Chapter 9

The Quality Perceived by the Young Customer Versus Coca Cola Zero Advertisement

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Additional information is available at the end of the chapter

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Abstract

Nowadays, the advertisement is one of the key activities of sale. An advertisement is not always true and sometimes it could be even misleading or false. This chapter is focused on the exemplary verification of the truth of the concrete advertisement. The verification has been provided based on the data coming from the research being provided among 300 young customers from the Czech Republic. The data have been processed statistically, and based on the hypothesis testing using one-way analysis of variance (ANOVA), the data are evaluated whether the advertisement is true or misleading. Research findings provide testimony of unfair practice of advertisement.

Keywords: advertisement, customer, unfair practices, quality perceived by the customer

1. Introduction

In these days, the struggle for a customer belongs to the daily company activities. The companies compete among each other in the field of the quality, price, payment methods, sales, and in many other ways. One of these fields, where the companies try to win customers, is the advertisement. The customer is bombed by the producers' advertisement and services providers in newspapers, magazines, TV, and in other media. Due to recent IT development, the effective marketing communication is via social networking site, more has been given by Shen et al. (2016) and Dehghani et al. (2016). The advertisement producers invent more or less perfect "stories" in order to change the customer's mind and to get him to their side. View more by El Ouardighi et al. (2016), Dehghani et al. (2016), Shen et al. (2016) and Chang (2009).

Is the content of advertisements true or the customer is only being misled? It is not a simple answer to this question. Of course, like everywhere, both will be true and it will depend on the concrete case. Following text deals with the analysis of one of such advertisements in more detail and it tries to show in a sophisticated way whether the advertisement is true or not. Dehghani et al. (2016) results show that entertainment, informativeness and customization are the strongest positive drivers. On the other hand, the advertising value affects both brand awareness and purchase intention of consumers accordingly.

One of the Coca Cola Company advertisements makes efforts to persuade customers that they would not recognize the taste difference between a Coca Cola and Coca Cola Zero. Therefore, the authors of this chapter have performed the testing of taste being perceived by the customer who perceives it (the quality perceived by the customer). The test results of the taste have become the subject of statistical elaboration aiming to approve or disprove whether the customers perceive the taste of Coca Cola and Coca Cola Zero in the same way. Thus the customer does not recognize the difference between both products, which may result in customer dissatisfaction. Another customer dissatisfaction has been given by Zeelenberg and Pieters (2004).

2. Theoretical bases

The taste of products has been evaluated by the customer verbally in analysis, and the verbal evaluation is transformed into the scoring (Blecharz and Stverkova, 2011; Blecharz, 2015). As for an easy understanding for the customer, five variants of answers have been chosen to make evaluation easier. Evaluation of the taste can be as follows:

- Excellent
- Rather good
- Average
- Rather bad
- Absolutely unsatisfactory

To each answer a score belongs, when "excellent" means 5 points, "rather good" is rated 4 points, … to "absolutely unsatisfactory" rated with 1 point. The results are elaborated by simple statistics, i.e., the arithmetic mean is calculated. The arithmetic mean answers the question; which taste is perceived better.

However, to make it clear that there is *really* a difference in taste perception, it is not enough only to compare the arithmetic means. It is necessary to compare all the data, or the Coca Cola group data and the data for the Coca Cola Zero group. This can help to determine whether the difference in the taste perception is statistically significant or whether it is only the interference that is causing the difference in results of means.

For this purpose, testing the hypothesis by the ANOVA method is used, same as McDougall et al. (1994). There are two hypotheses determined: the zero and the alternative hypotheses

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H_0: There is no difference between the two sets of data.

H_A: There is a difference between the two sets of data.

The hypotheses are evaluated by using the ANOVA method (analysis of variance). In this case, that difference in taste perception really exist, the so-called single-factor ANOVA is considered involving two groups of data (2 variability sources). Different marking of variables for the mathematical calculation are determined (processed by Ross (1989) and Roy (2001))[1]:

A = the examined factor (Coca Cola product),

A_1 = the first factor level (i.e., the first product group)

A_2 = the second factor level (i.e., the second product group)

A_i = the sum of results for the A_i-level,

$\bar{A}_i$= the average of results at the A_i, *tj.* A_i/n_{Ai}-level,

T = the sum of all results/surveying,

$\overline{T}$= the average of all results/surveying,

$_{Ai}$ = the number of surveying for the A_i - level,

N = the total number of surveying,

Y = the measured (determined) value,

S_T = the total sum of squares,

S_A = the sum of squares for the factor,

f = the number of degrees of freedom (= number of results -1),

C.F. = correction factor (T^2/N),

S_e = the sum of squares for the error,

V_i = variance,

F = F statistics used for F-test.

For a better understanding of the calculation, it is appropriate to demonstrate a simple example instead of formula listing.

Example 1

The task is to find out whether two variants of products differ by taste. **Table 1** shows respondents' evaluation.

[1]There is an alternative marking of variables by various authors, e.g., S_T as SS_T, S_A as SS_A, f as *v*, V as MS, etc.

A_1 (the first data group)	A_2 (the second data group)
5	3
3	3
4	5

Table 1. The data for the calculation model.

The process involves three steps:

a. the hypotheses H_0 and H_A are determined,

b. the single-factor ANOVA method is calculated, where the factor is of 2 levels,

c. the F-test is provided and the conclusion regarding the validity of hypotheses is stated.

a. The hypotheses:

H_0: There is no significant difference in the product taste perception.

H_A: The difference in the products taste perception is significant.

b. The ANOVA method (the calculation):

C.F. $= T^2/N = [(Y_1 + Y_2 + \ldots]^2/N = [(5 + 3 + \ldots + 4]^2/6 = 80.67$

$S_T = (5)^2 + (3)^2 + \ldots + (4)^2 -$ C.F. $= 84 - 80.67 = 3.33$

$S_A = (A_1)^2/n_{A1}+(A_2)^2/n_{A2} -$ C.F. $= (5 + 3 + 4)^2/3 + (3 + 3 + 4)^2/3 = 48 + 33.33 -$ C.F. $= 81.33 - 80.67 = 0.663$

(*Note*: Remember that A_1 is the sum of results of factor A at the first level, n_{A1} is the number of those results.)

$S_e = S_T - S_A = 3.33 - 0.663 = 2.667$

$f_T = 6 - 1 = 5$

$f_A = 2 - 1 = 1$

$f_e = 5 - 1 = 4$

$V_A = S_A/f_A = 0.663/1 = 0.663$

$V_e = S_e/f_e = 2.667/4 = 0.667$

$F_A = V_A/V_e = 0.663/0.667 = 0.994$

$F_e = V_e/V_e = 1/1 = 1$ (not in the ANOVA table)

The results are sorted to the standard tabular format—the ANOVA table (see **Table 2**).

(a) The hypotheses testing

When testing hypotheses, the F values are compared. If the calculated F value is greater than the tabular (critical) one ($F_{\text{cal}} > F_{\text{crit}}$), the alternative hypothesis is preferred.

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Variability source	f	S	V	F
factor (*A*)	1	0.663	0.663	0.994
Error (*e*)	4	2.667	0.667	
Total (*T*)	5	3.33		

Table 2. The ANOVA method for 1 factor, 2 levels.

Table 2 shows that the degree of freedom of the numerator for *F* is 1 (factor *A* = the row, *f* = the column) and the degree of freedom of the denominator is 4 (*e* = the row, *f* = the column).

The tabular (critical) *F* for 95% of the coefficient the reliability (CL), or 5% of the value alpha[2] significance level, is $F_{0.05}$ (14) = 7.7. See **Table 3** where the searched *F* is marked bold.

$f_1 f_2$	1	2	3	4	5	6	7	8	9	10
1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54	241.88
2	18.513	19.000	19.614	19.247	19.296	19.330	19.353	19.371	19.385	19.396
3	10.128	9.5521	9.2766	9.1172	9.0135	8.9406	8.8868	8.8452	8.8123	8.7855
4	**7.7086**	6.9443	6.5914	6.3883	6.2560	6.1631	6.0942	6.0410	5.9988	5.9644
5	6.6079	5.7861	5.4095	5.1922	5.0503	4.9503	4.8759	4.8183	4.7725	4.7351
6	5.9874	5.1433	4.7571	4.5337	4.3874	4.2830	4.2066	4.1468	4.0990	4.0600
7	5.5914	4.7374	4.3468	4.1203	3.9715	3.8660	3.7870	3.7257	3.6767	3.6365
8	5.3177	4.4590	4.0662	3.8378	3.6875	3.5806	3.5005	3.4381	3.3881	3.3472
9	5.1174	4.2565	3.8626	3.6331	3.4817	3.3738	3.2927	3.2296	3.1789	3.1373
10	4.9646	4.1028	3.7083	3.4780	3.3258	3.2172	3.1355	3.0717	3.0204	2.9782
11	4.8443	3.9823	3.5874	3.3567	3.2039	3.0946	3.0123	2.9480	2.8962	2.8536
12	4.7472	3.8853	3.4903	3.2592	3.1059	2.9961	2.9134	2.8486	2.7964	2.7534
13	4.6672	3.8056	3.4105	3.1791	3.0254	2.9153	2.8321	2.7669	2.7144	2.6710
etc.										

Table 3. The table $F_{0.05}$ (f_1, f_2), 95% reliability.

The calculated *F* value is smaller than the tabular (critical) *F* value, i.e., F_{cal} = 0.994 < F_{crit} = 7.7086, therefore is *the zero hypothesis* is valid, *i.e., there is no difference in the taste perception*.

If the calculated *F* value would be greater than the tabular (critical) *F* value, i.e., ($F_{cal} > F_{crit.}$), the alternative hypothesis would be valid.

In the case study performed the ANOVA calculations are provided only by the Microsoft Excel 2013.

The symbols being used in MS Excel 2013 look as follows:

The sum of squares: SS,

[2]Not: the reliability is mostly (=CL) 95%, i.e., the significance level alpha 5%.

The dispersion: MS,

The degrees of freedom: in Excel signed as "difference" (better to change into "f"),

The *P* value: the probability,

The error…called as "all selections",

The factor: called as "inter elections".

Contrary to the previous manual calculation *P* value is mentioned additionally. The *P* value is the probability whether the monitored value difference between the particular sets of products data is given due to the interference (the sum of many random effects) than by the factor (product) (see **Table 4**).

The *P* value is the second possibility to make decision whether the zero/alternative hypothesis

The ANOVA

Variability source	*SS*	*Difference*	*MS*	*F*	*P value*	*F crit*
Inter selections	0.666667	1	0.666667	1	0.373901	7.708647
All selections	2.666667	4	0.666667			
Total	3.333333	5				

Table 4. The calculation using MS Excel.

would be accepted or not.

- ***P* value < 5%** - the zero hypothesis $\boldsymbol{H_0}$ **would be rejected**, i.e., everything is given by interference and the alternative hypothesis $\boldsymbol{H_A}$ would be accepted (=the factor impact exists).
- ***P* value ≥ 5%** - the zero hypothesis $\boldsymbol{H_0}$ would be accepted[3] and the factor impact is considered unsubstantiated.

In the example, the value is $P = 0.3739$ or 37.39% and therefore the zero hypothesis would be accepted (also see the *F* comparison).

3. The case study: Coca Cola taste and Coca Cola Zero taste

In 2015, the Coca Cola Company introduced an advertisement in Czech Republic. The advertisement showed people drinking Coca Cola Zero but the product labels were hidden and they were thinking they were drinking Coca Cola. That is why the authors decided to provide real research to find out whether the customers would really not recognize the difference in the taste.

[3] Wonnacot and Wonnacot (1992) recommends to use the term "we accept the hypothesis", than the term "we do not reject the hypothesis".

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In other words, they did not recognize any difference in the taste between both the soft drinks. In case, the customers would not recognize the difference in taste the advertisement is true. If there would be identified any difference in the taste perception, then the advertisement is misleading. The research was performed in November 2015. It was addressed to an overall 300 customers of various places in the Czech Republic. The selection of respondents had been performed randomly. Each respondent was tasting about 0.05 liter of the soft drink, cooled to the suitable temperature, and the soft drinks were labeled A_1 and A_2. For purposes of the research the sign A_1 has represented the Coca Cola and the sign A_2 represented the Coca Cola Zero.

They were defined with these hypotheses:

H_0: There is no difference in taste perception of Coca Cola and Coca Cola Zero.

H_A: There is a significant difference in taste perception of Coca Cola and Coca Cola Zero.

Now, let us look at the results.

The arithmetic mean of all 300 results of taste evaluation:

Coca Cola: the average = 3.68

Coca Cola Zero: the average = 3.03

The arithmetic mean shows that the taste of sweet Coca Cola is perceived better than the taste of Coca Cola Zero. Is this difference statistically significant? It means—which hypothesis is valid—the zero or alternative? We will do the assessment based on **Table 5**. **Table 5** shows the results.

To calculated ANOVA, the coefficient the reliability 0.95 (alpha = 0.05) was chosen. **Table 5** shows that the critical F is lower than the calculated F ($F_{cal} = 47.43 > F_{crit} = 3.86$). And, at the same time, the P value is practically equals nearly zero. Based on these results such conclusion can be stated that the alternative hypothesis is valid, i.e., that the customers definitely distinguish the taste of both soft drinks and that they prefer the taste of the classic sweet Coca Cola.

Someone could claim that it can be a statistical discrepancy (so-called I. sort of error), i.e., there exist the probability that the zero hypothesis would be rejected wrongly in 5% of cases even it is true. However, these doubts can be very easily disproved by determining the limited alpha value for our case. The alpha value is determined by MS Excel where the F values calculated and critical are equal. Alpha value is 1.4502×10^{-11} (!).

Variability source	SS	Difference	MS	F	P value	F crit
Inter selections	62.72667	1	62.72667	47.42487	1.45E−11	3.857056
All selections	790.9467	598	1.322653			
Total	853.6733	599				

Table 5. The ANOVA: the taste perception of Coca Cola and Coca Cola Zero.

So, it can be said with 100% (99.99999999999%) probability that the taste of Coca Cola and Coca Cola Zero perceived by the customer is different. The Coca Cola advertisement is untrue and misleading.

4. Conclusions

Using the analogical way, it would be possible to evaluate the truth of other advertisements also with other producers. According to the large majority of the supply over demand, the producers try to persuade the customers to purchase the product often by using an untrue, misleading, or false advertisements.

There is a question where is the limit between the truth and untruth, the limit between the fair and unfair practices. Some advertisements are based on the obvious exaggeration; e.g., drinking a glass of Red Bull drink we would get wings. It would be here all right, the advertisement does not say the truth, but it says with an exaggeration that we will be fresh “like we would have the wings”.

Nevertheless, in the situation, when the advertisement argues that the product has a real feature, it cannot appear to be the untrue information. If it will be in the advertisement mentioned that the butter has 82% of fat and in fact it has only 70%, perhaps everyone will say that this is a false advertisement. If in this advertisement, if it appear that the information that you will not recognize the difference in the taste of two products and in fact it will be different, this will be the false advertisement again.

The untrue information in the advertisement presents the unfair practice of the “consumer's deception”. The advertisements containing the untrue information should be forbidden and strictly penalized everywhere in the world. Only in this way will the consumer protection make sense.

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