Impact of Consumer Gender on Expenditure Done in Mobile Shopping Using Test of Independence

Shanti Verma and Kalyani Patel

Abstract In India, a number of mobile users have grown exponentially in the last decade. Now people spend more time with smartphones rather than personal meeting. Mobile commerce is the growing area of research nowadays. Most of the companies provide better pricing in mobile applications so they involve customer in mobile shopping. In this paper, the authors conduct an online survey on smartphone users in India. They try to find out that the gender of customer is dependent on the amount spent in mobile shopping. The authors analyze 258 data sets and perform test of intendance both parametric and nonparametric. The result of survey gives p value = 0.373 for parametric test and p value = 0.386 for nonparametric test. These results show that customer gender and expenditure done in mobile shopping are related to each other.

Keywords Mobile shopping · Mobile commerce · Chi-square test
Fisher's exact test

1 Introduction

Data mining (DM) is a technique to find meaningful information from the huge sets of data. This information is helpful to take business decisions. Data mining is also used to predict future patterns of customers' behavior with the help of given sets of data [1]. The various mechanisms of data mining are abstractions, aggregations, summarizations, and characterizations of data [2]. In this paper, we used summarization and transformation of data sets to do the analysis of data. Nowadays, all

S. Verma (✉)
L J Institute of Computer Applications, Ahmedabad, India
e-mail: verma.shanti@gmail.com

K. Patel
K S School of Business Studies, Ahmedabad, India
e-mail: patelkalyani05@gmail.com

D.K. Mishra et al. (eds.), *Information and Communication Technology for Sustainable Development*, Lecture Notes in Networks and Systems 9,
https://doi.org/10.1007/978-981-10-3932-4_2

things are available online so there is a need to check how demographics of users effect their online shopping behavior.

Mobile commerce is a new emerging technology with greater scope which gives the ability to do commerce using mobile device [3, 4]. Shopping online via computer or mobile (M-shopping) makes the business process completely different than traditional business process. Products are same but the customer behavior changes as the business process changes. So there is a need to identify the customer judgment, perception, and behavior changes with respect to online or mobile shopping. Traditional predicting approaches are no longer applicable for M-business situations as the use of the Internet is rapidly spreading as an information gateway all around the world. In the current scenario, it is extremely difficult for marketing managers to deal with customer's buying patterns but also there is a need to deal with costumers regularly changing patterns [2]. As information technologies grow exponentially, now companies can store huge sets of data sets that are used to take decision about various offerings and fulfill customers' needs and expectations [5].

To collect primary data sets of customers' demographics and smartphone and mobile shopping usage, the authors used online survey method (Google forms). They collect 335 Indian customers' data sets from which after filtering 258 data sets are used for the study.

This paper is organized as follows: Introduction is provided in Sect. 1, the objective of the study is defined in Sect. 2, the literature review of mobile commerce, customer behavior, and test of independence is discussed in Sects. 3, 4 discusses survey description, Sect. 5 discusses the findings of experiment using R tool, and conclusion is provided in Sect. 6.

2 Objectives of Study

This section outlines the understanding of the mobile commerce and consumer buying behavior of the same as the core objectives of the study. To elaborate upon this theme, the main objectives of the study are identified as to test that customer gender is significantly independent of expenditure done in mobile shopping at once at 95% confidence. This study helps the companies to provide gender-based offers and find gender-centric behavior which helps to increase business profit of companies.

3 Literature Survey

3.1 Related Work: Test of Independence

A chi-square test is a statistical method to assess the goodness of fit between a set of observed values and expected values. There are two varieties of chi-square tests:

goodness of fit and test of independence. In this paper, the author used test of independence to determine whether the observed value (recorded) of one variable depends on the observed value (expected) of a different variable. Various authors used chi-square test to mine different sets of data. Some are as follows:

- Maryam Mahdavian and Fahimeh Mostajeran used the analysis of variance and chi-square test results to study key users skill of ERP system through a compressive skill measurement model [6].
- Badri et al. proposed a model that scrutinizes expected e-learners' intentions to offer e-learning programs efficiently and effectively using chi-square test values and structural equation modeling [7].
- Mr. Li used chi-square test and chi-square table analysis in customer satisfaction and empirical analysis [8].
- Rodney Graeme Duffett tries to find what effect does Facebook advertising have on the cognitive attitudinal component of Generation Y in an emerging country such as SA using ANOVA and chi-square test [9].
- Giannakos et al. performed statistical tests such as correlation coefficient and structural modeling and chi-square test values to investigating teachers' confidence on technological pedagogical and content knowledge: an initial validation of TPACK scales in K-12 computing education context [10].

3.2 Related Work—Mobile Shopping

In the current scenario, data mining can be used in various fields. E-commerce and M-commerce is one of the most upcoming fields where data mining is used. According to report of eMarketer, 2014, mobile phone Internet user growth in APAC by country India had the highest 38.3% growth in 2014. In future perspective, this report states that by 2018, India will have 11.7% growth in mobile phone Internet user. From this report, I conclude that there is highest growth in India toward mobile phone Internet usage and this leads to the use of mobile commerce growth in India.

- Ali Gohary and Kambiz Heidarzadeh Hanzaee performed a study that examines the relationship between Big Five personality traits with shopping motivation variables consisting of compulsive and impulsive buying, hedonic and utilitarian shopping values [11].
- Ceyda Aysuna Turkyilmaza, Sakir Erdema, and Aypar Uslua use factor analysis results for the personality traits and Kaiser-Meyer-Olkin test of sampling adequacy. They use variables personality traits (internal factor) and Web site quality (external factor) to check their effect on online impulse buying behavior [12].
- S. Muthukumar and Dr.N. Muthu prove from the study that India is the second largest cellular market in the world after China, with a massive subscriber base of 867.80 million, as of March 2013. This shows that in India there is a major role of mobile commerce for the growth of Indian economy [13].

- Ioannis Boutsis, Stavroula Karanikolaou, and Vana Kalogeraki presented PRESENT, our middleware that exploits the social behavior of the human crowd to identify group attendance behaviors and predict the next event for a user to attend [14].

4 Description of Survey

In this study, the authors used online survey method (Google forms) and collect data from all over the India.

4.1 Data Selection

- Out of 335 responses after filtering, 258 data sets are used for this study.
- Parameters of study are expenditure done in mobile shopping having five values (1) less than Rs. 1000, (2) Rs. 1000 to Rs. 3000, (3) Rs. 3000 to Rs. 5000, (4) Rs. 5000 to Rs. 10000, and (5) more than 10000 and gender of customer having two values male and female.

4.2 Data Collection

- Primary data collection through questionnaire: The mode of filling this questionnaire is through Google forms. The target audiences are smartphone sets who do mobile shopping.

4.3 Nature of Questionnaire

- A combination of multiple-choice questions was used in the questionnaires depending upon the complexity as well as the objective of the issues involved in the question. Cross-tabulations have been used in the questionnaires in order to simultaneously record the responses across more than one variable/response sets for meaningful analysis of the concerned issues.

4.4 Tool Used for Analysis

i. Data mining tool "R"
ii. Techniques: chi-square test and Fisher's exact test

5 Findings of Survey and Discussion

The author applied the chi-square technique to test that customer gender is significantly independent of expenditure done in mobile shopping at once at 95% confidence. Here, independent variable is gender of customer and expenditure done at once in mobile shopping is dependent variable.

5.1 Observed Frequency Table

table(Expenditure, Gender)

Expenditure	Gender	
	Female	Male
Less than Rs.1000	27	43
More than Rs. 10,000	3	8
Rs. 1000 to Rs. 3000	43	61
Rs. 3000 to Rs. 5000	15	26
Rs. 5000 to Rs. 10,000	4	17

The observed frequency table shows the original data obtained from survey conducted. In the above table for each value of expenditure, frequencies are given for male and female.

5.2 Expected Frequency Table

chi = chisq.test(tab)
chi$expected

Expenditure	Gender	
	Female	Male
Less than Rs.1000	26.072874	43.927126
More than Rs. 10,000	4.097166	6.902834
Rs. 1000 to Rs. 3000	38.736842	65.263158
Rs. 3000 to Rs. 5000	15.271255	25.728745
Rs. 5000 to Rs. 10,000	7.821862	13.178138

For the calculation of chi-square value, we have to calculate observed frequencies of each value that is present in observed frequency table. Here, we see that there are some differences between observed and expected frequencies.

5.3 Chi-square Value

chisq.test(tab, correct = T)

Pearson's Chi-squared test data: tab

X-squared = 4.2519, df = 4, p-value = 0.373

Here, we see that at four degrees of freedom, chi-square value is 4.2519 and p value is 0.373. We know that if p value is less than 0.05 for 95% confidence, null hypothesis is accepted. Here, p value is more than 0.05 and so null hypothesis is rejected which clearly shows that customer gender is significantly dependent on expenditure done in mobile shopping at once at 95% confidence.

5.4 Fisher's Exact Test

fisher.test(tab, conf.int = T, conf.level = 0.99)

Fisher's Exact Test for Count Data data: tab

$$\text{p} - \text{value} = 0.3861$$

alternative hypothesis: two-sided

For the Fisher's exact test at 99% confidence, we see that p value is 0.386 which is greater than 0.05 and so null hypothesis is rejected.

In above both test of independence, we see that p value is more than 0.05 which concludes that gender and expenditure are dependent on each other.

6 Conclusion

In the conducted survey, various demographics are taken, for example, age group, salary, family size, gender. In this paper, the author only used one demographic for study, i.e., gender. The results of study show that gender is dependent on the expenditure done in mobile shopping. These results are useful for the M-commerce companies to provide customers' gender-centric offers to increase the profit of their organization. In future, the authors try to test the effect of all demographics of users on the expenditure done in mobile shopping and also check which demographic factor effect is more to expenditure.

References

1. Jacinth Evangeline S, Subramanian KM, Venkatachalam K (2013) Survey on personal mobile commerce pattern mining and prediction. Int J Adv Res Comput Eng Technol (IJARCET) 2 (12):3163–3167
2. Moghadam AD, Jandaghi A, Safavi SO (2015) The probability of predicting e-customer's buying pattern based on personality type 4(1):18781–18785
3. Dhanalakshmi D, KomalaLakshmi J (2014) A survey on data mining research trends. Int J Eng Comput Sci 3(10):8911–8919
4. Ghode MPP (2014) Survey on personal mobile commerce pattern mining and prediction. Int J Technol Res Eng 1(8):538–540
5. Wei GT, Kho S, Husain W, Zainol Z (2015) A study of customer behaviour through web mining. J Inform Sci Comput Technol 2(1):103–107
6. Mahdavian Maryam, Mostajeran Fahimeh (2013) Studying key users' skills of ERP system through a comprehensive skill measurement model. Int J Adv Manuf Technol 69(9-12):1981–1999
7. Badri M et al (2014) Students' intention to take online courses in high school: a structural equation model of causality and determinants. Educ Inf Technol 1–27
8. Yong L (2009) Applications of Chi-square test and contingency table analysis in customer satisfaction and empirical analyses. In: IEEE computer society international conference on innovation management, pp 105–107
9. Duffett RG (2015) The influence of Facebook advertising on cognitive attitudes amid Generation Y. Electron Commer Res 15(2):243–267
10. Giannakos MN et al (2015) Investigating teachers' confidence on technological pedagogical and content knowledge: an initial validation of TPACK scales in K-12 computing education context. J Comput Educ 2(1):43–59
11. Gohary A, Hanzaee KH (2014) Personality traits as predictors of shopping motivations and behaviors: a canonical correlation analysis. Arab Econ Bus J 9(2):166–174
12. Turkyilmaz CA, Erdem S, Uslu A (2015) The effects of personality traits and website quality on online impulse buying. Procedia-Soc Behav Sci 175:98–105
13. Muthukumar S, Muthu N The Indian kaleidoscope: emerging trends in M-commerce
14. Boutsis I, Karanikolaou S, Kalogeraki V (2015) Personalized event recommendations using social networks. In: 2015 16th IEEE international conference on mobile data management (MDM), vol. 1. IEEE
15. Nithya J, Geetha R (2012) Agent-based data mining in mobile commerce: an overview. IJCSET |2(4):1065–1068

http://www.springer.com/978-981-10-3931-7

Information and Communication Technology for Sustainable Development
Proceedings of ICT4SD 2016, Volume 1
Mishra, D.K.; Nayak, M.; Joshi, A. (Eds.)
2018, XXIV, 512 p. 194 illus., Hardcover
ISBN: 978-981-10-3931-7