ESSEC BUSINESS SCHOOL

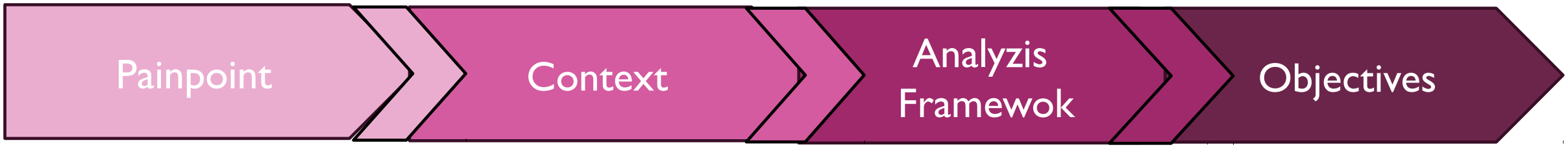
orange™

ORANGE FRENCH TELECOM

CUSTOMER RELATIONSHIP PREDICTION

accenture
High performance. Delivered.

EXECUTIVE SUMMARY



French Telecom company, Orange, leader on the French domestic landlines and mobile phone markets. intends to stay dominant and to **maximize its customer-value.**

In this constantly evolving context involving merging, purchases and technologies' advances, Orange, the former National French operator, like its competitors must comply with French Telecom Authority and EU recommendations.

Our method relies on a predictive analyzis of a large public dataset (50,000 examples with 230 variables) on the customer behavior released in 2009 by Orange.

We will assume that the consumer behavior is still relevant with current financial results.

We aim to optimize our customer-value by **leveraging three KPI (customer analytics): churn, cross-selling (appetency), upselling rates**.

To achieve this goal, we should **prioritize our marketing efforts** by segmenting our customer types

CONTEXT: THREE MAIN FACTORS

- Highly competitive sector:
  - the entry of a new competitor (Free Mobile) in January 2012 on the mobile market prompted operators to decrease prices
  - users tend to prefer low-cost offers and no-commitement plans (rather than Mobile Virtual Network Operator and prepaid deals)
  - the average revenue per user (ARPU) has dramatically dropped since 2005

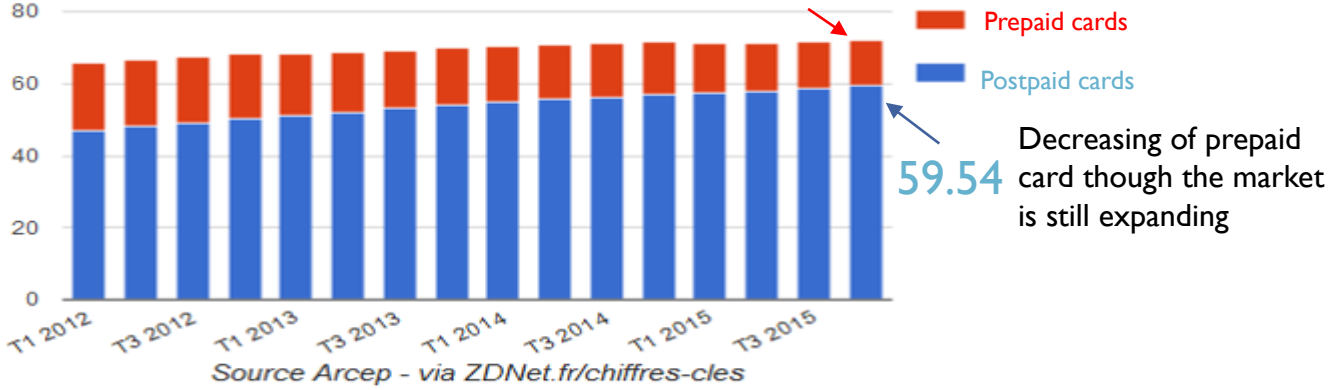
- Technological advances: deployment of 4G network is a new opportunity to generate profit with the launch of new offers

- European and national regulations:
  - French ART (Regulation Authority of Telecommunication) sets up termination rates and requirements to operators nationwide
  - as a global market, mobile market sector European Union is monitored by European Union Commission

HIGHLY COMPETITIVE MARKET

Postpaid deals and no-commitment plans are increasing

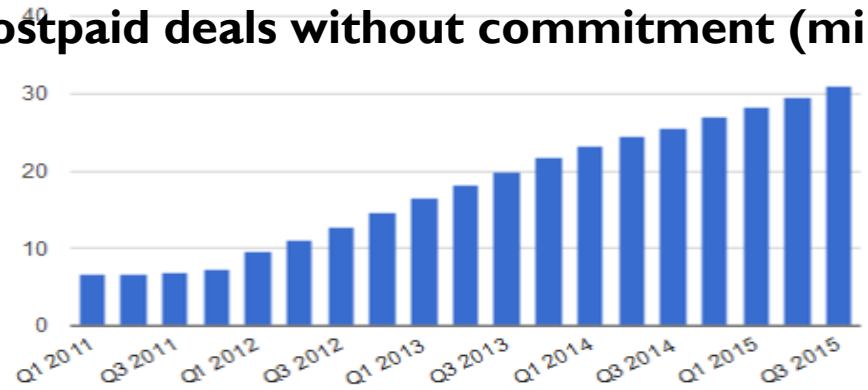
Total numbers of active SIM-cards: 72.132 millions



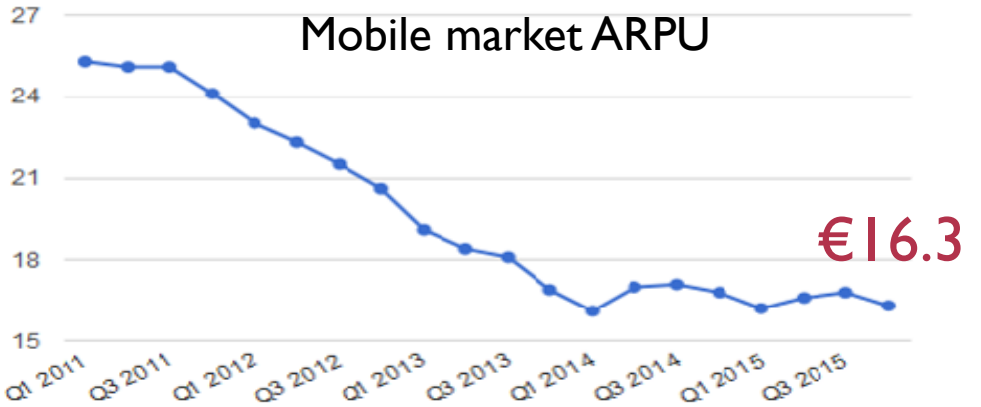
Source Arcep - via ZDNet.fr/chiffres-cles

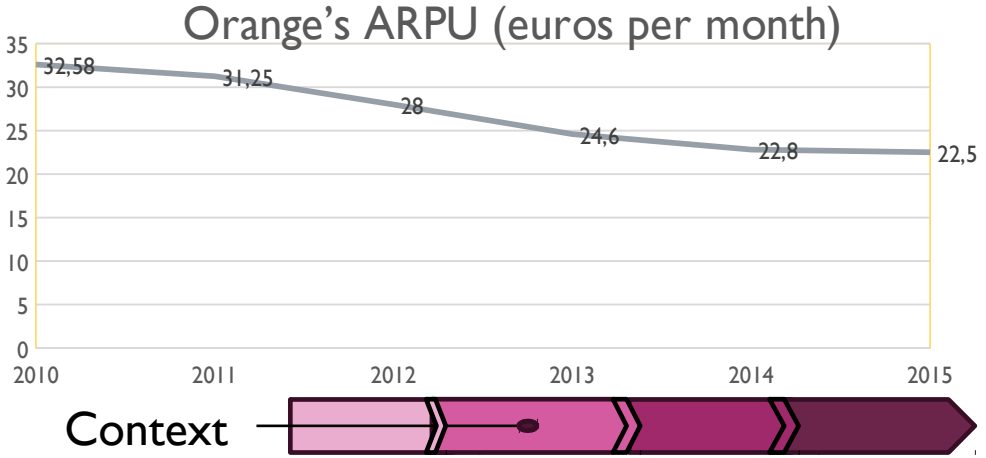
Decreasing of prepaid card though the market is still expanding

Postpaid deals without commitment (millions)



Average Amount Paid per user (ARPU)



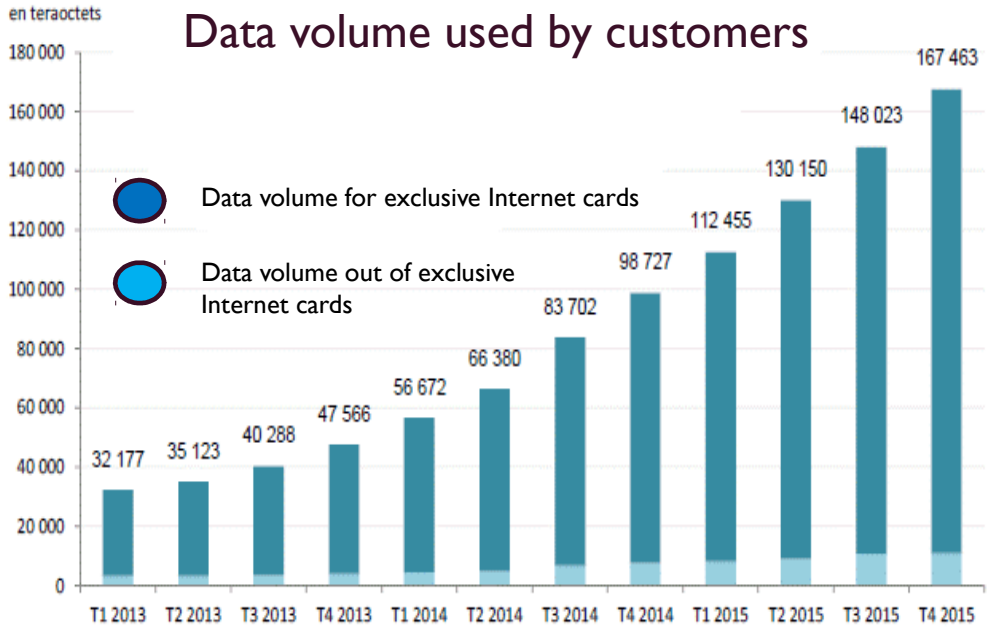


4G BOOSTS USE OF DATA BY CUSTOMERS AND GENERATES NEW REVENUES

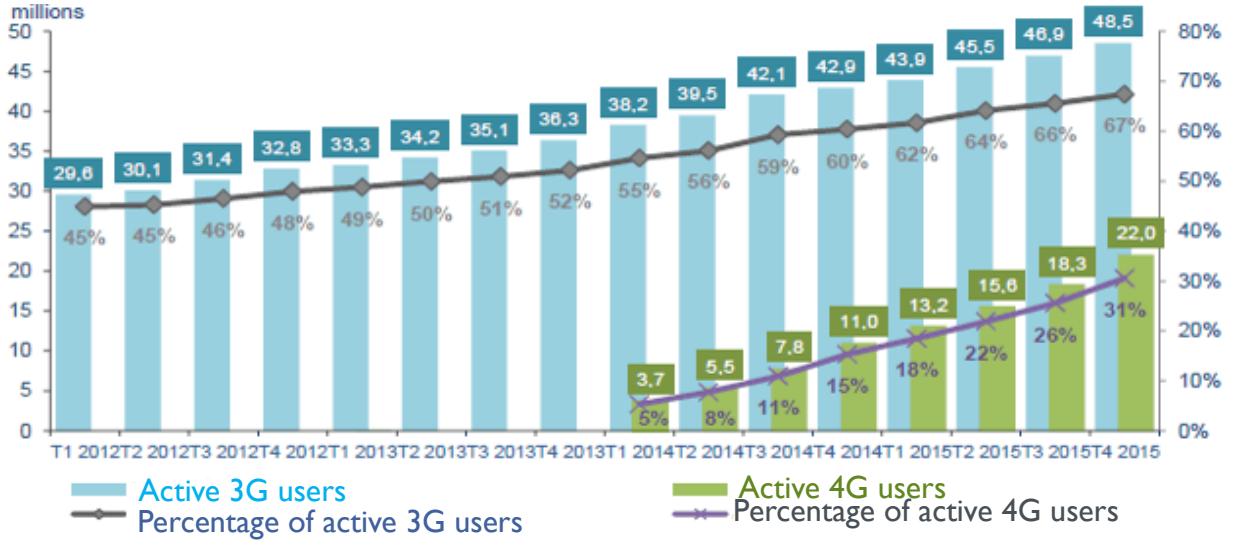
Compared download time of a game or a video of 60Mo (2mns long in 4G and 10 mns long in 3G+)

A 4G Mobile suscriber uses each month 2-3 times more data (2-3 Go) than a 3G suscriber. Incented by new uses enabled by 4G broadband, customers are prompted to switch to more expensive packages.

Data volume used by customers



Number of active cards on 3G and 4G netwoks



Context

REGULATIONS

Prices are set up by French ART (Regulation Authority of Tele-communications) and commonly considered as under-estimated in France compared to EU countries

- Mobile calls termination rates from 1/1/2016: **0.0076€/mn**

(EU average: 1.92cts €/mn)

- SMS termination rates from 1/1/2016: **0.01€/SMS**

(EU average: 0.0253€/mn)

For an Orange Mobile's average user, with a quick calculation, we get

Voice calls (3h10) = 190 * 0.0076€ = 1.44€

SMS: 252 * 0.01€ = 2.52€

→ **3.96 €**

(not including 3G-4G whose each additional Mo not included within the susbcription threshold is billed 0.01€ nationwide)

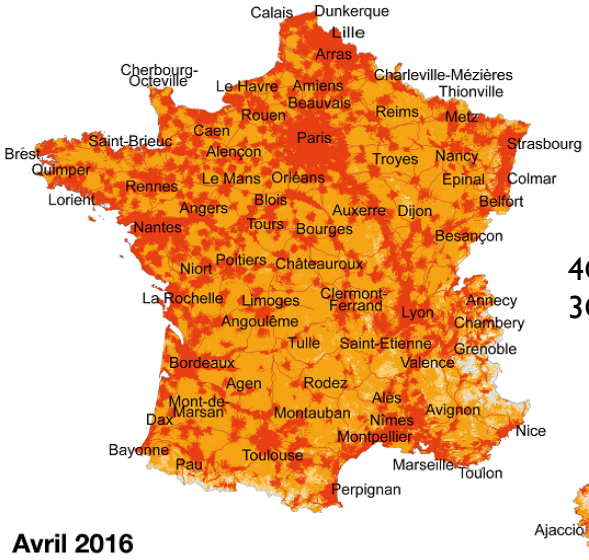
If we take the EU average costs:, we get;

190 *0.0192 = 3.64

252 * 0.0253 = 6.375

→ **10.01 €**

4G deployment requires massive investments for all operators. ART checks that this deployment complies with users' rights to equal access to broadband internet.



4G Reach: 80 % users

3G+: 99 % users

Orange Mobile Internet Coverage

Context

PREDICTIVE MODELS

DATA AND MODELING APPROACH

- 50,000 observations with 230 variables, 190 of which are numerical and 40 of which are categorical
- The target variables are Churn (customer attrition), Appetency (propensity to purchase) and Up-Selling (likelihood to buy more expensive goods and services).
  - Appetency: 1.78 %
  - Churn: 7.34 %
  - Upsell: 7..364 %

  There is no overlap among the three variables, i.e. if a customer has a 1 for churn, they will have 0s for both of the other variables.
- As the outcome variables are all binary, classification models were selected as the best models for this exercise. Models applied included Random Forest, Logistic Regression, Naïve Bayes, with the goal of selecting the best model type and variable set for each of the three target variables. That is, the modeling process for each target has been completed independently and models and variables selected for each target will be custom selected. An ensemble model approach was also used to attempt to combine the results of the individual approaches into a superior model.
- In-House Models

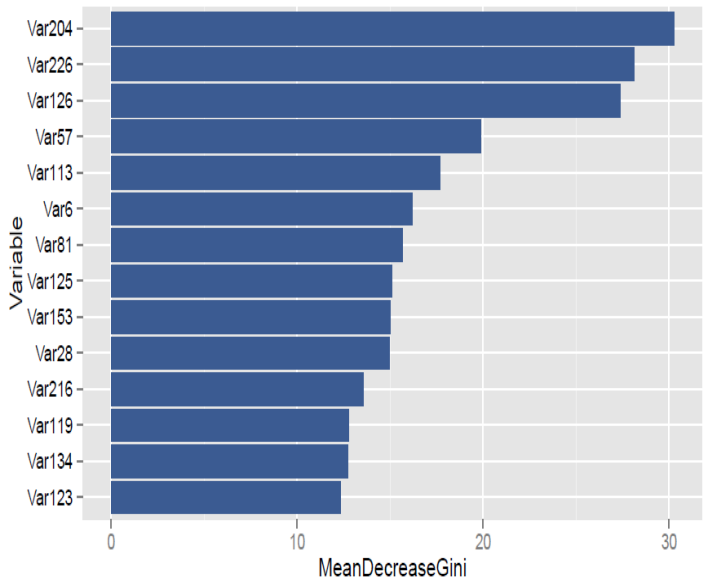
Churn	Appetency	Upselling	Score
0.7435	0.8522	0.8975	0.8311

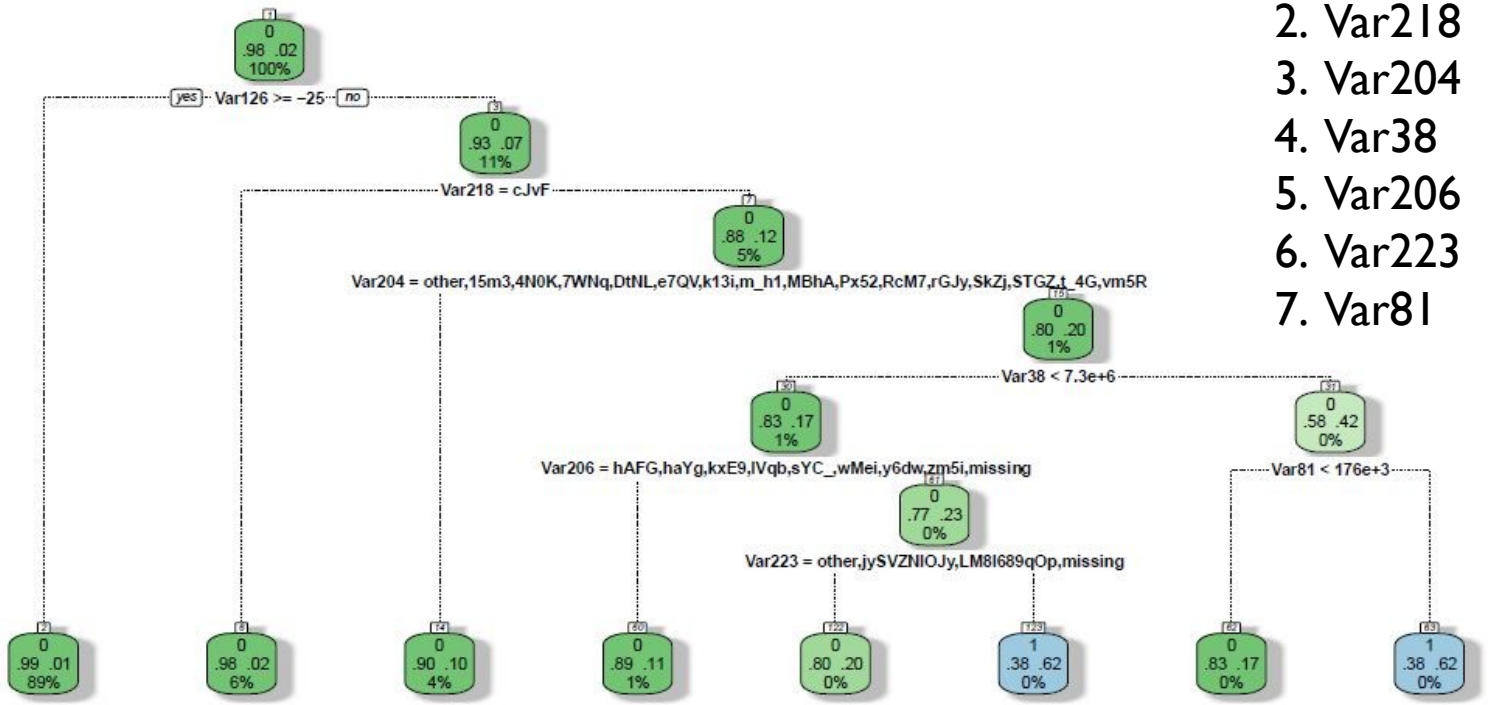
ISSUES AND DATA CLEANSING

- Anonymity: Several levels of anonymity have been implemented.
  - First the variable names have been replaced by number values, i.e. Var1 to Var230.
  - Secondly, the variable values have been replaced with seemingly nonsensical information for instance categorical variables have been replaced with series of random characters..
  - The actual product or service that the company is offering is also unknown.
- Missing Variables: Many of the observations are missing values. Combined with the anonymity above, it is difficult to determine if data is missing for a legitimate reason, as in possibly the values represent marketing campaigns and a missing value indicates that that customer was not targeted by that campaign.
  - Numeric variables: Missing values for numeric variable were replace by using zero (0) for numeric variables, and an indicator variable was added to retain visibility with a 1 indicating the value was replaced and a 0 indicating it was not.
  - Categorical variables: Missing values for categorical variables were replaced with 'missing' and a indicator variable was added to retain visibility with a 1 indicating the value was replaced and a 0 indicating it was not.

APPETENCY – VARIABLES SELECTION

Selection by Random Forest model



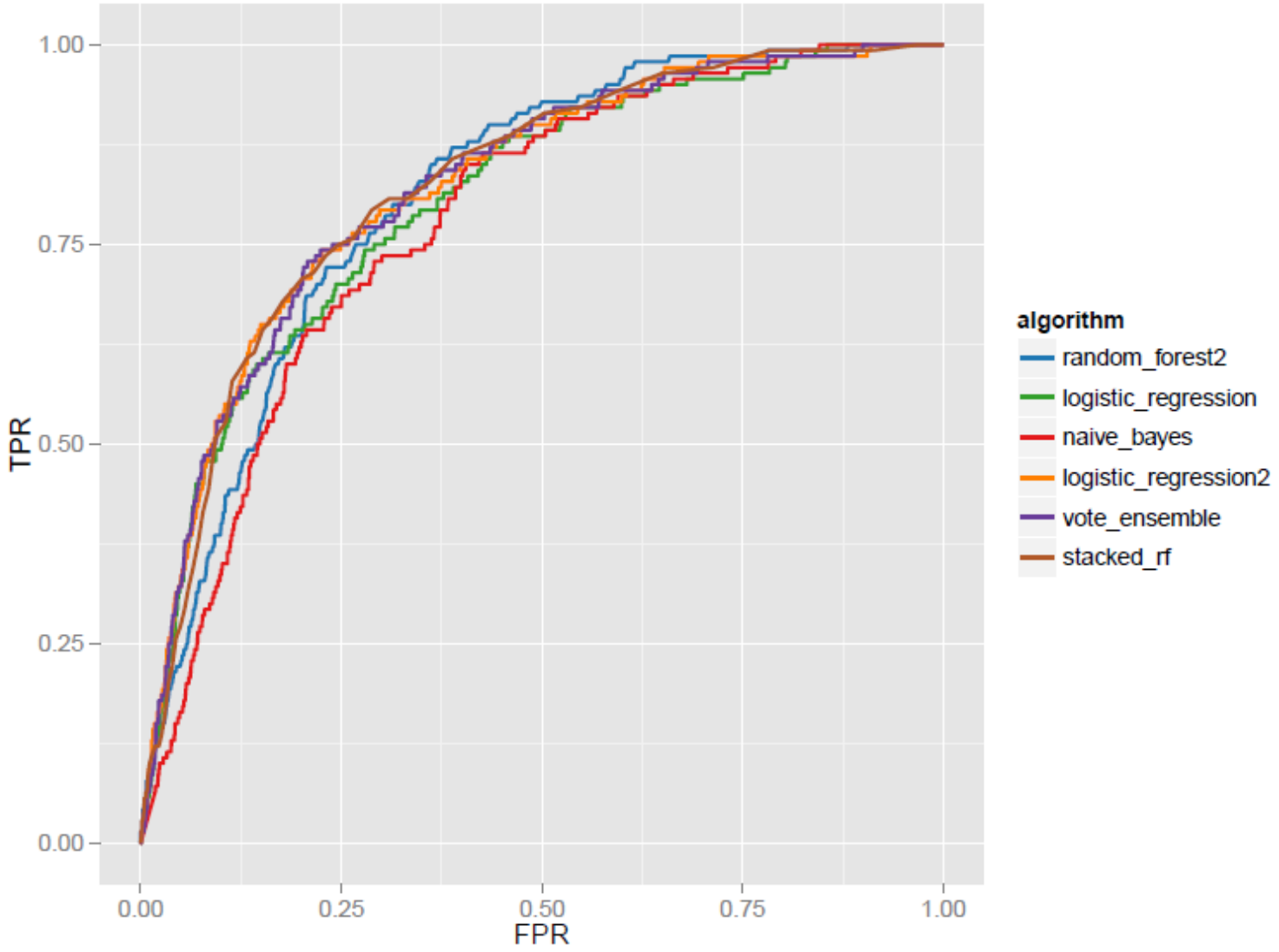


1. Var126
2. Var218
3. Var204
4. Var38
5. Var206
6. Var223
7. Var81

Analyzis framework

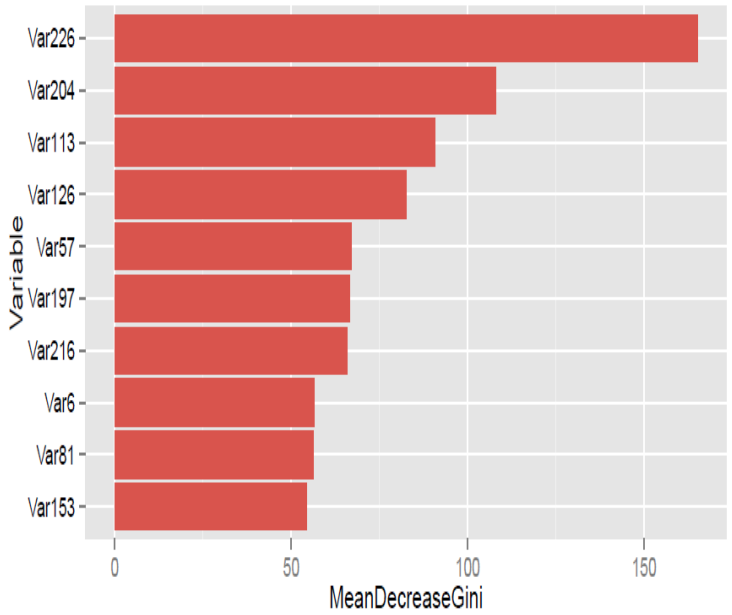
APPETENCY - PREDICTIVE MODELING

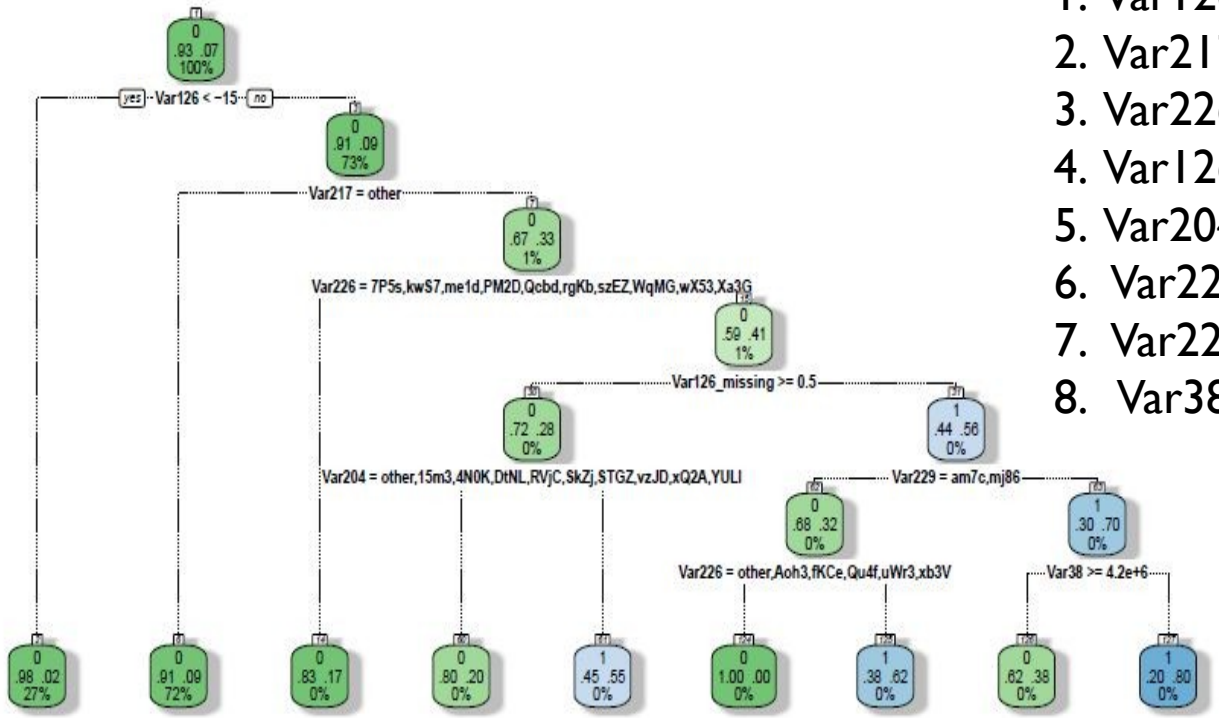
Algorithms	Out of Sample ROC
In House Model	0.8522
Random Forest2	0.8324733
Logistic regression	0.8057657
Naive Bayes	0.7793469
Logistic regression2	0.8204741
Vote ensemble	0.8357444
Stacked Random Forest	0.8291562



CHURN – VARIABLES SELECTION

Selection by Random Forest model

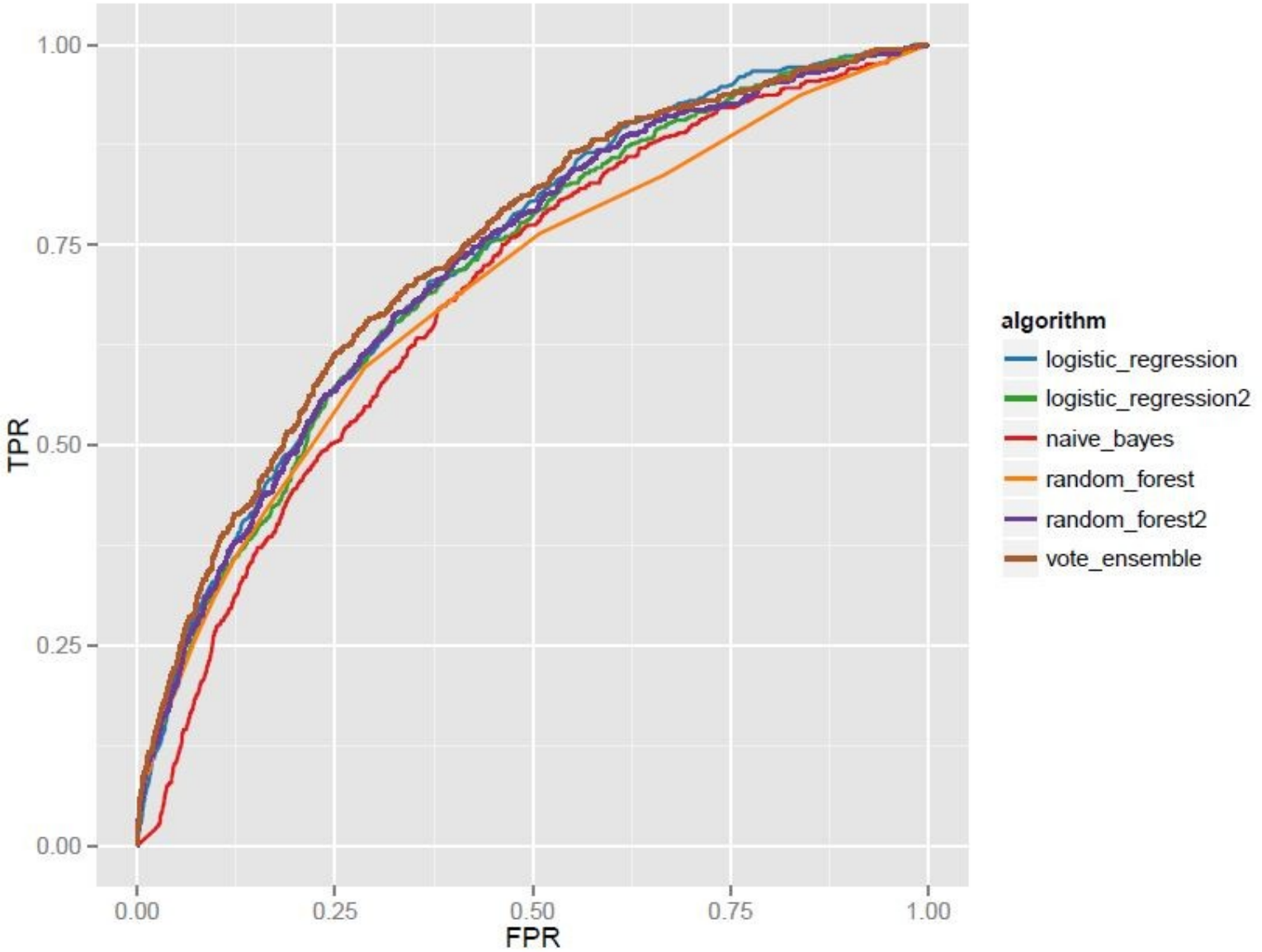




1. Var126
2. Var217
3. Var226
4. Var126_missing
5. Var204
6. Var229
7. Var226
8. Var38

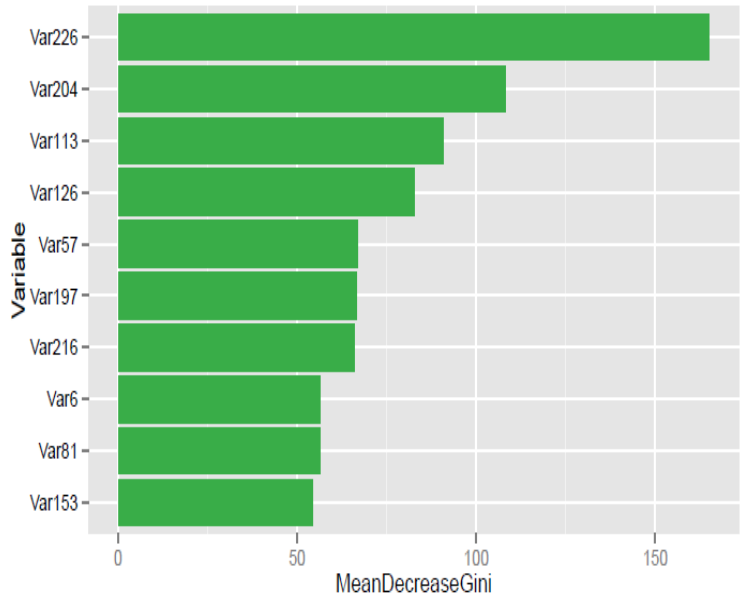
CHURN - PREDICTIVE MODELING

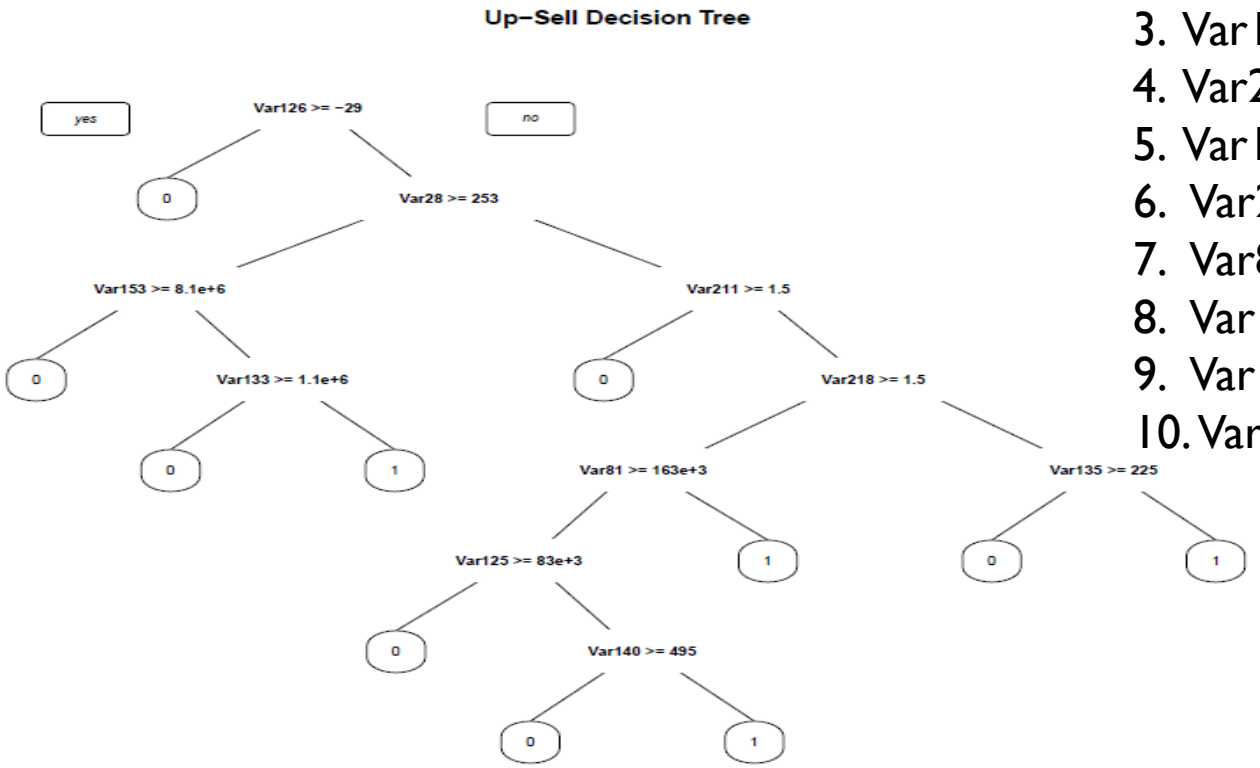
Algorithms	Out of Sample ROC
In_House	0.7435000
Random forest2	0.6805885
Random forest	0.6957932
Logistic regression	0.715561
Logistic regression2	0.6120991
Vote ensemble	0.7250015
Random Forest ensemble	0.7035371



UPSELL – VARIABLES SELECTION

Selection by Random Forest model



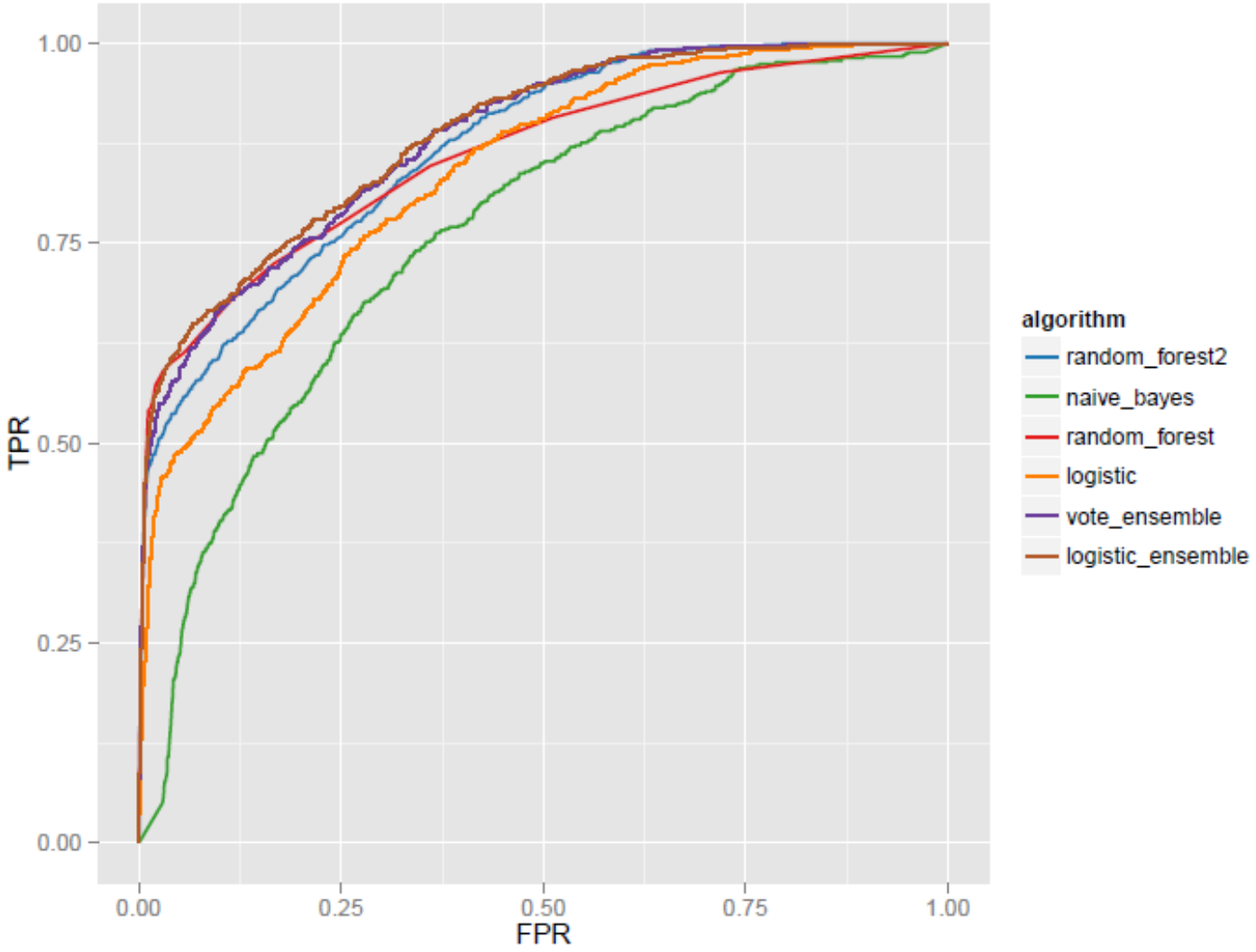


1. Var126
2. Var28
3. Var153
4. Var211
5. Var133
6. Var218
7. Var81
8. Var135
9. Var125
10. Var140

Analyzis framework

UPSELL
-
PREDICTIVE MODELING

Algorithms	Out of Sample ROC
In_House	0.8975000
Random forest2	0.8414729
Random forest	0.8201009
Logistic regression	0.8182955
Naive bayes	0.76040861
Vote ensemble	0.8465618
Random Forest ensemble	0.8462520



STRATEGY: RETAIN, CROSS-SELL, UP-SELL

Appetency (cross-sell); customers willingness to buy an additional service.

Upsell: likelihood of the customer to upgrade to a more profitable services.

Churn (attrition rate): likelihood that a customer will discontinue to use the services or goods provided by the company

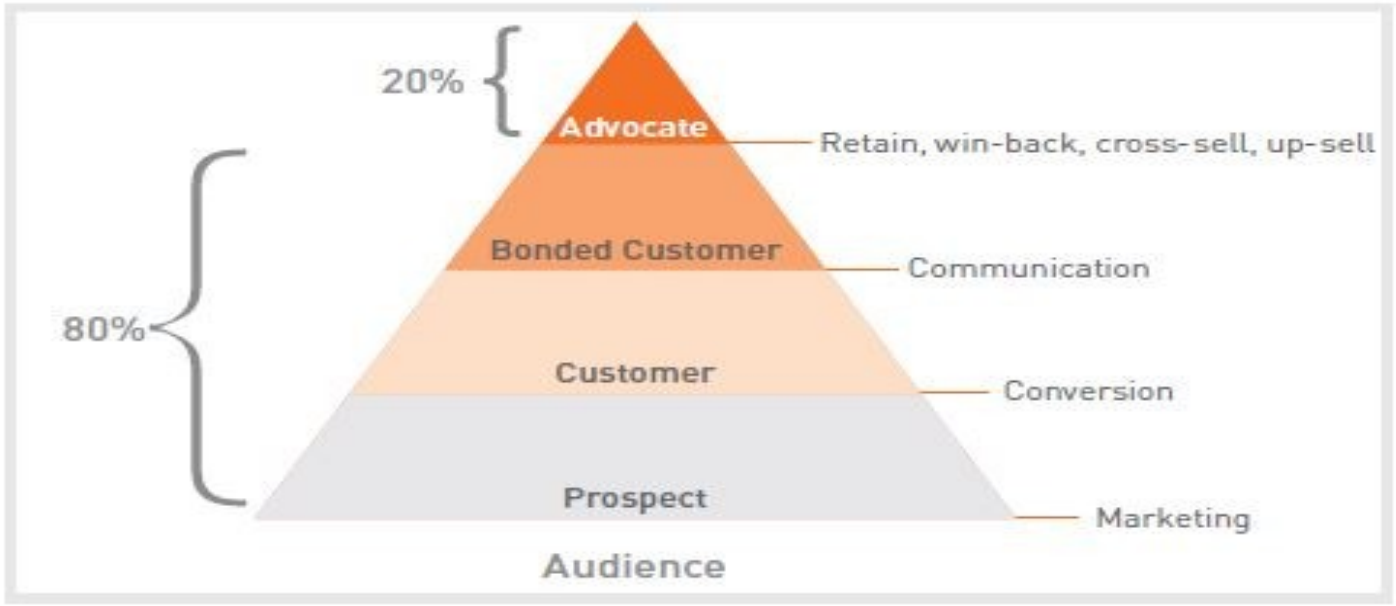


Figure 1. *A simple CRM model can provide strategic guidance.*

SFR

SFR is said to use already a predictive marketing tool enabling the company to detect churners and address them special offers before they stop using the company's services. This tool detects 81 % of potential churners and actions taken for keeping these customers would yield a retention rate of 75 %.

Objectives & Added Value

Premium cost market

- Unlimited SMS/MMS
- Unlimited international voice calls

Origami Zen

2 Go/4G (Limited access beyond that threshold)

20 Go/4G Unlimited internet access from Europe/USA 35 days/year

20 Go/4G (0.01€/Mo beyond that threshold) Unlimited internet access 35days/year from Europe

Origami Play

5 Go/4G (+ 3 Go Roaming Internet/year)
Optional: 10 Go/4G (39.99€
30 TV Channels
Cloud storage: 10 Go

30 Go/4G (0.01€/Mo beyond that threshold) Unlimited SMS, Voice calls, internet access from Europe

Origami Jet

15Go / 4G From Europe
Voice calls : 3h/year
+ unlimited SMS/MMS
+ 3Go Roaming Internet /year
Optional: Unlimited voice calls + 7 Go/year (69.99€)

40 Go/4G (0.01€/Mo beyond that threshold) Unlimited SMS, Voice calls, internet access from Europe. Free Second Data SIM-card

24.99€ | 25.99€ | 29.99€ | 32.99€ | 44.99€ | 49.99€ | 79.99€

B&YOU
- Either 20 Go/4G
- Either 5 Go/4G + Unlimited internet access from Europe 15 days/year

20 Go/4G Unlimited internet access 35 days/year from Europe

Hyper-competitive environment with focus on differentiation by 4G data volume allowed to users

Low & Medium cost market: - Unlimited SMS/MMS + - 2 h voice calls to France

2€ | 4.99€ | 5.99€ | 9.99€ | 10.99€ | 14.99€ | 15.99€ | 19.99€

free
50 Mo/3G-4G

Sosh par Orange
50 Mo/4G

B&YOU
20 Mo/4G

SFR
100 Mo/4G

Mobile by Orange
50 Mo/4G
Optional: 1 Go/4G (14.99€)
(12 months commitment)

Sosh par Orange
Unlimited calls
50 Mo/4G

B&YOU
Unlimited calls
20 Mo/4G

SFR
1 Go/4G

B&YOU
1 Go/4G

SFR
Unlimited calls
1 Go/4G

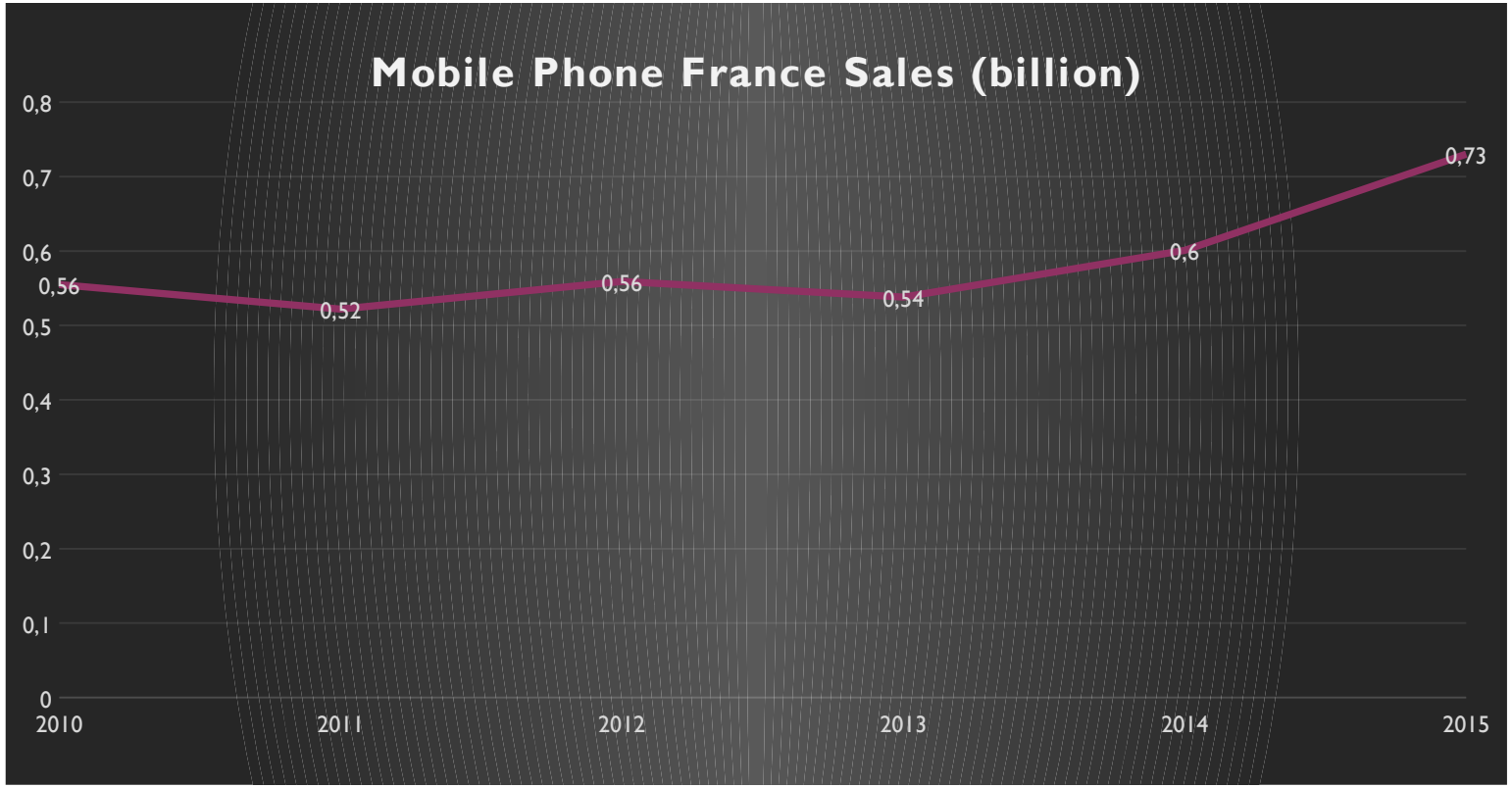
free
Unlimited calls
50 Go/4G

Sosh par Orange
Unlimited calls
5 Go/4G
10 Go/4G (24.99€)

B&YOU
Unlimited calls
5 Go/4G

Objectives

CROSS-SELLING: TERMINAL (MOBILE DEVICES) SALES ARE STEADILY INCREASING IN A SHRINKING MARKET



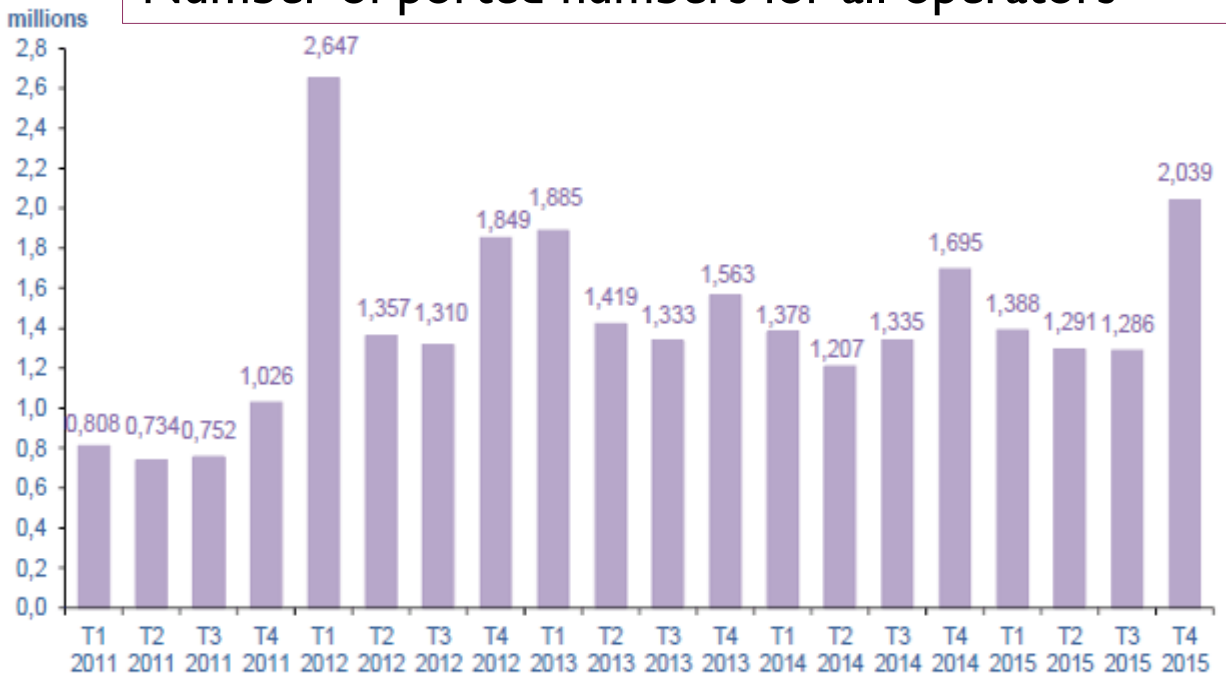
Mobile Phone Sales represent **9.7 %** of total revenue in France at the end of 2015 whereas it was only 5.7 % in 2010.

Yet, Orange Mobile had an exclusive partnership from 2007 to 2009 with Apple to sell iPhone with Orange Mobile line subscription.

CHURN RATE: CONTINUED STRONG CUSTOMER RETENTION

Portability as the capacity for any customer to change operator while keeping its current phone number is a good indicator of the churn rate.

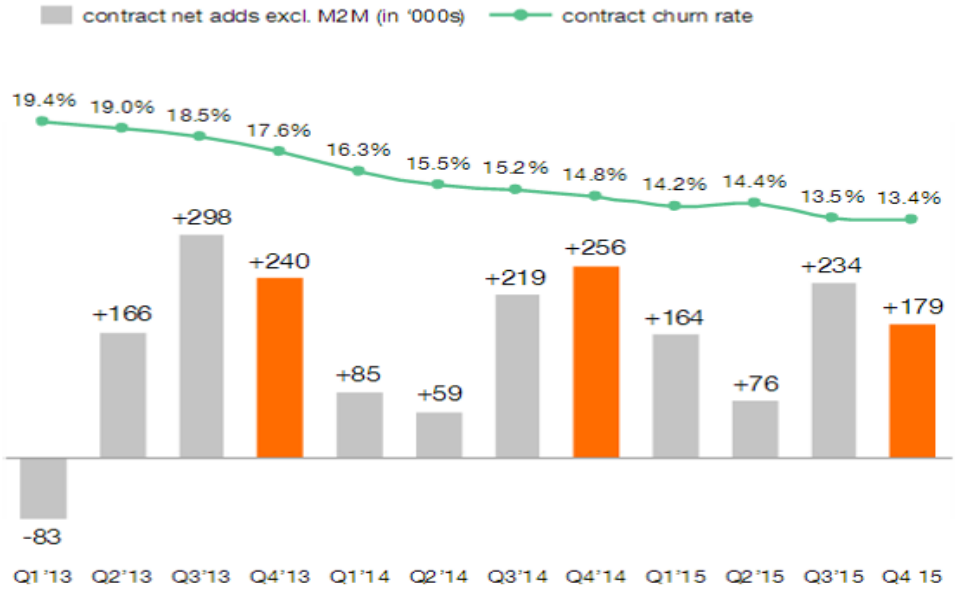
Number of ported numbers for all operators



Contract churn rate is constantly decreasing.

+6 pts

95% of customers repriced on post April 2013 tariff plan



Objectives & Added Value

UP-SELLING: LEVERAGING 4G POWER TO UPGRADE DEALS

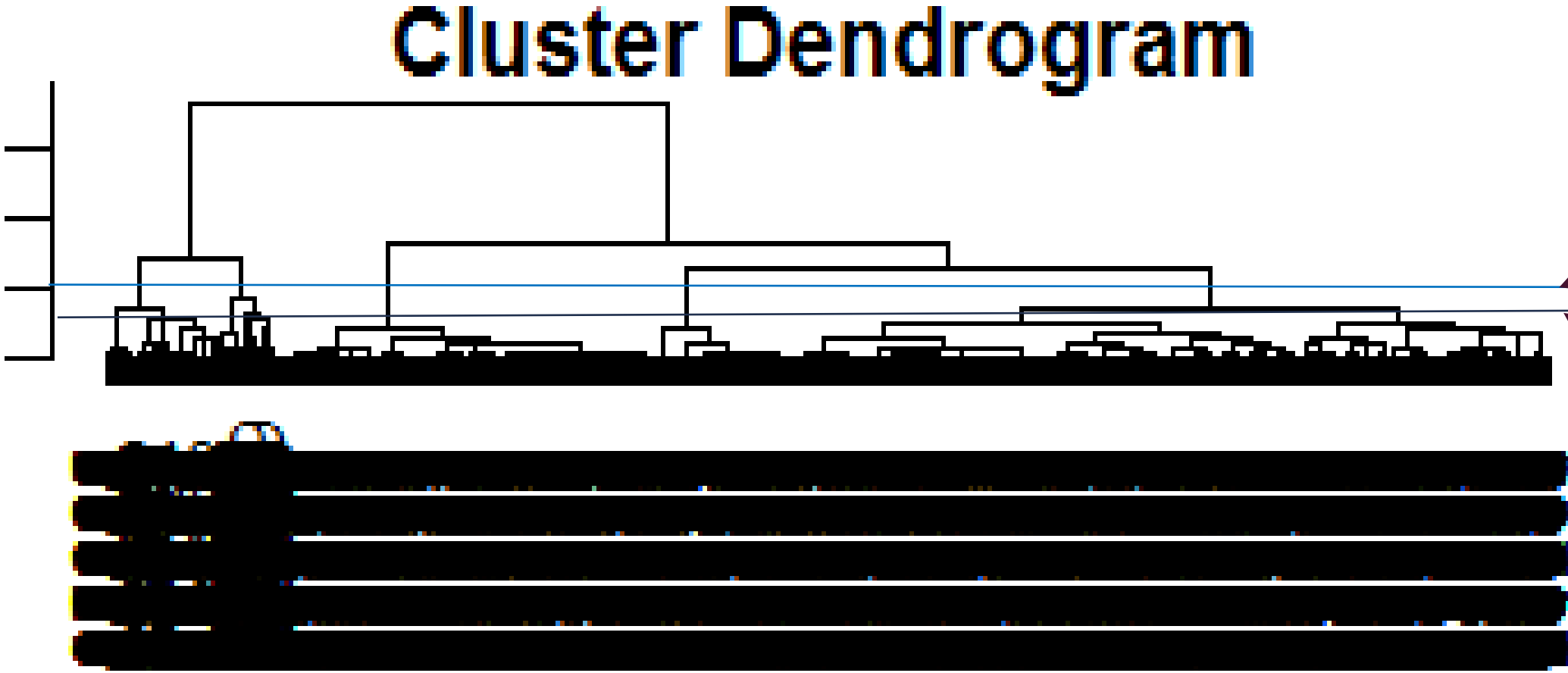
With sending video files and streaming video services (Periscope, Twitch, Facebook Live and soon YouTube Connect), getting more and more popular, users demand for a full-live experience is growing.

We have identified three levels of deals with up-selling (See Slide 8);

- Origami Jet: 49.99€ → Optional: Unlimited voice calls + 7 Go/year (69.99€)
- Origami Play: 32.99€ → Optional: 10 Go/4G (39.99€)
- Low-Cost deal with Mobile by Orange : 9.99€ → Optional: 1 Go/4G (14.99€)

We can not know in what extent each type of deals yields some added-revenue and how they contribute to the upsales total. There is no way to have a weighted average. So, we will consider the bottom-line with a profit of only 5€ (14.99€ - 9.99€) for each up-sales.

CLUSTERING - HIERARCHICAL



- Two models:
  - 5 clusters
  - 8 clusters

HIERARCHICAL CLUSTERING MODELS

5 CLUSTERS MODEL

Cluster	churn	appetency	upsell	%
1	5,56%	2,63%	11,19%	52,54%
2	5,74%	0,59%	7,72%	10,10%
3	11,96%	0,00%	1,54%	25,92%
4	6,36%	1,78%	4,58%	7,86%
5	6,70%	1,68%	2,23%	3,58%

Churn: 0.75 * 11.96% * 25.92% * 22.5€ * 24,140,000 * 12
= 151,540,414 €

Appetency: 2.63% * 52.54 % * 350 € * 24,140,000
= 116,748,451 €

Upsell: 11.19% * 52.54 % * 5€ * 24,140,000 * 12
= 85,154,709 €

353,443,574€

8 CLUSTERS MODEL

Cluster	Churn	Appetency	Upsell	%
1	6,03%	8,00%	5,57%	17,24%
2	5,33%	0,00%	13,94%	35,30%
3	5,74%	0,59%	7,72%	10,10%
4	11,96%	0,00%	1,54%	25,92%
5	4,46%	0,89%	4,46%	2,24%
6	7,12%	2,14%	4,63%	5,62%
7	8,41%	1,87%	1,87%	2,14%
8	4,17%	1,39%	2,78%	1,44%

Churn: 0.75 * (11.96% * 25.92% + 8.41 % 2.41 %) * 22.5€ * 24,140,000 * 12 = 161,448,171 €

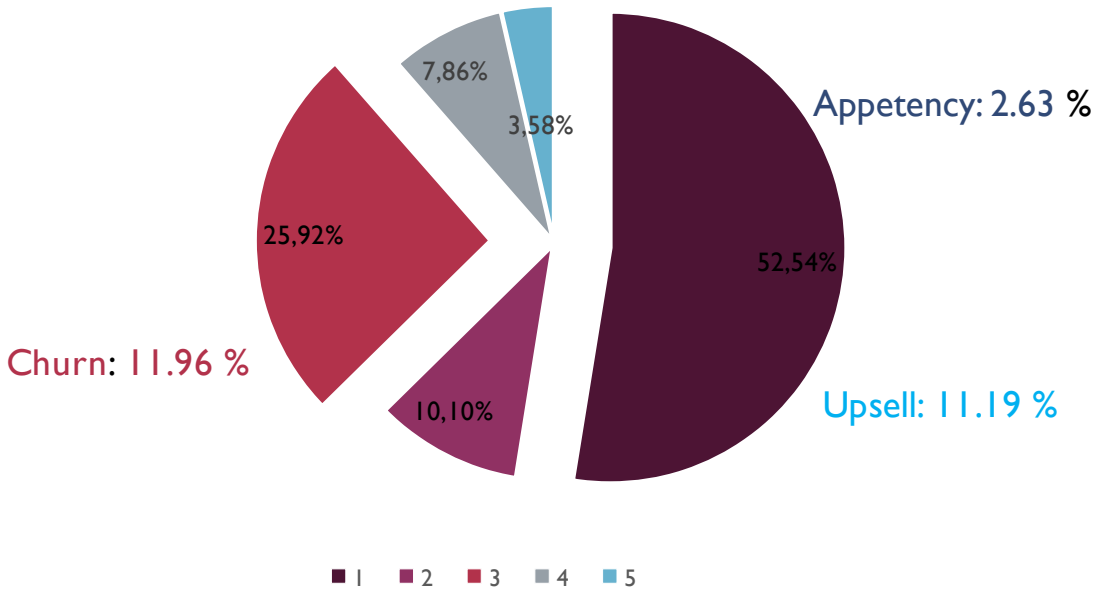
Appetency: (8% * 17.24 % + 2.14% * 5.62 %) * 350 € * 24,140,000
= 126,690,051 €

Upsell: 13.94% * 35.3 % * 5€ * 24,140,000 * *12*
= 71,273,156 €

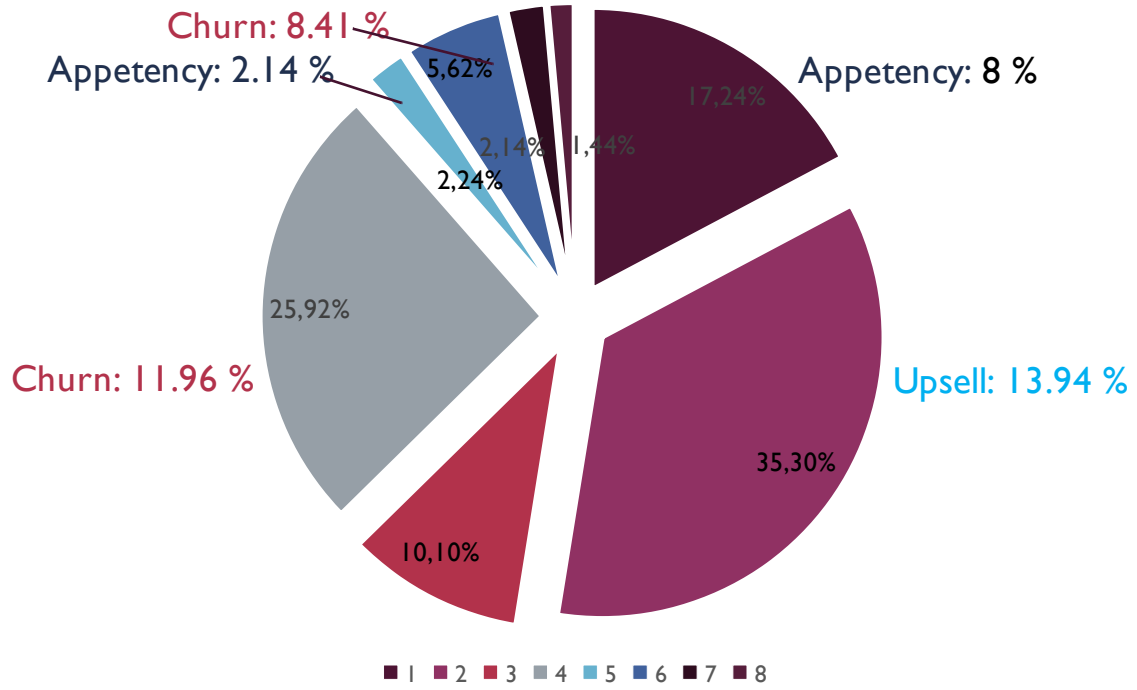
359,411,379 €

% CLUSTER SHARES

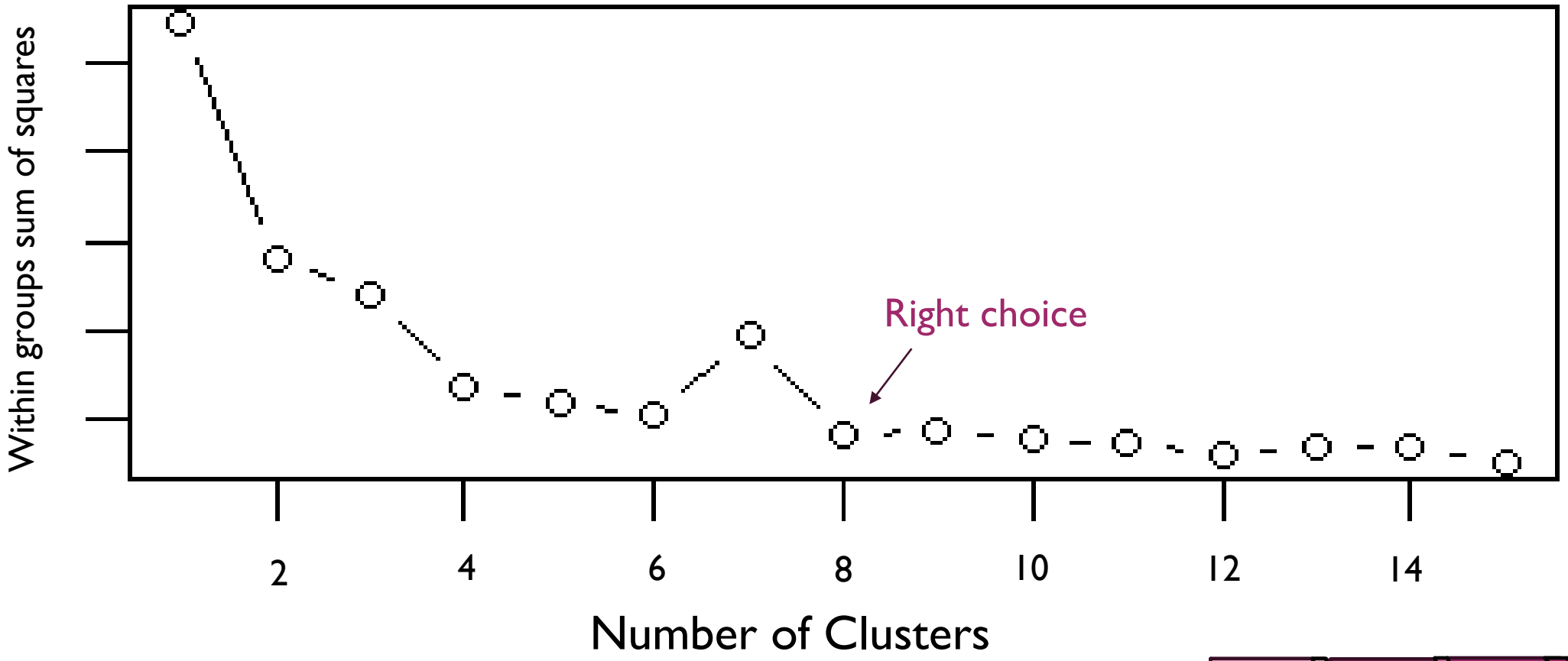
% Cluster – 5 clusters Model



% Cluster – 8 clusters Model



CLUSTERING - KMEANS



CLUSTERING - KMEANS

Cluster	churn	appetency	upsell	%
1	7,83%	2,09%	6,79%	7,66%
2	8,06%	1,42%	11,22%	12,66%
3	8,02%	0,84%	8,86%	4,74%
4	8,79%	0,82%	9,89%	7,28%
5	5,93%	1,38%	8,50%	33,42%
6	7,87%	1,80%	4,97%	14,48%
7	7,20%	2,59%	3,60%	13,88%
8	9,86%	2,04%	6,12%	5,88%

0.75 (retention rate) * (9.86% * 5.88% + 8.79% * 7.28 % + 8.06% * 12.66% + 8.02 * 4.74%) = 2.475%
2,475% % * 24.14M (nb of suscribers) * 22.5€ (ARPU) * 12 (months/year) =
161,333,930€

(2.1 % * 7.66 %) + (2.59 % * 13.88 %) + (2.04 % * 5.88 %) = 0.64 %
0.64 % * 350€ (average price for a mobile phone) * 24.14M
= **54,099,285€**

(11.22 % * 12.66 % + 8.86% * 4.74% + 9.89% * 7.28 %) = 2.56 %
2.56 % * 24.14M * 5€ (margin for upsell) * 12 (months/year)
= **37,084,949€**

252,518,165 €

Objectives

CONCLUSION

- The best model is the 8 Clusters Hierarchical Clustering Model that yields 359,411,379 € more revenue, i.e. 4.78 % more revenue (yearly total revenue: 7.507 billion).

  Given that the actual products or services that the company is providing is also unknown, we made some assumptions to add value based on the state of the market (See next slides 15-18) and retained the following figures: 5€ (extra benefit for upsell) and 350€ as average mobile price device for appetency/cross-sell. Due to the anonymized data, we can not make a ***calibration model*** *taking into account the customer lifetime*

$$\text{Customer Lifetime Value} = \frac{Margin * Retention\ Rate}{1 + Discount\ Rate - RetentionRate}$$

- Best predictive models (proportion of the explained variance in the dependent variable) for:
  - Appetency: Vote Ensemble: 0.8357 / RandomForest2: 0.8324 (Orange 's In House model: 0.853)
  - Churn: Vote Ensemble: 0.725 / Logistic Ensemble: 0.7155 (Orange 's In House model: 0.7435)
  - Upsell: Vote Ensemble: 0.8466 / Logistic Ensemble: 0.84625 (Orange 's In House model: 0.8975)

  The assignment was to use the small data set of only 230 variables, the actually data set consisted of 15,000 variables. This gives a large advantage to the Orange in-house team and other competitors. Also given that there were a large number of missing values with anonymized data, the In-house team likely had more insights into what the variables represented and therefore could engage more thoughtful data replacement approaches.