

# Hoxell-enabled Personalization: Berna Hotel

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## Introduction

This is the current report for the persalization study of *HGRM* use at the *Berna Hotel*. The report was generated on 17 August, 2016.

## Basic statistics

The dataset includes **125032** reservations for **128000** hotel stays during the **01 January, 2010** to **30 June, 2016** timeframe. Of these, **18965** are personalized either physically or through myPage.

## Personalization Request via Traditional Channel and myPage

```
##
##
##          mean          sd      min      max
## -----
## Stays      1641.03      224.55     808     2167
## physical    39.85       22.03        2      105
## virtual    243.95      66.52     102     464
## physical     1.06       0.25         1         4
## virtual     6.22       3.73         1        50
```

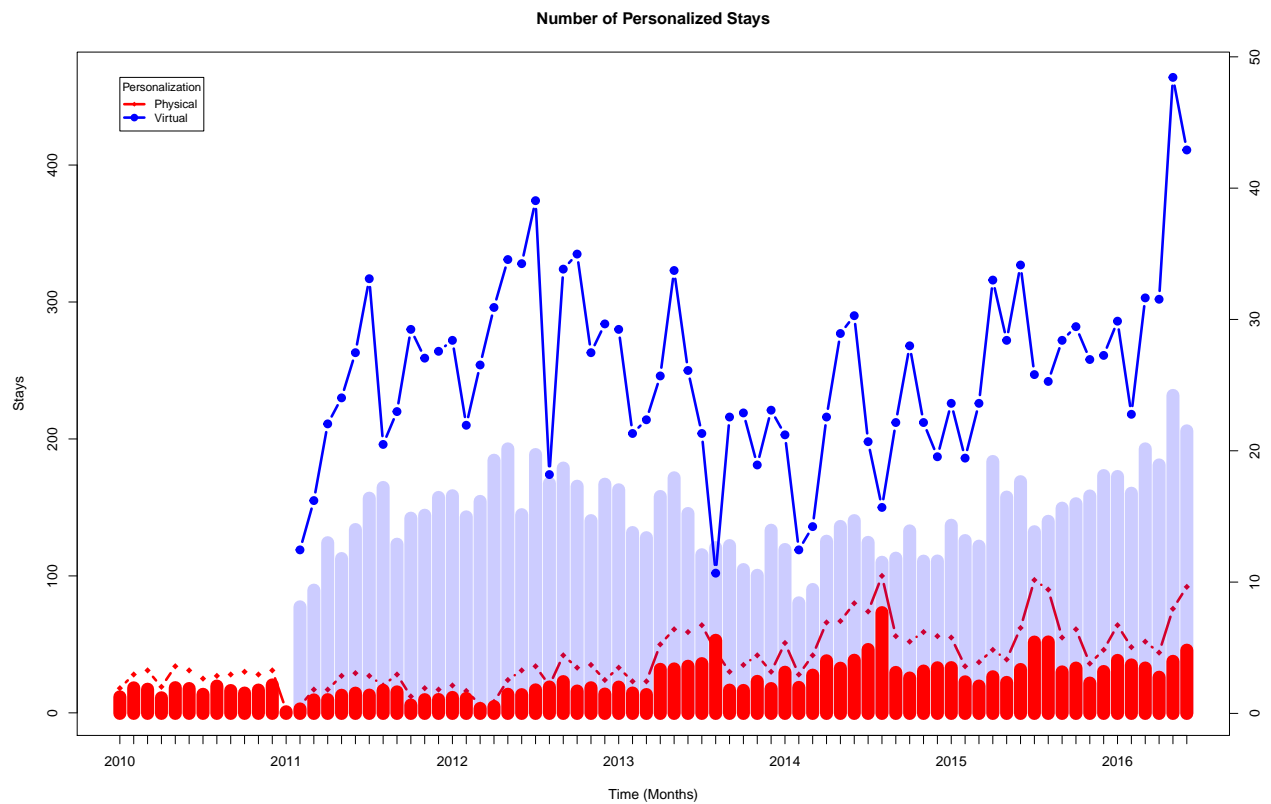
# The effect of Hoxell on preference elicitation: Customers

Our analysis shows that the introduction of Hoxell has a significant impact on the number of guests who personalize their stay at Berna Hotel. It also indicates that the introduction of personalization features in Hoxell has a positive effect on personalization via the tradition (physical) method.

## Poisson and Binomial Regression Results

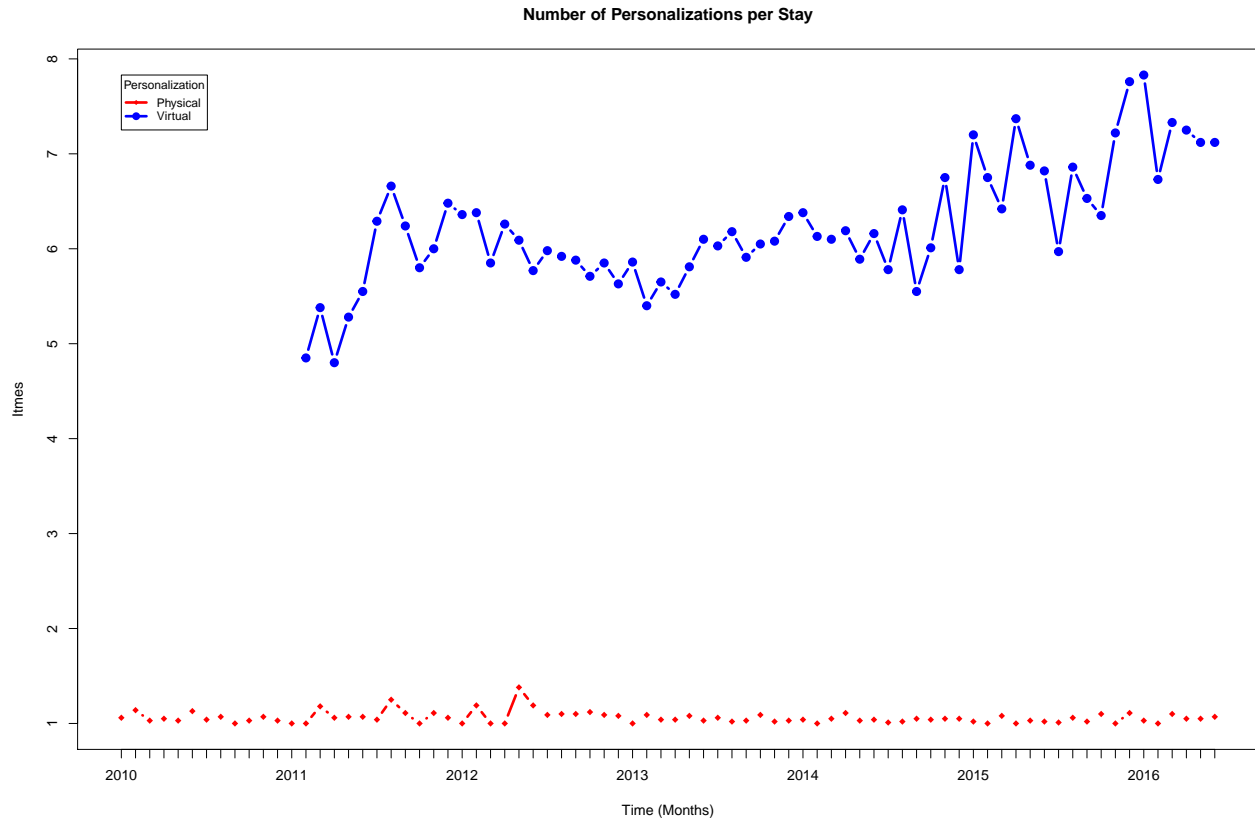
```
##
##
##
```

	Estimate	Std. Error	z value	Pr(> z )	
## -----	-----	-----	-----	-----	-----
## (Intercept)	0.05	0.02	3.07	0	NA
## Methodvirtual	1.77	0.02	99.98	0	NA
## (Intercept)	-4.11	0.06	-74.37	0	0.02
## methodvirtual	1.90	0.02	90.36	0	6.70
## virtualizationTRUE	0.48	0.06	8.26	0	1.62



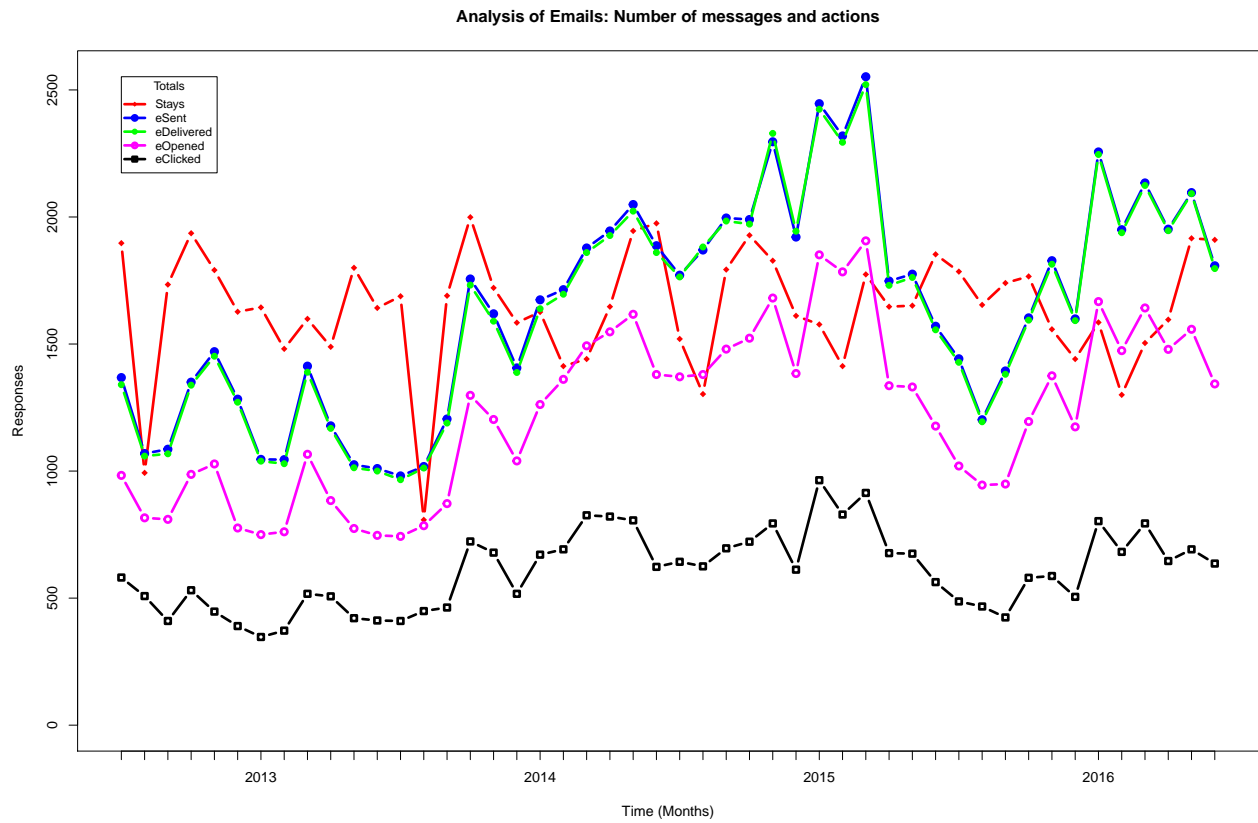
## The effect of Hoxell on preference elicitation: Personalizations

This analysis focuses on the number of items requested by customers who personalize. We find a strong impact of Hoxell on the number of items requested by customers. Specifically when personalizing through traditional means customers chose an average of 1.06 items. Conversely, when using Hoxell they select 6.22 items.

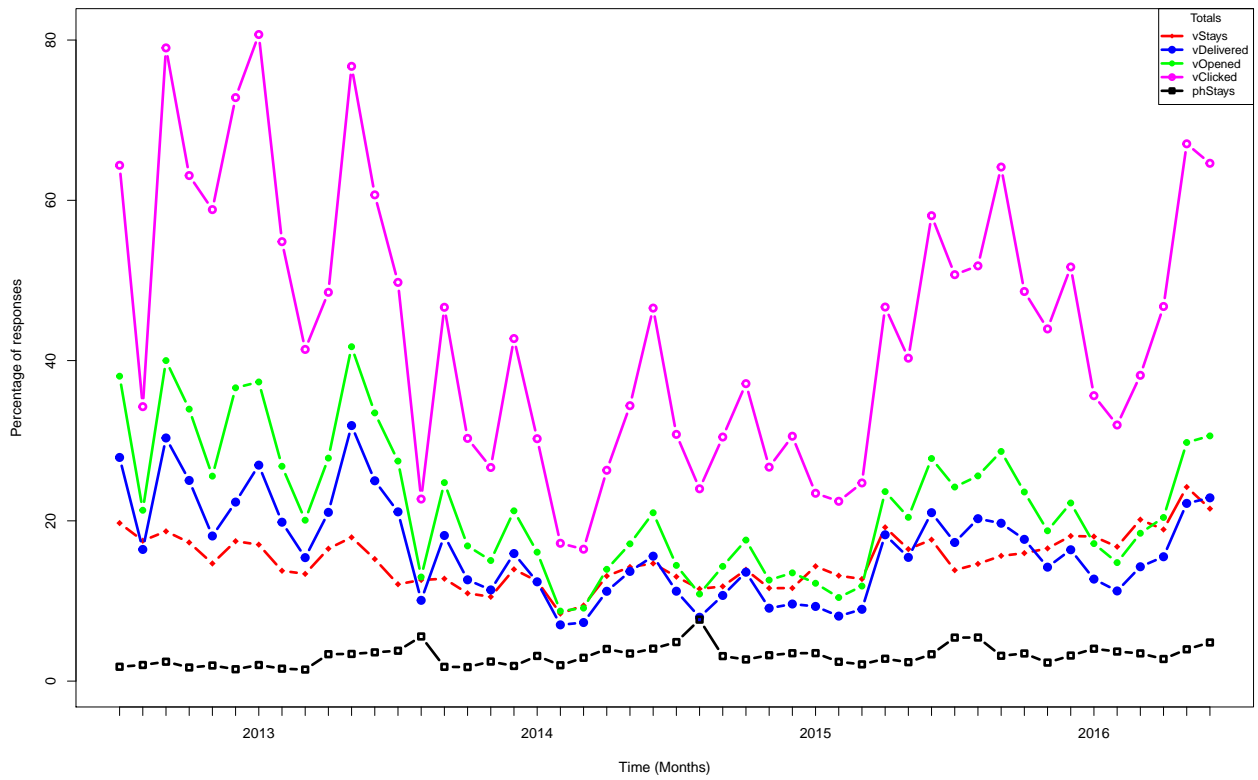


# Analysis of emails

This section provides a monthly analysis of emails sent via the Mandrill application.



Analysis of Emails: Percentage of Personalizations



# The Effect of Personalization on Service and Value Hotel Ratings

We test the effect of personalizations on hotel service and value ratings using 7060 reviews posted to Booking.com merged with reservation data.

## Personalization Effect on Service

```
##
##
##
```

	Estimate	Std. Error	z value	Pr(> z )	
## 2.5 5	-4.52	0.20	-23.00	0.00	NA
## 5 7.5	-2.51	0.14	-17.93	0.00	NA
## 7.5 10	0.04	0.13	0.29	0.77	NA
## Personalization	0.15	0.06	2.53	0.01	1.16
## ADR	-0.17	0.03	-5.97	0.00	0.84
## LoS	0.00	0.02	-0.07	0.94	1.00
## ROOM_TYPEQUALITY	0.31	0.07	4.11	0.00	1.36
## ROOM_TYPESUPERIOR	0.36	0.07	5.08	0.00	1.43
## ROOM_TYPESINGOLA (BASIC)	0.00	0.08	-0.06	0.95	1.00
## ADULTS	0.20	0.06	3.14	0.00	1.22
## CHILDREN	0.08	0.09	0.91	0.36	1.09
## PrefPrice	0.00	0.01	-0.16	0.87	1.00

## Personalization Effect on Value

```
##
##
##
```

	Estimate	Std. Error	z value	Pr(> z )	
## 2.5 5	-3.45	0.15	-22.61	0.00	NA
## 5 7.5	-1.68	0.13	-13.04	0.00	NA
## 7.5 10	0.56	0.13	4.44	0.00	NA
## Personalization	0.12	0.06	2.18	0.03	1.13
## ADR	-0.37	0.03	-13.16	0.00	0.69
## LoS	-0.04	0.02	-2.48	0.01	0.96
## ROOM_TYPEQUALITY	0.34	0.07	4.73	0.00	1.40
## ROOM_TYPESUPERIOR	0.35	0.07	5.21	0.00	1.42
## ROOM_TYPESINGOLA (BASIC)	0.12	0.08	1.49	0.14	1.13
## ADULTS	0.32	0.06	5.33	0.00	1.38
## CHILDREN	0.03	0.09	0.38	0.71	1.03
## PrefPrice	0.00	0.01	0.14	0.89	1.00

## The Effect of Number of Personalization on Service

##	Estimate	Std. Error	z value	Pr(> z )	
## -----	-----	-----	-----	-----	-----
## 2.5 5	-4.48	0.42	-10.62	0.00	NA
## 5 7.5	-2.60	0.31	-8.49	0.00	NA
## 7.5 10	0.07	0.29	0.25	0.80	NA
## Count.of.Personalization.Items.Used	0.02	0.02	1.43	0.15	1.02
## ADR	-0.15	0.06	-2.36	0.02	0.86
## LoS	-0.01	0.04	-0.26	0.80	0.99
## ROOM_TYPEQUALITY	0.17	0.14	1.18	0.24	1.18
## ROOM_TYPESUPERIOR	0.35	0.15	2.40	0.02	1.42
## ROOM_TYPESINGOLA (BASIC)	0.25	0.18	1.39	0.17	1.29
## ADULTS	0.22	0.14	1.64	0.10	1.25
## CHILDREN	0.36	0.23	1.54	0.12	1.43
## PrefPrice	0.00	0.01	-0.37	0.71	1.00

## The Effect of Number of Personalization on Value

##	Estimate	Std. Error	z value	Pr(> z )	
## -----	-----	-----	-----	-----	-----
## 2.5 5	-4.13	0.36	-11.49	0.00	NA
## 5 7.5	-2.09	0.28	-7.44	0.00	NA
## 7.5 10	0.32	0.27	1.17	0.24	NA
## Count.of.Personalization.Items.Used	0.01	0.01	0.76	0.45	1.01
## ADR	-0.34	0.06	-5.52	0.00	0.72
## LoS	-0.08	0.04	-2.09	0.04	0.93
## ROOM_TYPEQUALITY	0.34	0.14	2.46	0.01	1.40
## ROOM_TYPESUPERIOR	0.27	0.14	1.94	0.05	1.31
## ROOM_TYPESINGOLA (BASIC)	0.08	0.17	0.48	0.63	1.09
## ADULTS	0.26	0.13	2.00	0.04	1.29
## CHILDREN	0.08	0.20	0.40	0.69	1.08
## PrefPrice	0.00	0.01	0.12	0.90	1.00

## Hoxell Impact on Positive Share-Shift

This analysis focuses on the effect of personalization on the creation of a direct relationship with the customers that leads to share-shift from intermediated (high-cost) to direct (low-cost) distribution channels.

The analysis is based on a sample of 10115 reservations by guests who visited the hotel more than once during the timeframe of our analysis. Of these returning customers 1867 engaged in personalization during their first visit to the Berna Hotel.

### Beneficial Share-Shift

```
##
##
##              Estimate   Std. Error   z value   Pr(>|z|)   Odds.Ratio
## -----
## (Intercept)      -1.698       0.184    -9.250     0.000     0.183
## I(Method.0 == "Virtual")TRUE    0.344       0.094     3.653     0.000     1.411
## ADR.1             0.084       0.042     2.009     0.045     1.088
## ROOM_TYPE.1QUALITY    0.190       0.129     1.477     0.140     1.210
## ROOM_TYPE.1SUPERIOR  -0.030       0.119    -0.255     0.798     0.970
## ROOM_TYPE.1SINGOLA (BASIC)    0.388       0.116     3.341     0.001     1.474
## ADULTS.1          -0.101       0.098    -1.036     0.300     0.904
## CHILDREN.1         0.062       0.161     0.381     0.703     1.063
##
## [1] 0.2933743
```

### Detrimental Share-Shift

```
##
##
##              Estimate   Std. Error   z value   Pr(>|z|)   Odds.Ratio
## -----
## (Intercept)      -0.927       0.260    -3.560     0.000     0.396
## I(Method.0 == "Virtual")TRUE  -0.542       0.138    -3.935     0.000     0.581
## ADR.1             0.049       0.065     0.760     0.447     1.051
## ROOM_TYPE.1QUALITY  -0.371       0.216    -1.718     0.086     0.690
## ROOM_TYPE.1SUPERIOR  -0.228       0.175    -1.302     0.193     0.796
## ROOM_TYPE.1SINGOLA (BASIC)    0.267       0.164     1.630     0.103     1.306
## ADULTS.1          -0.157       0.149    -1.059     0.290     0.854
## CHILDREN.1         0.022       0.236     0.091     0.927     1.022
##
## [1] -0.3766819
```



## Hoxell Impact on Positive Share-Shift - Limited window

This analysis focuses on the effect of personalization on the creation of a direct relationship with the customers that leads to share-shift from intermediated (high-cost) to direct (low-cost) distribution channels. Unlike the previous analysis we only use a portion of the data constraining only to people who return to the property within a limited window of days

The analysis is based on a sample of 3793 reservations by guests who visited the hotel more than once during the timeframe of our analysis. However we limit the analysis to only guests who returned withing **365** days. Of these returning customers 498 engaged in personalization during their first visit to the Berna Hotel. This analysis is performed by focusing only on those second stays that were booked after departure of the first stay. In other words, we eliminated instances where the second reservation was made before the first stay as the guest would have booked before enjoying the benefits of personalization.

### Beneficial Share-Shift

```
##
##
##              Estimate      Std. Error    z value    Pr(>|z|)    Odds.Ratio
## -----
## (Intercept)      -1.157         0.251      -4.606      0.000      0.315
## I(Method.0 == "Virtual")TRUE    0.699         0.147       4.760      0.000      2.011
## ADR.1            -0.073         0.067      -1.078      0.281      0.930
## ROOM_TYPE.1QUALITY    0.007         0.213       0.032      0.974      1.007
## ROOM_TYPE.1SUPERIOR  -0.222         0.182      -1.219      0.223      0.801
## ROOM_TYPE.1SINGOLA (BASIC)    0.090         0.155       0.580      0.562      1.094
## ADULTS.1           0.093         0.145       0.640      0.522      1.097
## CHILDREN.1         0.155         0.262       0.593      0.553      1.168
##
## [1] 0.5730438
```

### Detrimental Share-Shift

```
##
##
##              Estimate      Std. Error    z value    Pr(>|z|)    Odds.Ratio
## -----
## (Intercept)      -1.469         0.401      -3.665      0.000      0.230
## I(Method.0 == "Virtual")TRUE  -0.371         0.249      -1.489      0.136      0.690
## ADR.1             0.202         0.105       1.923      0.054      1.224
## ROOM_TYPE.1QUALITY  -0.612         0.432      -1.415      0.157      0.542
## ROOM_TYPE.1SUPERIOR  -0.096         0.301      -0.320      0.749      0.908
## ROOM_TYPE.1SINGOLA (BASIC)    0.574         0.247       2.325      0.020      1.775
## ADULTS.1           0.128         0.250       0.512      0.609      1.137
## CHILDREN.1         0.345         0.402       0.858      0.391      1.411
##
## [1] -0.254701
```

The analysis is based on a sample of 2473 reservations by guests who visited the hotel more than once during the timeframe of our analysis. However we limit the analysis to only guests who returned withing **183** days. Of these returning customers 299 engaged in personalization during their first visit to the Berna Hotel. This analysis is performed by focusing only on those second stays that were booked after departure of the first

stay. In other words, we eliminated instances where the second reservation was made before the first stay as the guest would have booked before enjoying the benefits of personalization.

## Beneficial Share-Shift

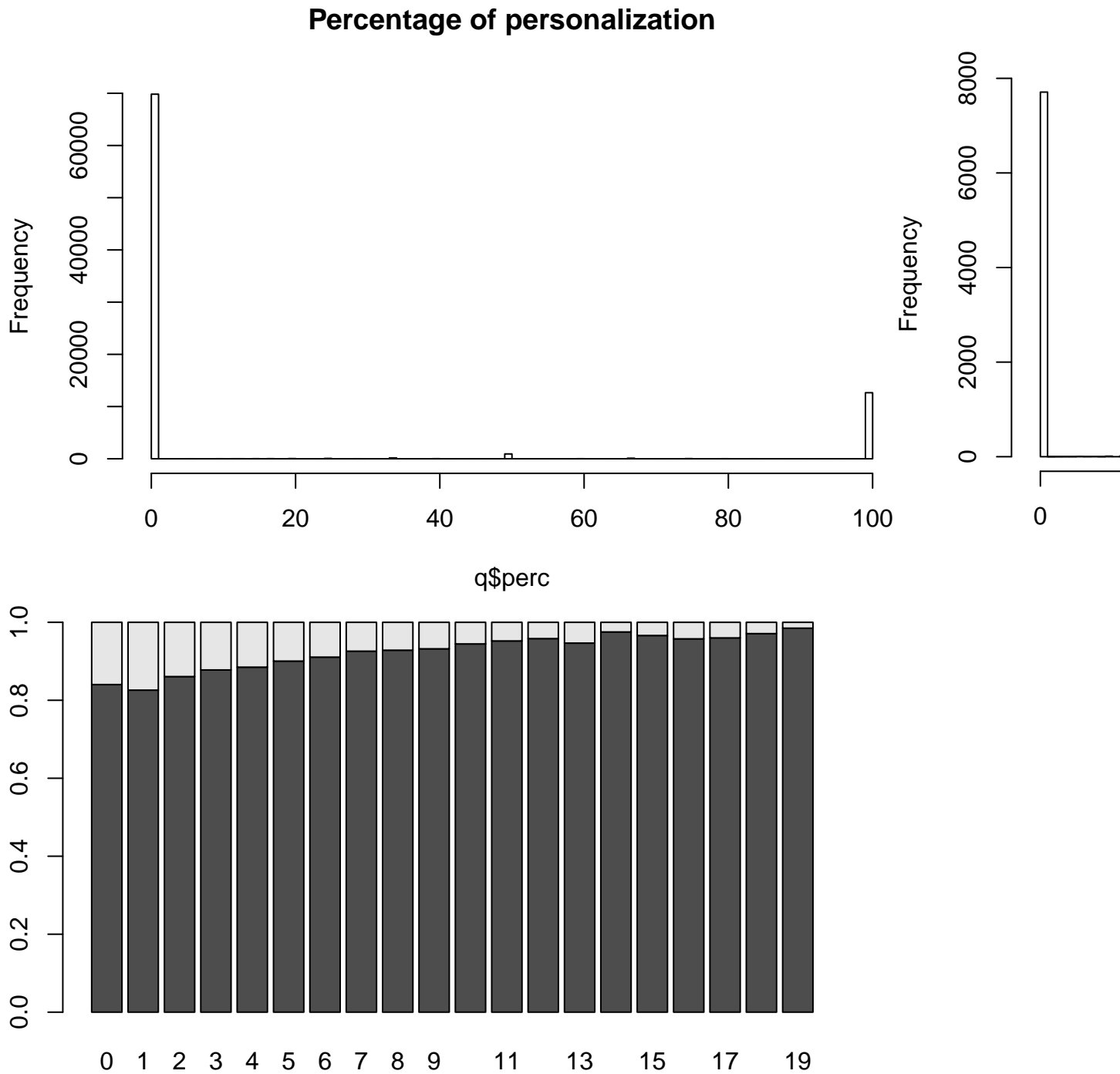
```
##
##
##              Estimate   Std. Error   z value   Pr(>|z|)   Odds.Ratio
## -----
## (Intercept)         -1.197         0.298     -4.014     0.000         0.302
## I(Method.0 == "Virtual")TRUE      0.717         0.190      3.786     0.000         2.049
## ADR.1                -0.028         0.087     -0.318     0.751         0.973
## ROOM_TYPE.1QUALITY    -0.065         0.286     -0.228     0.820         0.937
## ROOM_TYPE.1SUPERIOR   -0.327         0.221     -1.481     0.139         0.721
## ROOM_TYPE.1SINGOLA (BASIC)  0.089         0.184      0.485     0.628         1.094
## ADULTS.1              0.231         0.176      1.315     0.189         1.260
## CHILDREN.1            0.140         0.330      0.425     0.670         1.151
##
## [1] 0.589363
```

## Detrimental Share-Shift

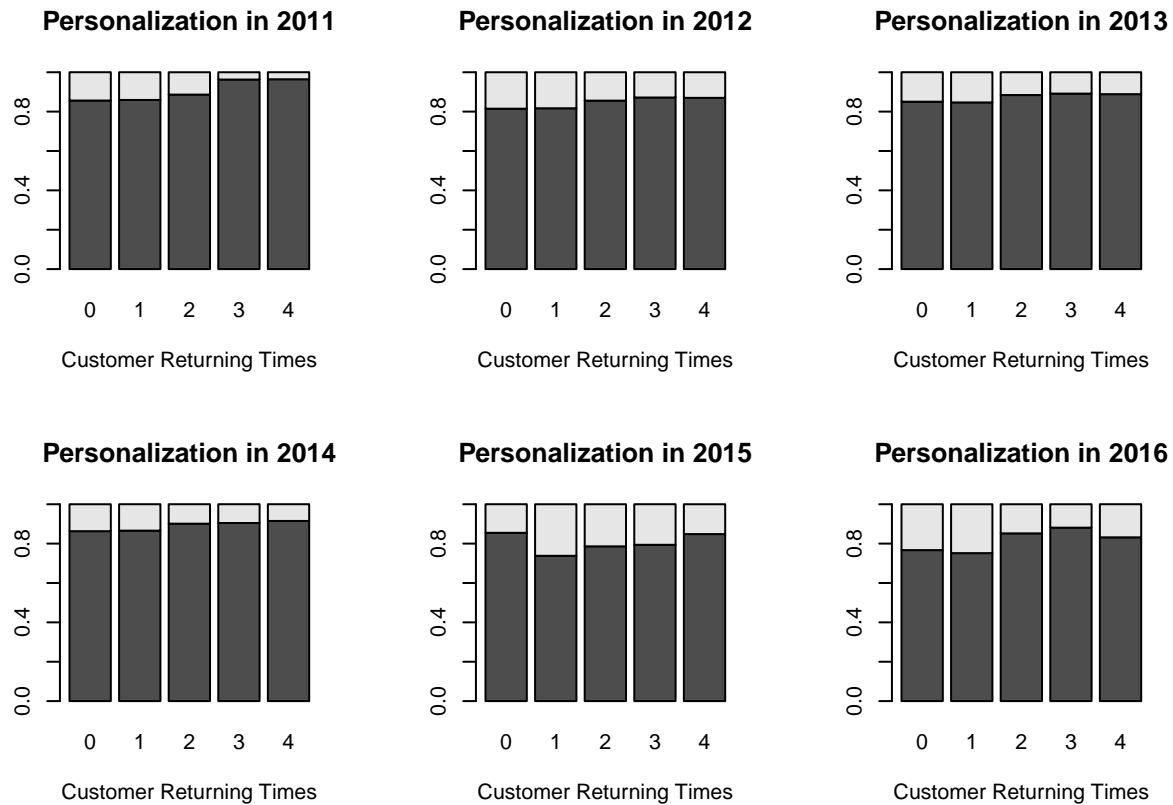
```
##
##
##              Estimate   Std. Error   z value   Pr(>|z|)   Odds.Ratio
## -----
## (Intercept)         -2.217         0.639     -3.470     0.001         0.109
## I(Method.0 == "Virtual")TRUE    -0.781         0.427     -1.832     0.067         0.458
## ADR.1                 0.373         0.163      2.289     0.022         1.453
## ROOM_TYPE.1QUALITY    -0.173         0.633     -0.273     0.785         0.841
## ROOM_TYPE.1SUPERIOR   -0.176         0.438     -0.402     0.688         0.838
## ROOM_TYPE.1SINGOLA (BASIC)  0.744         0.392      1.899     0.058         2.103
## ADULTS.1              0.387         0.388      0.998     0.318         1.473
## CHILDREN.1            0.461         0.560      0.824     0.410         1.586
##
## [1] -0.4041096
```

## Extra analysis of personalization by number of stays

The first histogram shows how the overwealming majority of guests does not personalize their stay, or always personalizes the stay. A few guests personalize some of the times with the only notable group being the 50%. The second chart shows the proportion of guests that personalize for each group returning between zero and 20 times to the property.



These are the proportion of personalization by year for those retunring zero to four times at Berna.



```
## Personalization in 2011
##      0      1      2      3      4
## 0 11835 2019 1210 337 189
## 1 1988 331 155 13 7
## Personalization in 2012
##      0      1      2      3      4
## 0 11307 1857 1680 489 214
## 1 2570 416 283 72 32
## Personalization in 2013
##      0      1      2      3      4
## 0 10850 1579 1716 616 359
## 1 1909 286 225 75 45
## Personalization in 2014
##      0      1      2      3      4
## 0 11446 1471 1799 693 366
## 1 1814 228 197 73 34
## Personalization in 2015
##      0      1      2      3      4
## 0 11546 1093 1507 543 319
## 1 1961 388 410 141 57
## Personalization in 2016
##      0      1      2      3      4
## 0 5138 336 795 311 183
## 1 1561 111 138 42 37
```

The following analysis shows the extent of personalization by booking channel. Berna is most successful in stimulating personalizations via the website. Given the value of personalization, Berna should be much more proactive in stimulating personalization - particularly from guests who book directly with the hotel.

```
##          BOOKING_CHANNEL
## Personalization      internet  gds bookings europe b.v. expedia
##          0  8408      4448  1243          32278  15463
##          1   290      376   16          6412   1735
##          BOOKING_CHANNEL
## Personalization home page hotel berna milano
##          0      16335          4763
##          1      6261          302
```

```
##          BOOKING_CHANNEL
## Personalization      internet  gds bookings europe b.v. expedia home page
##          0  0.97      0.92  0.99          0.83   0.90   0.72
##          1  0.03      0.08  0.01          0.17   0.10   0.28
##          BOOKING_CHANNEL
## Personalization hotel berna milano
##          0          0.94
##          1          0.06
```

## Extra analysis of Traces and Personaization Items

### Analysis of Traces - Items Requested through Physical Personalization

This analysis is performed on 2583 reservations with traces that express personalization items. The list of items, ordered by highest percentage of requests is:

```
round(cumsum(sort(prop.table(rez), decreasing = TRUE)), 3)
```

##	Extra.Bed	Special.Occasion	Pillow	Baby.cot
##	0.489	0.610	0.687	0.761
##	Bathroom	Flooring	Diet	Pet
##	0.833	0.869	0.899	0.923
##	In.room.amenities	Bedding.matress	Minibar	Others
##	0.945	0.961	0.975	0.986
##	Towels.bathrobe	Transportation	Temperature	
##	0.991	0.997	1.000	

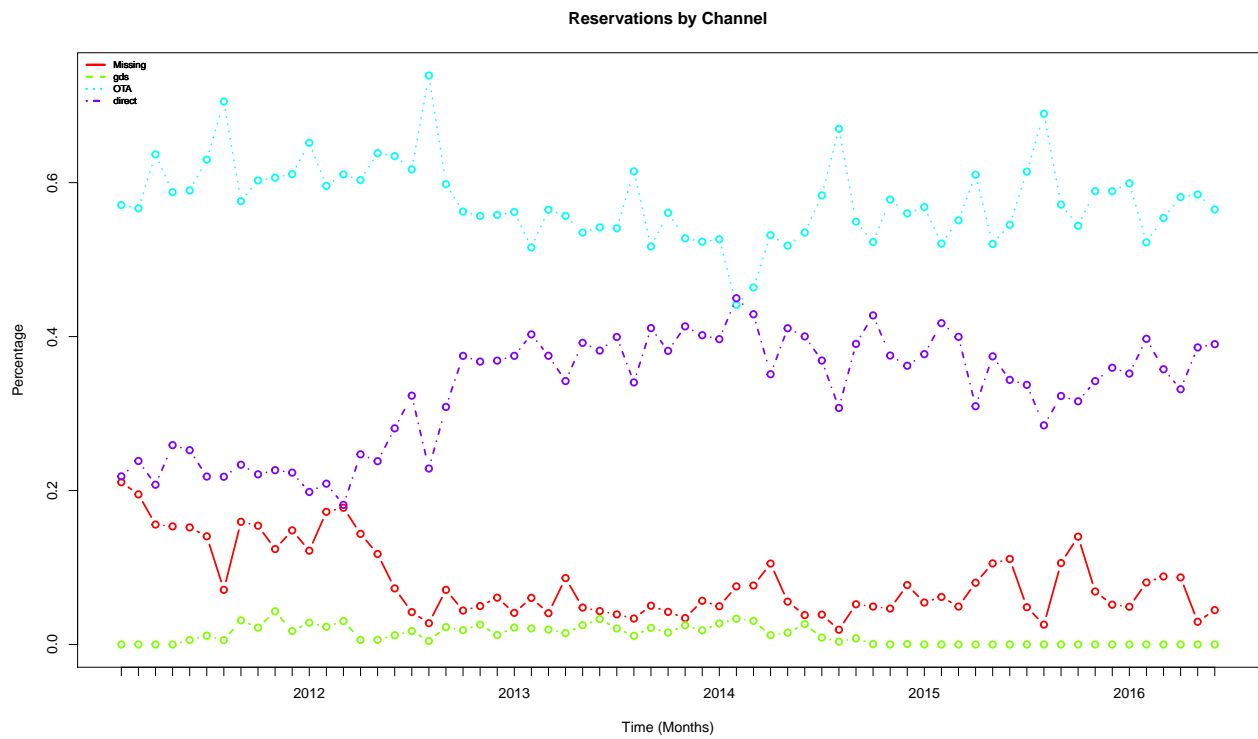
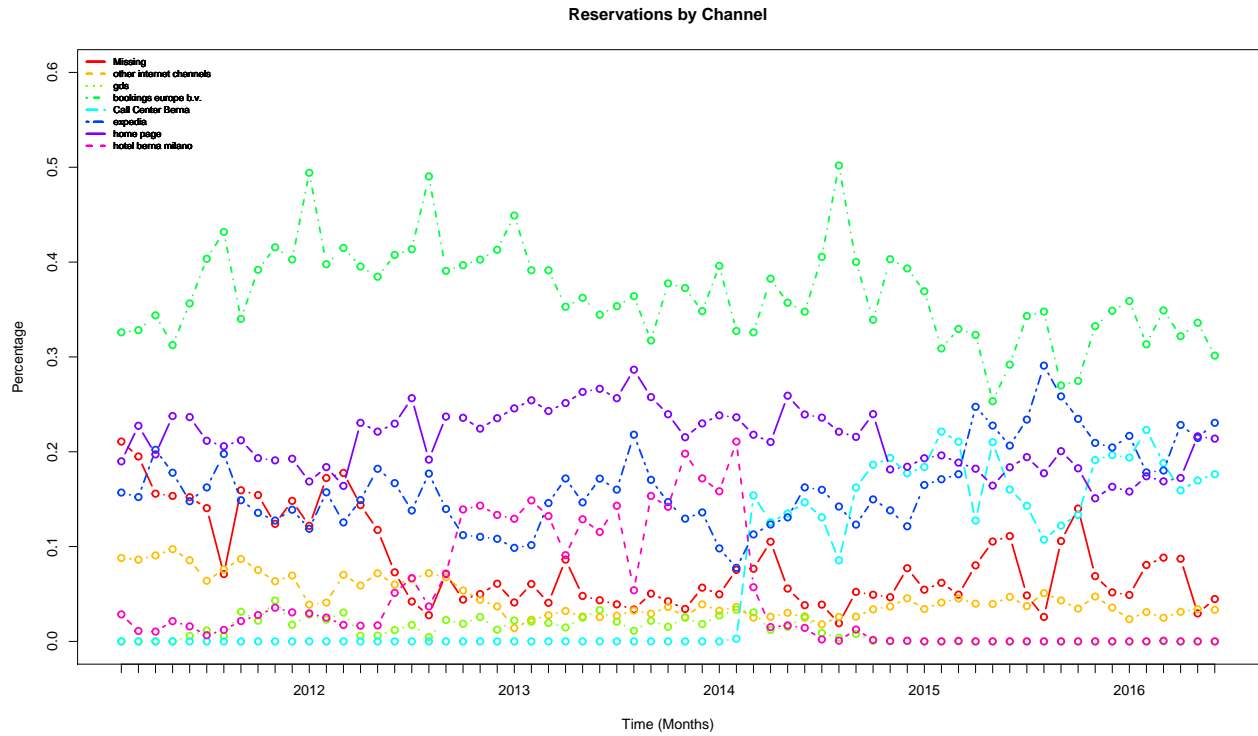
### Analysis of Items Requested through Hoxell

The list of items, ordered by highest percentage of requests is:

```
round(cumsum(sort(prop.table(rez), decreasing = TRUE)), 3)
```

##	Drink	PillowType	Temperature
##	0.330	0.489	0.632
##	BedType	PillowsExtra	Towels
##	0.761	0.848	0.928
##	ToiletPaper	ClothingManagement	Food
##	0.961	0.972	0.980
##	WelcomeBasket	KidsAmenities	Newspaper
##	0.986	0.992	0.997
##	BathAmenities	RoomAmenities	Other
##	0.999	1.000	1.000
##	Floors		
##	1.000		

## Extra analysis of Disintermediation over time



## Stickiness of the personalization effect

The following data shows that once a customer has personalized after reserving via an OTA he is more likely to choose a direct channel and to continue to do so over the subsequent three stays.

Table 1: Number of Reservations by Channel on First Repeat

		internet	gds	bookings europe b.v.	expedia	home page	hotel berna milano
0	81	72	8	1071	312	526	86
1	4	6	1	193	11	159	16

Table 2: Percentage of Reservations by Channel on First Repeat

		internet	gds	bookings europe b.v.	expedia	home page	hotel berna milano
0	0.04	0.03	0	0.50	0.14	0.24	0.04
1	0.01	0.02	0	0.49	0.03	0.41	0.04

Table 3: Number of Reservations by Channel on Second Repeat

		internet	gds	bookings europe b.v.	expedia	home page	hotel berna milano
0	31	16	5	353	86	260	48
1	4	0	1	59	9	73	5

Table 4: Percentage of Reservations by Channel on Second Repeat

		internet	gds	bookings europe b.v.	expedia	home page	hotel berna milano
0	0.04	0.02	0.01	0.44	0.11	0.33	0.06
1	0.03	0.00	0.01	0.39	0.06	0.48	0.03

Table 5: Number of Reservations by Channel on Third Repeat

		internet	gds	bookings europe b.v.	expedia	home page	hotel berna milano
0	12	8	1	151	47	168	31
1	0	0	0	24	1	48	3

Table 6: Percentage of Reservations by Channel on Third Repeat

		internet	gds	bookings europe b.v.	expedia	home page	hotel berna milano
0	0.03	0.02	0	0.36	0.11	0.40	0.07
1	0.00	0.00	0	0.32	0.01	0.63	0.04