St.Petersburg School of Economics and Management

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Analysis of promotions based on consumer flows in retail

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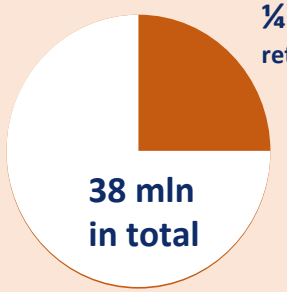
Motivation & Research question

Customer experience (CX) plays a key role in creating competitive advantage for businesses (Lemon & Verhoef, 2016). CX is a broad concept that describes all interactions between a consumer and a business.

In retail, marketers use out-door advertising (or Big Media promotions) to create a satisfying CX (Chalil et al., 2020).

- It includes billboards, facades and other promo types which affect different consumer segments differently (Zhang & Wedel, 2009)

Out-door advertising in Russia in 2021



(Statista, 2022)

Motivation of this study: there is a necessity to create an effective method to detect customer behavior changes caused by different promotion types.

Research question: How do promotions affect the behavior of different consumer flows?

The results of the literature review

What determine if promotions are effective for a retailer?

1

Promotion characteristics:

- Different elements in promotions (Narasimhan et al., 1996; Bijmolt et al., 2005; Ailawadi et al., 2009)
- Number of units which are on promotion (Inman et al., 1997; Manning & Sprott; 2007)

2

Promotion sensitivity across different consumer segments:

- Frequent customers expose to sales promotions in a greater way that infrequent ones (Vakratsas & Bass, 2002; Arce-Urriza et al., 2017).
- Reaction of occasional consumers is stronger than that of regular consumers (Bawa & Ghosh, 1991).

-> there is a necessity to evaluate consumer reactions to marketing activities more accurately

Research gap:

There are no studies that would allow to determine the impact of Big Media promotions on customer behavior

Methodology: description of data

The data covers the period **from 09.2019 to 09.2020**. They contain all transactions of buyers from one region from the Russian supermarket chain.

Transactional data of **customers**:

Name	Definition
Client_id	Customer ID
Day	Date of purchase
Check_id	Check ID
Num_sales	Number of sales of products
Selling_price	Selling price of products

The dataset about **promotions**:

Name	Definition
Promo_type	Type of promotion
Offer_id	Promotion ID
Sku	Product ID
Start_date	Promotion start date
End_date	Promotion start date

Types of promos:

- billboards
- facades
- seasonal promos
- biweekly

Methodology: 1st stage

01. Clustering by periods and calculation of flows

- Dividing the dataset into **52 periods** (one period = one week)
- Division of customers **into clusters by metrics** frequency and monetary for each period (K-means)
  - Frequency – the number of purchases made in one period
  - Monetary – the total amount of money spent by a buyer on goods over a certain period

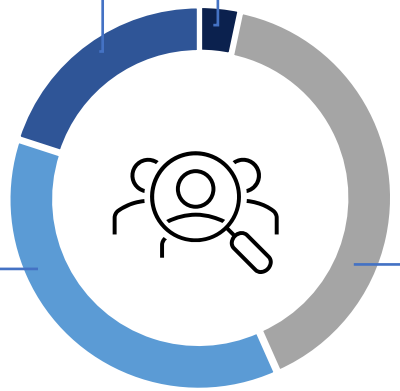
Received 4 clusters:

- 3 with active buyers - **sleeping, loyal and champions**
- 1 with unactive buyers – **churn** (with customers who have made no purchases in a week)

Methodology: description of clusters

LOYAL
5000 average check
3 times per week

CHAMPIONS
11000 average check
3 times per week



SLEEPING
2000 average check
1 time per week

CHURN
not active

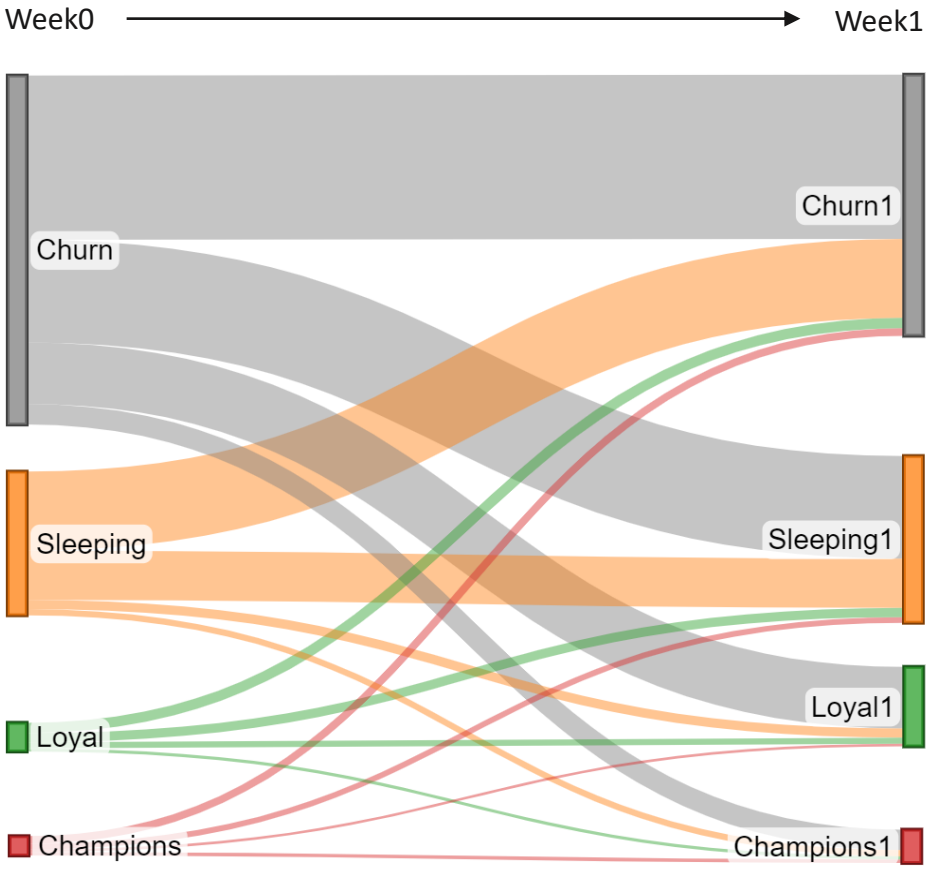
In total
85 000
customers
were analyzed

Methodology: calculation of flows

- **Calculations of flows:**
  4 clusters * 52 weeks -> **16 flows * 51 periods**

The flow - the percentage of buyers leaving one cluster for another in the next period

- Count **the number of promotions** of each type for each period:
  - Billboards - 50
  - Facades - 70
  - Seasonal promos - 150
  - Biweekly promos - 130



Methodology: 2nd stage

02. Search for causal relationships between flows and promotions

Initial data are time-series data (flows coefficients and number of promos)

- SSA analysis helps to detect trend component and get rid of noise
- First differences method helps to bring the distribution back to normal
- **DBN model training** to detect causal relationships

Output of DBN model:

$$y = a_0 + a_1 * x_1 + a_2 * x_2 + a_3 * x_3 + a_4 * x_4 ,$$

where y – first difference of flows - *presents the intensity of customer flows*

x_i – first difference of promotions - *presents the intensity of promotions*

Results: positive flows

Positive flows – customers who **increase** their purchasing activity to next period

Flows	Intercept	Billboards	Facades	Seasonal	Biweekly
sleeping_to_loyal	-0,0142	-0,0097	-0,0037		
sleeping_to_champions	-0,0348	-0,0082	0,0204		0,0112
loyal_to_champions	0,0301	-0,0030	-0,0212	-0,0056	
churn_to_sleeping	0,0308				
churn_to_loyal	0,0014	0,0042	0,0011	0,0001	
churn_to_champions	0,0000	-0,0053		-0,0010	0,0023

! Without any effects of promotions **positive flows from sleeping** are constantly decreasing while **positive flows from loyal and churn** are constantly increasing

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2 Facades and biweekly promos have a positive effect on the flow from **sleeping to champions**

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1 No type of promo has a positive effect on the flow from **sleeping to loyal**

2 Facades and biweekly promos have a positive effect on the flow from **sleeping to champions**

3 Flow from **loyal to champions** is constantly increasing but facades reduce this flow

! Without any effects of promotions **positive flows from sleeping** are constantly decreasing while **positive flows from loyal and churn** are constantly increasing

Results: negative flows

Negative flows – customers who **decrease** their purchasing activity to next period

! As we consider negative flows, positive coefficients for them mean that these flows are increasing. It's bad for business that's why positive values are colored by red

Flows	Intercept	Billboards	Facades	Seasonal	Biweekly
sleeping_to_churn	0,0050	-0,0100			0,0286
loyal_to_sleeping	0,0001		-0,0327		
loyal_to_churn	0,1492		-0,0137		
champions_to_sleeping	0,0411			0,0017	
champions_to_loyal	-0,2267	-0,2248	-0,1050	0,0030	
champions_to_churn	-0,1564				

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1 Buyers tend to constantly leave **cluster loyal**, facades significantly reduce these flows

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1 Buyers tend to constantly leave **cluster loyal**, facades significantly reduce these flows

2 While the negative flows from the **champions** themselves are decreasing, additionally, they are reduced by billboards and facades

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1. Buyers tend to constantly leave **cluster loyal**, facades significantly reduce these flows
2. While the negative flows from the **champions** themselves are decreasing, additionally, they are reduced by billboards and facades
3. **Seasonal and biweekly catalogs** slightly increase negative flows

Conclusion: main ideas

- Positive flows from sleeping to more active clusters **are decreasing without promotions**
  -> it's necessary to organize Big Media promotions not to lose these customers

- Billboards and facades influence on customers **the fastest** (within 1 week) while seasonal and biweekly promotions have a **delayed effect**
  -> according to the goals of marketing campaign the number of different promo types should be defined

- Overall, **promotions are more effective in terms of reducing negative flows** (in comparison to increasing positive flows)
  -> the budget should be accurately allocated to Big Media promotions as they don't bring net profit

Discussions

There are no studies which research influence of Big Media promotions on customers. That's why results can be compared only in terms of frequent/occasional groups of buyers.

Previous studies

Frequent customers have a greater sensitivity to promotions (Vakratsas & Bass, 2002; Arce-Urriza et al., 2017).

Reaction to promotions of **occasional consumers** is stronger than that of regular consumers (Bawa & Ghosh, 1991).

- However, Vakratsas & Bass (2002) clarify that the effect of promotions on occasional shoppers also depends on the category of product being discounted.

This research

The most **frequent clusters** are loyal and champions:

- **Negative flows from loyal and champions are significantly reduced** by billboards and facades

BUT: positive flow loyal to champion is negative affected by promotions – contradicts past works

Occasional customers are positive flows from churn:

- **No significant effect** of promotions on them

Conclusion: contribution & limitations

1. Theoretical contribution

- A new branch of analysis: considering the effectiveness of promos from the side of consumer behavior

2. Managerial implication

- Outdoor advertising often doesn't bring net profit for retailer - the number of promos should be strictly limited by those values which could reduce negative flows. Extra promos are waste of budget in most cases
- When planning promo calendar the duration of effect should be considered – seasonal and biweekly promos should be launched in advance

Limitation at periods

Problem: some coefficients reflect the negative impact of promotions as well as low effect from long-term promotions
Reason: the model is trained only for 1 lag (considers 1 period).
To overcome: in the future more periods should be added

EXAMPLE

In January flow from **loyal to churn increases** (intensity > 0.15)

Managers know that loyal to churn flow can be significantly **reduced by facades** (at 0,014)

They **launched** necessary number of facades (x*0,014) to reduce this flow

Facades are fast-influenced promo – next 1-2 weeks **loyal customers returned**

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