A strategy map was determined with the results obtained and the results were monitored on the business intelligence platform. Customer analytics are used extensively by the leading companies of the banking, telecom and retail sectors and significant outputs are achieved. Within this framework, customer analytical studies conducted in the public market are also important.

### Keyword

Customer Analytics,  
Customer  
Relationship  
Management, RFM  
Analysis

## 1. INTRODUCTION

The appropriation allocated for information and communication technologies (ICT) investments from the central government budget in 2018 amounted to approximately 5 billion ₺, an increase of nearly 5.5 times since 2002. While the ratio of investments made in information and communication technologies, which returned in a short time and made significant contributions to business efficiency, to total public investments in 2002 was 2.9%, this ratio was 5.8% in 2018.

Although there is no clear data on how much is invested in analytical applications in the public sector, it is known that analytical application projects exist and that these projects are increasing gradually. It is very important that the information technology investments of public institutions, which understand the

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importance of the difference these applications will make, are in the direction of data recording, processing and security. From this point of view, analytical and predictive studies in the public procurement sector are considered to be very important.

Considering the share of public procurement in national economies and public expenditures, and as a development and policy tool in national economies, it is an area open to research. Public procurement is a policy tool that needs to be analyzed especially as it builds and develops national technological capability and capacity, and thus accelerates economic development. (Yulek & Tiryakioglu, 2015).

The most important guide of the Directorate General of State Supply Office (DMO), which is the official implementer of public procurement in Turkey, in achieving its medium and long-term goals is the strategic plan of the institution. There are two performance indicators. One of the important strategic objectives in the plan was stated as "Providing effective, efficient, fast and sustainable central supply service", and this strategic objective was determined as "Increase rate in the number of customers purchasing (compared to the previous year)" and "Customer satisfaction rate". In the public sector, as in every sector, knowing the customers, determining their profiles, understanding what they want and distinguishing the most valuable ones are of vital importance in terms of customer relationship management. It has been seen that approaches such as analytical marketing methods and customer relationship management are needed at least as much as companies in the private sector, since there are no customer analytics-like studies with public institutions in the position of customers of the sector and DMO is a for-profit government company. Thus, it is aimed to increase sales and efficiency by offering the right value proposition to the right customer at the right time, while designing more effective and less costly action plans.

In terms of marketing, companies don't need to put in the same effort to win or retain every customer. Some customers are in a position to bring more profit to the business because of their purchasing habits or because the business's products add more value to it. The important thing is to get in touch with the right customer at the right time and on the right subject. This is also aimed with customer relationship management (Corbae et al., 2003).

Establishing and managing close relationships with customers is an important success factor for any business (Corbae et al., 2003). Developments in information and communication technologies, especially the significant increase in the amount of data stored in electronic media, and the difficulty of interpreting this data in terms of human capacity have led researchers to analytical studies (Balaban & Kartal, 2015).

Public procurement; especially when it is supported with analytical tools such as business intelligence and data mining, many studies can be done on savings, efficiency, appropriateness and sustainability. Namely, it is known that investments have been made in recording and storing data in the public sector, but the studies on processing and analyzing the data have just begun. In terms of public procurement, it is very important to analyze the purchasing tendencies of public institutions, which are considered as customers, on the basis of value and behavior, and to determine the future procurement profiles of public institutions.

Briefly; Issues such as the need to increase its market share and profitability according to the market conditions as required by the DMO business model, and the presence of a "customer" stakeholder who does not have any purchasing obligation, have made customer analytics studies in the public procurement sector essential. With the study, while evaluating the customers, in addition to the total purchase amount, other parameters that are important in customer loyalty and customer valuation, such as the date of the last purchase and the frequency of purchases within a certain period, are included in the analysis; Segmenting them into value-based segments such as "Star", "Loyal", "Potentially Loyal", "Hold-Develop" and "Risky", behavior-based segments such as "churn", "passive", "single purchase" and it is aimed for DMO to develop and implement marketing strategies by setting targets according to segments.

The organization of the study is as follows; In the method section, the tools and methods used to make the data suitable for analysis, the outputs and effects of the model in the findings section, and the results in the discussion and conclusion section are explained within the framework of the research problem.

## 2. METHOD

CRISP-DM approach, which is a widely used data mining standard today, was used in this study. (Shearer, 2000).

Within the scope of the study, instead of exporting the data in the ERP (Enterprise Resource Planning) system and analyzing it statically with data mining tools, the IBM SPSS Modeler product was directly connected to the Oracle database and a dynamic model setup was preferred. Thus, historical records are provided to affect the model instantly and it is possible to obtain up-to-date outputs at any time. A customer datamart was created by moving the tables containing the descriptive data of the customers in the ERP, recorded during registration, and row-based data covering all the historical data generated during sales and purchasing, to the data warehouse scheme with the SQL and ETL tool. By adding customer information in other modules to the aforementioned datamart, target data sets were created and finally, the data were made relational by making the data suitable for analysis. The application was modeled with the IBM SPSS Modeler analytical tool. After the data required for analysis was taken from the database in all streams where the analysis was made (analysis area, stream), operations such as data cleaning, deduplication, editing, and creating new variables from existing data fields were performed.

While cleaning the data, the inconsistencies in the analysis data fed from the operational systems were eliminated, arrangements were made according to the constraints in line with the business needs, and abnormal records were excluded from the analysis. The data made suitable for the analysis were subjected to RFM analysis, which is known as an effective analytical marketing model in the field of customer analytics, and with this method, value and behavior-based customers were segmented.

RFM Analysis; It is an abbreviation of the words Recency, Frequency and Moneatry and is an analytical method used for effective marketing method. Its main premise is that customers with recent, frequent, and large purchases are the most promising customers in future marketing campaigns. The results obtained in the researches showed that;

There are three main factors that increase the likelihood of a customer to respond to campaigns, and these are listed in order of importance:

- If the customer has shopped recently, customer can still shop. Recency
- If the customer is shopping frequently, customer can still do it. Frequency
- If the customer's total purchase amount is high, customer can still shop.

In this framework, in the RFM analysis, current customers are scored with values between 1 and 5 in terms of Relevance, Frequency and Amount based on their shopping history. Thus, existing customers are divided into 125 different customer types with 3-variable RFM scores ranging from 1 to 5.

In the study, data cleaning and editing of the customer records that are consistent in 2016 and after, respectively, were carried out. RFM segments (star, loyal, potential loyal, retain-develop, risky) are defined. In addition, due to the nature of the RFM model, behavior-based segments such as loss, passive and single purchase were determined for the data not included in the model. Then, for the customers in the RFM segments, Two Step clustering processes are performed separately for the vehicle, catalog and mixed sales types and on the basis of each R, F, M parameter information, and the most discrete cluster is determined as the first segment according to the separation status of the clusters. By re-clustering with Kohonen networks, other segments were defined and in which segments the customers were located was analyzed. Finally, the generated RFM segments were separated according to lost, passive and single purchase customer segments and defined as separate data sets.

## 3. RESULTS

As a result of the scoring and segmentation made by looking at the expenditures made by the customers, the currentity and frequency of the expenditures since 2016, the segments detailed below were obtained.

**STAR:** It is the customer group that makes purchases most frequently, most up-to-date and in the highest amounts. It is the customer group with the highest score in terms of purchase frequency and currency, and purchase amounts.

**LOYALTY:** It is a group of customers who buy frequently, recently, with high amounts.

**POTENTIAL LOYALTY:** This is the customer group with lower purchase relevance compared to the loyal customer segment.

**HOLD / DEVELOP:** This is the customer group with low frequency and up-to-dateness. The purchasing stability of this group is low.

**RISKY:** It is the customer group with the lowest purchase frequency and up-to-dateness.

RFM analysis, which allows only value-based segmentation, was completed in a sense and combined with behavior-based segments, and the subject was discussed with a comprehensive CRM perspective. Behavior-based segments and their definitions can be examined below.

**SINGLE PURCHASING:** It is the customer group with a single order number and therefore not included in the RFM analysis.

**LOST:** It is a group of customers who have not arrived in the last 4 quarters, and who have returned two or more in the previous 4 quarters.

**PASSIVE:** It is the customer group that has never arrived in the last 4 quarters and has come once or never in the previous 4 quarters.

When value-based segments are examined, it is seen that important information is obtained for the marketing department. The knowledge that nearly half of the customers are not very valuable according to the model, but only 2.2% of them are very valuable, is very critical in terms of marketing costs.



Figure 1.RFM Segments

In order to minimize analytical and operational marketing costs, customers are segmented with the most valuable label instead of the most purchaser. To give an example of the information in Figure 1; Although the customers in the star segment were 2.2% of the total customers, they made 19.4% of the sales. Customers in the risky segment, on the other hand, made up only 8.5% of the sales, despite being 45.4% of the total customers.

	The Number of Customers	Customers (%)	Revenue (%)
Star	82	%1	%16,4
Loyal	575	%6,9	%33,6
Potential Loyal	546	%6,5	%15,6
Hold & Improve	844	%10	%11,9
Risky	1703	%20,3	%7,2
Single Purchase	3175	%37,9	%3,1
Valuable Churn	36	%0,4	%6,3
Churn	838	%10	%4,2
Passive	588	%7	%1,6

**Figure 2.**Segment Overview

Customers who are not included in the RFM model due to rule sets are further grouped into five RFM segments according to their behavioral-based buying trends. Thus, all customers were evaluated with a holistic approach. According to the information in Figure 2; While 38% of the total customers were included in the RFM model, 45% of the total customers were in the single purchase, 10% lost and 7% passive segment. On the other hand, customers included in the RFM model realized approximately 85% of the total sales.

#### 4. DISCUSSION AND CONCLUSION

In the previous parts of the study, the usage areas of the concept of customer analytics in customer relationship management processes and the public procurement sector, and the importance of the public procurement economy for the world and our country were mentioned. Then, the methodology and findings of the study were shared.

As a result of the studies, since not every customer is included in the analysis due to the nature of the RFM model, some rules were defined for non-model customers, so that the study was holistic. At the end of the study, customers were segmented based on behavior and value, and no out-of-segment customers were left. Behavior-based segments are defined as single purchase, loss, and passive, while value-based RFM segments are defined as star, loyal, potential loyal, retain-develop, risky.

In order to use this holistic model, various analytical reports have been designed that can be easily accessed by sales units. With these reports, sales units will be able to easily determine which customers can visit and within what framework, promotion distribution, focus customers and priorities.

Analytical reports are designed to automatically create tables in the database to be shared with all sales units quarterly. Thus, it was also possible for both business units and senior management to monitor the reports, actions taken and their results on the business intelligence platform. The reports are designed in a flexible structure so that they can be monitored by important categories such as sales units, budget type, top administration and province. And finally, two new performance indicators have been introduced for sales units that are followed only by sales targets. These;

1. RFM Segment Pass Rate (the goal of moving each customer to the next segment)
2. Loss Recovery Rate (target of recovering abandoned customers identified as lost)

When the reports and performance indicators produced as a result of the study are examined, it is seen that important inputs are produced for studies such as customer loyalty program, customer visit/event program

and incentive model. Thus, it is aimed to make customer relationship management more centralized and less costly.

When the performance indicators determined for the sales units are analyzed, as can be seen in the "RFM Segment Transition Target" table detailed below; It is aimed to move at least 5% of the customers in the segments to the next segment for the next period. If the sales units achieve these targets for the customers in their portfolio, an additional income of at least 285 Million ₺ is expected.

**Table 1:** RFM Segment Transition Target

UNIT AND SEGMENT CUSTOMERS	5. RISKY	4. HOLD& IMPROVE	Transition (%5)	3. POTENTIAL LOYAL	Transition (%5)	2. LOYAL	Transition (%5)	1. STAR
PAZARIAMA DAİRE BAŞKANLIĞI	241	131	7	101	5	102	5	21
İZMİR BÖLGE MÜDÜRLÜĞÜ	186	99	5	76	4	65	3	17
BURSA BÖLGE MÜDÜRLÜĞÜ	188	104	5	68	3	70	4	9
İSTANBUL BÖLGE MÜDÜRLÜĞÜ	182	100	5	77	4	77	4	20
TRABZON BÖLGE MÜDÜRLÜĞÜ	145	65	3	53	3	36	2	6
ESKİŞEHİR BÖLGE MÜDÜRLÜĞÜ	148	61	3	47	2	53	3	8
MERSİN İRTİBAT BÜRO MÜDÜRLÜĞÜ	124	61	3	39	2	36	2	7
GAZİANTEP BÖLGE MÜDÜRLÜĞÜ	93	48	2	33	2	35	2	4
ERZURUM İRTİBAT BÜRO MÜDÜRLÜĞÜ	94	36	2	24	1	20	1	2
ELAZIĞ BÖLGE MÜDÜRLÜĞÜ	78	49	2	23	1	18	1	3
DİYARBAKIR İRTİBAT BÜRO MÜDÜRLÜĞÜ	61	34	2	34	2	11	1	1
VAN İRTİBAT BÜRO MÜDÜRLÜĞÜ	44	22	1	14	1	20	1	
<b>TOTAL</b>	<b>1.584</b>	<b>810</b>	<b>41</b>	<b>589</b>	<b>29</b>	<b>543</b>	<b>27</b>	<b>98</b>



**Figure 3:** Segment Transition Expectations

When another performance indicator determined for sales units is examined, considering the sales statistics for the 2016 - 2018 period, the table with details below; According to the CRM model, a total of 813 catalog customers did not use any purchasing method in the last 4 quarters and showed an "abandonment tendency".

In this context, it is aimed for sales units to "recover" at least 15% of the customer institutions that have tended to leave in 2019.



**Table 2:** Lost Gain Targets

Sales Units	Chum Customers	Churn Recovery Targets
STOK SATIŞLARI VE ÖDEMELER ŞUBE MÜDÜRLÜĞÜ	136	20
İZMİR BÖLGE MÜDÜRLÜĞÜ	100	15
BURSA BÖLGE MÜDÜRLÜĞÜ	98	15
İSTANBUL BÖLGE MÜDÜRLÜĞÜ	78	12
TRABZON BÖLGE MÜDÜRLÜĞÜ	73	11
MERSİN İRTİBAT BÜRO MÜDÜRLÜĞÜ	67	10
ESKİŞEHİR BÖLGE MÜDÜRLÜĞÜ	59	9
ERZURUM İRTİBAT BÜRO MÜDÜRLÜĞÜ	47	7
GAZİANTEP BÖLGE MÜDÜRLÜĞÜ	47	7
DIYARBAKIR İRTİBAT BÜRO MÜDÜRLÜĞÜ	37	6
ELAZIĞ BÖLGE MÜDÜRLÜĞÜ	36	5
VAN İRTİBAT BÜRO MÜDÜRLÜĞÜ	35	5
<b>Total</b>	<b>813</b>	<b>122</b>

In summary, if at least 15% of the customers with a sales potential of 700 Million ₺ and who have a tendency to leave are regained, it is aimed to generate an additional 105 Million ₺ income to the total sales. As a result, the expected results for the CRM approach and RFM analysis were achieved with the study.

The results of the study were found to directly benefit the DMO business objectives. In particular, it is thought to contribute to the realization of strategic goals. Marketing units have become able to follow their customers with determined segments with monthly or weekly reports. Analytical information generated by segment transitions and lost customer reports will be used to make data-driven decisions. Thus, as in any business, all expenses spent on customer communication can be optimized. On the other hand, it is seen that the outputs of the study also meet the concepts and requirements of CRM and RFM.

On the other hand, with the study; Academic contributions were made to subject areas such as analytical studies in the public procurement sector and customer analytics in the public sector.

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