

STATISTICAL ANALYSIS OF ONLINE SHOPPING BEHAVIOR OF STUDENTS

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Abstract

Article provides insight into the statistical analysis of the behavior of students who buy in the online environment. As statistical units were used students of University of Ss. Cyril and Methodius in Trnava (Slovak Republic). Except to the descriptive statistics we focused on testing of statistical hypothesis. The most frequently test was chi-square test for independence whereby we investigated whether the responses in each group were statistically significant. These results may help in targeting marketing campaigns in an online environment.

Key words:

Chi-square. Gender. Internet. Online shopping.

Introduction

The early related works to online shopping behavior was done by Bellman et al. (1999). Researchers studied the predictors of online shopping behavior. Approximately 10000 people completed the survey that included questions about online behavior and internet attitudes. Authors reported a wired lifestyle for buyers, whose main characteristics are searching for product information on the internet, receiving a large number of email messages every day, having internet access in their offices.¹

The business relevance of online shopping is most important. A better understanding of customers allows better marketing strategies. It helps online retailers to beat out the increasing competition both on- and offline, too.^{2,3} Yang and Lai compared effects of three product bundling strategies on different online shopping behaviors. They collected data of the behavior of 1500 users. They indicated that significantly better decisions are made on the bundling of products when browsing and shopping-cart data are integrated than when only order data or browsing data are used.⁴

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- 1 BELLMAN, S., LOHSE, G. L., JOHNSON, E. J.: Predictors of online buying behavior. In *Communications of the ACM*, 1999, Vol. 42, No. 12, p. 34.
 - 2 CHILDERS, T. et al.: Hedonic and utilitarian motivations for online retail shopping behavior. In *Journal of Retailing*, 2001, Vol. 77, No. 4, p. 528.
 - 3 YANG, T., LAI, H.: Comparison of product bundling strategies on different online shopping behaviors. In *Electronic Commerce Research and Applications*, 2006, Vol. 5, No. 4, p. 297.
 - 4 Ibidem.

Online consumer behavior has been the subject of considerable research in the last years. Understanding may be difficult, because the main entities involved, consumers and businesses, have been transformed.^{5,6} In trust on online buying, women search more information by visiting more products. They are interested in clothing and men are interested in electronics goods. The women are more likely to read the reviews on products. Man showed no significant differences in information search across product categories. This implies that the influence of product characteristics on consumer's information search differs between man and woman.^{7,8}

Vrabec in his research argue, that 27,85% of students are online shoppers.⁹ Every online shop includes the pictures of products. To keep the copyright of these pictures we recommended using the steganography.¹⁰

1 Methodology

The aim of our research is to investigate gender differences in online shopping and purchase habits or behavior of students. Our dataset consist of 1052 records. We selected only students who shopping online. After this selection, data set contains 915 records. Students responded to 52 questions, divided into 5 categories:

- demographic and sociological information,
- ability to work on the internet,
- connection methods to the internet,
- online shopping,
- complaints.

For the purpose of this article, we selected only questions about demographic and sociological information and question about online shopping. The questionnaire is available only in online form (via Google Docs). We supposed that all respondents are computer literate. The data collection has taken 2 years and is

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- 5 KOUFARIS, M.: Applying the Technology Acceptance Model and Flow Theory to Online Consumer Behavior. In *Information Systems Research*, 2002, Vol. 13, No. 2, p. 210.
 - 6 SVATOSOVA, V.: Motivation of Online Buyer Behavior. In *Journal of Competitiveness*, 2013, Vol. 5, No. 3, p. 14.
 - 7 PARK, J., YOON, Y., LEE, B.: The Effect of Gender and Product Categories on consumer Online information Search. In *Advances in Consumers research*, 2009, Vol. 36, p. 365.
 - 8 PAWAR, S. S., MORE, D. K., BHOLA, S. S.: Online Buying Behavior of College Students. In *Indian Streams Research Journal*, 2014, Vol. 4, No. 7, p. 3.
 - 9 VRABEC, N.: Digitálni domorodci na slovensku: komunikácia a nová identita mládeže v on-line prostredí. In *Communication Today*, 2010, Vol. 1, No. 1, p. 88.
 - 10 HALENAR, R.: Steganography used for copyright protection in Matlab environment. In *European Journal of Science and Theology*, 2014, Vol. 10, No. 1, p. 260.

still available. For results we used descriptive statistical method (frequencies, crosstabs and plots) and hypothesis testing (T-tests, chi-square tests).

We tested these null hypotheses:

- Hypothesis 1: The average age of the responders is 20 years.
- Hypothesis 2: Products shopping online significantly differ by gender.
- Hypothesis 3: Especially online shopping of electronics products significantly differ by gender

The minimum number of responders (sample size) was counted by the formula:

$$ss = \frac{Z^2 \times p \times (1 - p)}{c^2}$$

where

ss = sample size

Z = Z value (e.g. 1.96 for 95% confidence level)

p = percentage picking a choice, expressed as decimal

c = confidence interval, expressed as decimal

We determined the confidence interval to the value 0,035 (3,5%). The calculated value of sample size was 784. The number of completed questionnaires was 915 (only online shoppers). Therefore, we recalculated the confidence interval. The new value of confidence interval is 0,032 (3,2%).

2 Results

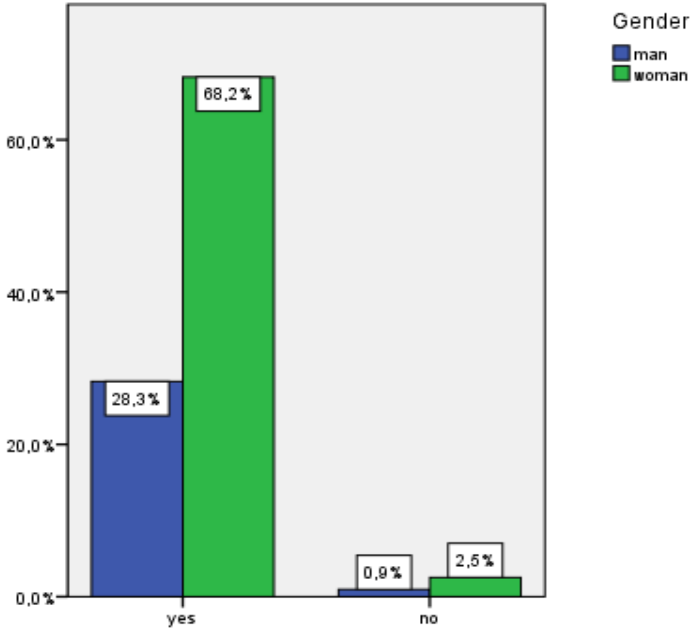
Total number of completed questionnaire was 948; the sample consists of online and not online shoppers. Table 1 shows absolute and relative numbers of respondents distributed by gender.

Table 1: Cross tabulation of respondents

| | | Have you ever bought online? | | | | Total | |
|--------|-------|------------------------------|------------|-------|------------|-------|------------|
| | | Yes | | no | | | |
| | | Count | % of Total | Count | % of Total | Count | % of Total |
| Gender | Man | 268 | 28,3% | 9 | 0,9% | 277 | 29,2% |
| | Woman | 647 | 68,2% | 24 | 2,5% | 671 | 70,8% |
| Total | | 915 | 96,5% | 33 | 3,5% | 948 | 100,0% |

Source: Own processing

Picture 1 shows relatives numbers from Table1.



Picture 1: Relatives number of online and not online shoppers

Source: Own processing

As is shown in Table 1, 96,5% of respondents are online shoppers, only 3,5% are not online shoppers. It indicates that the vast majority of students have bought online.

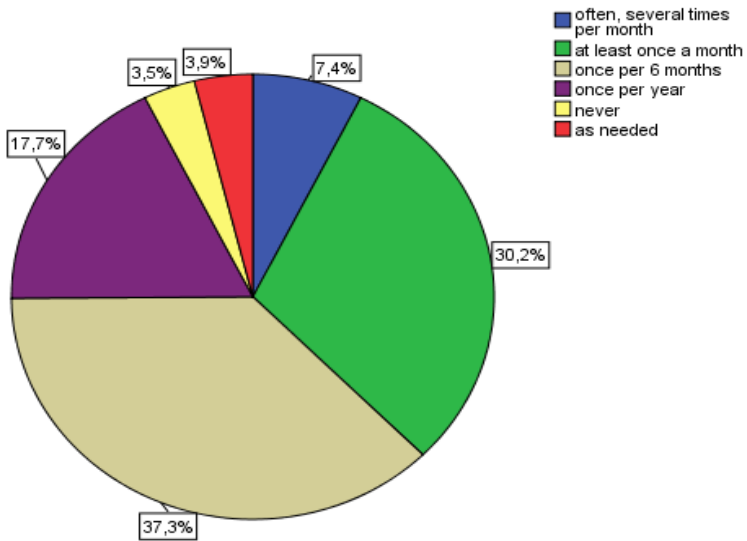
The further distribution of respondents provides Table 2:

Table 2: Question – How often do you buy online?

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|--------------------------------------|-----------|---------|---------------|--------------------|
| Valid often, several times per month | 70 | 7,4 | 7,4 | 7,4 |
| at least once a month | 286 | 30,2 | 30,2 | 37,6 |
| once per 6 months | 354 | 37,3 | 37,3 | 74,9 |
| once per year | 168 | 17,7 | 17,7 | 92,6 |
| Never | 33 | 3,5 | 3,5 | 96,1 |
| as needed | 37 | 3,9 | 3,9 | 100,0 |
| Total | 948 | 100,0 | 100,0 | |

Source: Own processing

Picture 2 shows the relative numbers of answers.



Picture 2: Relatives number of buying frequency

Source: Own processing

The first tested hypothesis was hypothesis 1.

- Hypothesis 1: The average age of the responders is 20 years.

Table 3: One sample statistics

| | N | Mean | Std. Deviation | Std. Error Mean |
|-----|-----|-------|----------------|-----------------|
| Age | 915 | 20.02 | 1.491 | .049 |

Source: Own processing

Table 4: One Sample T-test

| | Test Value = 20 | | | | | |
|-----|-----------------|-----|-----------------|-----------------|-------------------------------------------|-------|
| | t | df | Sig. (2-tailed) | Mean Difference | 95% Confidence Interval of the Difference | |
| | | | | | Lower | Upper |
| Age | .355 | 914 | .723 | .017 | -.08 | .11 |

Source: Own processing

The results in Table 3 and Table 4 indicate, that the average age is 20 years (t=0,355, p=0,723). It means that responders are full time students.

Table 5 shows products, which are online shopped by man and woman. For next testing are important only products with 5 or more count in each gender (answer „yes“). This condition is due to the testing of hypothesis about the distribution of

responses between genders (Hypothesis 2). The total percentage in each column is counted from 911 respondents, 4 respondents did not answer. This process is characteristic for multi response analysis.

Maximum Man respondents prefer to buy electronics (22,1%), followed by clothes (17,9%) and sport items (13,9%). Women respondents prefer to buy clothes (54,9%), followed by books (38,5%) and gifts (34,8%).

Table 5: Product Shopping Online

| | Gender | | | | Total | |
|----------------------------------|------------|--------------|------------|--------------|------------|---------------|
| | man | | Woman | | Count | % of Total |
| | Count | % of Total | Count | % of Total | | |
| Clothes | 163 | 17,9% | 500 | 54,9% | 663 | 72,8% |
| Electronics | 201 | 22,1% | 271 | 29,7% | 472 | 51,8% |
| Books | 120 | 13,2% | 351 | 38,5% | 471 | 51,7% |
| gifts | 92 | 10,1% | 317 | 34,8% | 409 | 44,9% |
| sport items | 127 | 13,9% | 126 | 13,8% | 253 | 27,8% |
| Cosmetics | 18 | 2,0% | 226 | 24,8% | 244 | 26,8% |
| Jewelry | 22 | 2,4% | 184 | 20,2% | 206 | 22,6% |
| household appliances | 46 | 5,0% | 54 | 5,9% | 100 | 11,0% |
| Music | 50 | 5,5% | 43 | 4,7% | 93 | 10,2% |
| software products | 55 | 6,0% | 21 | 2,3% | 76 | 8,3% |
| Furniture | 24 | 2,6% | 52 | 5,7% | 76 | 8,3% |
| Food | 22 | 2,4% | 29 | 3,2% | 51 | 5,6% |
| Cars | 32 | 3,5% | 17 | 1,9% | 49 | 5,4% |
| baby items | 5 | 0,5% | 23 | 2,5% | 28 | 3,1% |
| decoration accessories | 2 | 0,2% | 4 | 0,4% | 6 | 0,7% |
| music instruments of necessities | 4 | 0,4% | 0 | 0,0% | 4 | 0,4% |
| necessaries for hobby | 1 | 0,1% | 2 | 0,2% | 3 | 0,3% |
| Services | 2 | 0,2% | 0 | 0,0% | 2 | 0,2% |
| healthcare equipment | 0 | 0,0% | 2 | 0,2% | 2 | 0,2% |
| Tours | 1 | 0,1% | 1 | 0,1% | 2 | 0,2% |
| Shoes | 0 | 0,0% | 1 | 0,1% | 1 | 0,1% |
| dietary supplements | 1 | 0,1% | 0 | 0,0% | 1 | 0,1% |
| Total | 266 | 29,2% | 645 | 70,8% | 911 | 100,0% |

Percentages and totals are based on respondents.

Source: Own processing

As a result of Table 5, we can see the total differences between man and woman in each product. But we are no able to determine the statistical significance of answers between the genders. For this we can use the chi-square test for independence. The value of Pearson Chi-Square and significance is shown in Table 6.

The second tested hypothesis was hypothesis 2.

- Hypothesis 2: Products shopping online significantly differ by gender.

Table 6: Product’s chi-square test for independence

| Products | Pearson Chi-Square | Significance | Difference |
|---------------------------------|--------------------|--------------|------------|
| Clothes | 25,724 | 0,000 | Y |
| Electronics | 83,205 | 0,000 | Y |
| Books | 6,810 | 0,009 | Y |
| Gifts | 16,492 | 0,000 | Y |
| sport items | 73,809 | 0,000 | Y |
| Cosmetics | 77,140 | 0,000 | Y |
| Jewelery | 44,457 | 0,000 | Y |
| h o u s e h o l d appliances | 15,137 | 0,000 | Y |
| Music | 29,939 | 0,000 | Y |
| software products | 74,268 | 0,000 | Y |
| Furniture | 0,210 | 0,647 | N |
| Food | 5,001 | 0,025 | Y |
| Cars | 32,427 | 0,000 | Y |

Source: Own processing

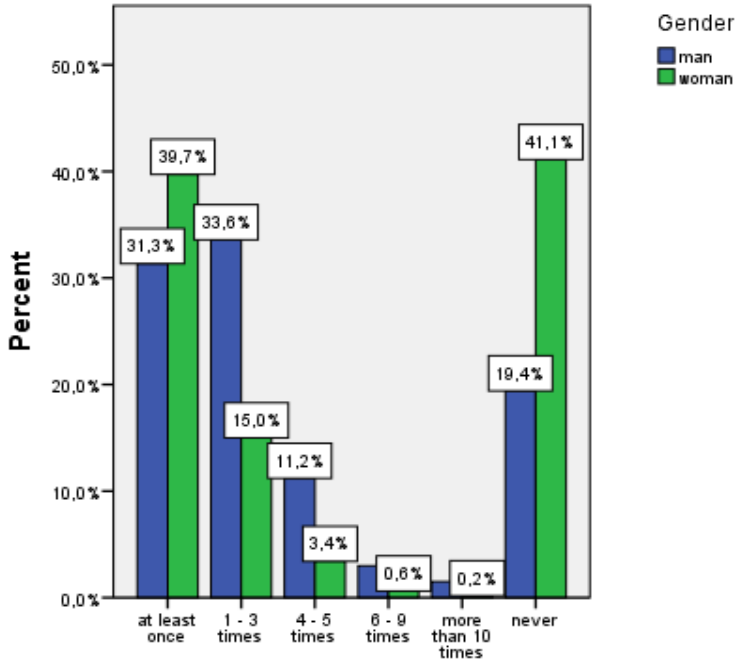
As we can see from Table 6, the distribution of answers between genders is different. Only one answer (furniture) is distributed uniformly. The other products were not assessed, because the number of answers in each gender was less than 5. The results in Table 6 indicate that products shopping online are significantly differing by gender.

The special category in the questionnaire was question about shopping of electronics. The respondents responded to two questions. We are asking about the frequency of shopping electronics and about the reasons of shopping. The answers have been subjected to the hypothesis testing.

Table 7: Question – How many times have you bought electronics in online shop in the last year?

| | Gender | | | | Total | |
|-----------------------|--------|------------|-------|------------|-------|------------|
| | man | | woman | | Count | % of Total |
| | Count | % of Total | Count | % of Total | | |
| at least once | 84 | 9,2% | 257 | 28,1% | 341 | 37,3% |
| 1 – 3 times | 90 | 9,8% | 97 | 10,6% | 187 | 20,4% |
| 4 – 5 times | 30 | 3,3% | 22 | 2,4% | 52 | 5,7% |
| 6 – 9 times | 8 | 0,9% | 4 | 0,4% | 12 | 1,3% |
| more than 10 times | 4 | 0,4% | 1 | 0,1% | 5 | 0,5% |
| Never | 52 | 5,7% | 266 | 29,1% | 318 | 34,8% |
| Total | 268 | 29,3% | 647 | 70,7% | 915 | 100,0% |

Source: Own processing



Picture 3: Relative numbers of online shopping electronics – total for each category of gender

Source: Own processing

In Table 7, we can see, that 341 (37,3%) respondents have shopped at least one. But a similar number of respondents have never shopped electronics. Picture 3 shows other view to the number of respondents, who have shopped electronics online. The relative's number of online shoppers between genders seems to be the same. Statistical significance was determined by chi-square test for independence (Table 8). We selected 576 respondents, who have shopped electronics online.

Table 8: Question – What was the reason that you bought an electronic product online?

| | Gender | | | | Total | |
|---------------------------------------------|------------|--------------|------------|--------------|------------|---------------|
| | man | | Woman | | Count | % of Total |
| | Count | % of Total | Count | % of Total | | |
| own needs | 156 | 27,1% | 262 | 45,5% | 418 | 72,6% |
| references from friends, family | 14 | 2,4% | 54 | 9,4% | 68 | 11,8% |
| ads on internet | 6 | 1,0% | 17 | 3,0% | 23 | 4,0% |
| ads in the media – print, radio, television | 2 | 0,3% | 4 | 0,7% | 6 | 1,0% |
| product price | 28 | 4,9% | 33 | 5,7% | 61 | 10,6% |
| Total | 206 | 35,8% | 370 | 64,2% | 576 | 100,0% |

Source: Own processing

The last tested hypothesis was Hypothesis 3.

- Hypothesis 3: Especially online shopping of electronics products significantly differ by gender.

The returned value of Pearson Chi-Square was 10,940. The statistical significance of this test was 0,027. These results indicate that the reasons of online shopping of electronics products are significantly differing by gender.

Conclusion

Our research on gender differences in online shopping behavior of students indicates the diversity between genders. As we shown in figures and tables, men and women prefer different habits when they are online shopping. This conclusion is supported by hypothesis testing. We have accepted all 3 determined hypothesis. This research is going to continue by testing other dependencies between the variables.

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