

Does the device matter? Differences between the behaviour of e-shoppers using smartphones, tablets and desktops.

Andrzej Szymkowiak, Bartłomiej Pierański

Poznan University of Economics and Business

Abstract The aim of this paper is to show changes in the ways various technologies are used in the process of purchasing products online. The paper presents a comparative analysis of the buying behaviour of consumers depending on the devices they use; namely desktop computers, tablets and smartphones. The findings of the study point to significant differences in behaviour, and consequently to the need for conducting separate analyses for tablet and smartphone users as opposed to the users of desktop computers.

Keywords: e-commerce, customer behaviour

Introduction

Retail sales on the Internet are growing rapidly. On a global scale, in 2016 they reached the value of 2.7 billion dollars, representing a 17.5% increase compared to the previous year and an increase of as much as 124% compared to 2012. Despite this impressive growth, Internet-based sales account for only 7% of total sales [19]. This means that there is ample space for further dynamic developments in this type of retailing.

Technological advancement is accompanied by changes with regard to the devices which customers use to make purchases in online stores. It is generally believed that smartphones will soon become the most prevalent tools for accessing the Internet [19]. This, however, does not change

the fact that other mobile devices (tablets) as well as stationary equipment (laptops, desktops) will continue to remain in mass use. As a result, the need arises to address the question of the diversity of customers' buying behaviour depending on the equipment that they use when shopping online. The aim of this paper was to identify differences in behaviour between three groups of e-shoppers. The first group purchased products with the aid of a laptop, the second group used a tablet, and the third one a smartphone. Particular attention was paid to the identification of possible differences between the users of tablets and smartphones. The article consists of four parts. The introductory part is followed by a literature review relating to the issues of e-commerce and m-commerce. Next, the results of the empirical research are presented, and the final part delineates the main conclusions.

Related work

According to the concept proposed by McKay and Marshal (2004), e-commerce can be seen as a process which is based on the Internet and which permits conducting activities involving the buying and selling of products, the exchange of information, etc. These activities can be carried out without any time constraints, and pertain to entities located anywhere around the world, the only requirement being that these entities have access to the Internet [1]. On the other hand, m-commerce is defined by Tiwari and Buse as any transaction which is initiated and/or completed by using mobile access to computer-mediated networks with the help of mobile devices [12]. The relationship between e- and m-commerce is not clearly defined. According to some researchers, m-commerce is merely an extension of e-commerce [7]. On the other hand, others believe that such an approach is too narrow and does not include all the possibilities of m-commerce [8]. Because of its substantial potential associated with such features as ubiquity, personalization, flexibility, and dissemination [9], m-commerce enables the implementation of a broad spectrum of business activities [10], which are not available within the framework of e-commerce [11]. In the literature to date, however, hardly any attention has been given to a comparative analysis of these two areas of business. The

vast majority of research concerns various aspects in the functioning of either m-commerce or e-commerce. This is partly a result of the specificity of such business operations. Within m-commerce, for example, mobile advertising [4] and mobile retail navigation [5] were analysed, which are impossible to implement in e-commerce. A very interesting study was conducted by Chan and Chong [13], which investigated the relationships between demographic profiles, users' motivations and perceptions of security, with m-commerce usage activities. The behaviour of customers who shop using mobile devices has also been analysed across different sectors, for example Parker and Wang [6] studied the fashion industry, and in various countries, for instance in Qatar [15]. On the other hand, research on e-commerce has included such issues as ease of purchasing [16], ease of navigation [17], and the perceptions of risks and benefits [18].

An attempt to compare m-commerce and e-commerce was made by Jimenez and San-Martin (2016). In their article, the authors presented a review of previous studies that highlight the differential characteristics of m-commerce [14]. Their findings are presented in Table 1.

M-commerce	E-commerce	Authors
High ubiquity	Low ubiquity	Groß (2015), Gu et al. (2013), Holmes et al. (2013)
Less space to show information (screen of between 5 and 9 inches, depending on device)	More space to show information (generally, screen of 14 inches or more)	Adipat et al. (2011), Ghose et al. (2012)
Relatively greater effort in the process of searching for information	Relatively less effort in the process of searching for information	Adipat et al. (2011), Ghose et al. (2012)
Slower and less stable internet connection	Faster and more stable internet connection	Gu et al. (2013)
Increased costs associated with its use	Lower costs associated with its use	Choi et al. (2008)

Transactions with user mobility	Transactions in static environments	Gu et al. (2013)
Greater customization	Less customization	Choi et al. (2008)
Greater access to target audience	More restricted access to target audience	Liébana-Cabanillas et al. (2014)

Table 1: Differences between m-commerce and e-commerce

Source: [14]

Analysing the information presented in the table above it can be concluded that in addition to the business potential and the ability to influence customers (for example, access to target audience or personalization), what clearly distinguishes e-commerce from m-commerce are the devices that are necessary to view the offering and complete a commercial transaction. These devices determine, among other things, the space to show information or the effort involved in the process of searching for information. E-commerce is associated with stationary devices; in other words, a characteristic feature of e-commerce is that it is based on stationary equipment such as desktops or laptops. M-commerce, on the other hand, is based on mobile devices such as smartphones or tablets. A characteristic feature of such devices is that they can be used anytime and anywhere [2]. And it is precisely these types of devices, even though they do have some flaws (Table !!!), that make it possible to implement certain functionalities within m-commerce that are not available in e-commerce. Taking into account the different possibilities of influencing shoppers through stationary devices (e-commerce) in relation to mobile devices (m-commerce) as well as the different situations in which consumers use them, it seems reasonable to assume that an e-consumer will exhibit different motivations, expectations and behaviour than an m-consumer [3]. Therefore, it seems important to analyse the differences in the shopping behaviour of e-consumers and m-consumers.

The analysis will focus on the equipment used by consumers. This more detailed level of analysis will help not only to identify the differences between m- and e-shoppers but, above all, to show differences in the behaviour of buyers depending on the device they use for shopping. To this

end, the paper will determine differences in the behaviour of three groups of shoppers according to what they use: smartphone, tablet (both m-commerce), or laptop (e-commerce). The conclusions reached as a result of this analysis should expand the current state of knowledge because previous research in this area has tended to conduct analyses at a more general and aggregated (in terms of the devices used) level of m- and e-commerce.

Research

The study included all the users who utilised the resources of a single online store. The analysis covered the entire period of the website's existence; that is, over 6 years. The data collected pertained to all visits to the website according to specific IP addresses. Currently, this is the only available technical method for identifying users. Although one cannot exclude the situation in which a user will visit a store using various devices which will be assigned different IP addresses; in the case of, for example, a home Internet network all the devices connected to the Internet will be identified as a single IP address. The use of IP addresses in the analysis of web traffic also permits the identification of users who make repeated visits to a site. Such users can be described as returnees. The study analysed all the visits to the site, the total number of which was 2,260,842. These visits were made by 1,580,043 users, who spent an average of 3.28 minutes on the site, viewing 5.34 pages on average, which gave a total of 12,079,980 hits. The majority of the visitors were users of stationary equipment: there were 1,422,008 of them which represented 89.36%. In turn, there were 169,369 users of mobile devices, which represented 10.64% (of which mobile phone users represented 7.32% and tablet users 3.32%).

Figure 1 shows the number of sessions via desktop, smartphone and tablet over a period of six years. Throughout the whole analysed period, a steady increase in the number of sessions was observed for each device; however, the dynamics of the changes were different. The most significant changes concerned tablets. However, the extremely low initial figure of 2 hits in the first year analysed in relation to 2,611 hits in the next year

makes it difficult to draw inferences. In subsequent years the growth amounted to 277%, 88%, 50% and 15%. As regards mobile phones, the rate of change was also the highest in the first two years, at 264% and 326% respectively. Subsequent periods were characterized by growth at a level of 120%, 89% and 57%. As regards desktop computers, the growth was not as dynamic, achieving an average of 23%.

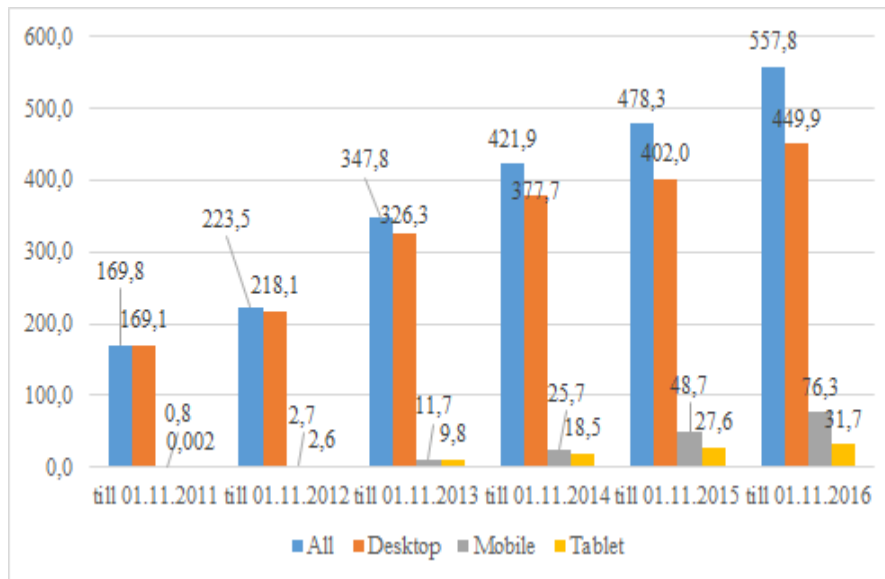


Fig.1: Number of page views using different ICT devices for the years 2010-2016 (in thousands)

Source: own compilation

The differing rate of growth in the number of people using different ICT equipment resulted in a change in the structure of users (Figure 2). One can notice a steady decline in the proportion of desktop users visiting the store's website (from 99.5% in 2011 to 82.8% in 2016). Simultaneously, there was a gradual increase in the proportion of people using mobile devices, especially smartphones. In the last analysed year, nearly 13% of visits to the online store were made by smartphone users. The evident increase in the proportion of people who used a smartphone to visit the website is a consequence of an increase in the popularity of these devices as well as changes in how consumers use them. Smartphones are increasingly used to browse the Internet, and this also includes visiting online

stores. In addition, the analysis of website traffic reveals only a slight decline in the proportion of tablet users in the general structure of visits (from 4.7% in 2015 to 4.5% in 2016). However, the short time period of the analysis means that it is difficult to state whether this decline is an indication of any long-term trends in this respect.

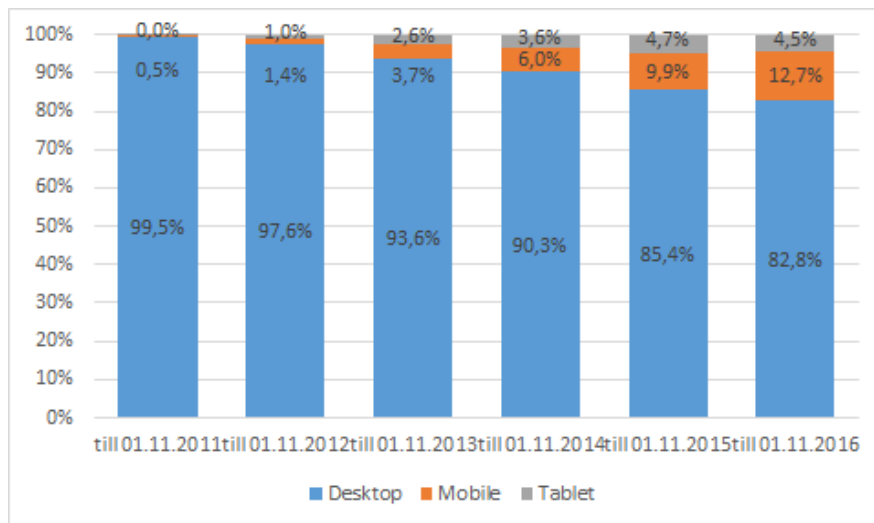


Fig. 2: The structure of users according to the device used in the years 2011-2016

Source: own compilation

Changes in the structure of users in terms of the devices which they use should not be attributed to any intentional efforts on the part of the retailer. The online store did not target the users of any particular type of device. The main source of visits to the website was traffic redirected from the search engine, and the results were the same irrespective of the device used. Thus, the causes of the changes should be attributed to the expansion of new technologies and ways of using them.

The present study has attempted to identify differences in the shopping behaviour of consumers depending on the device that they use. In order to do this 540,065 sessions completed in 2016 were analysed, which included 426,546 sessions with computers; 81,496 sessions with smartphone devices; and 32,023 sessions with tablets. The content of the analysed website store was the same regardless of the device used. Also,

the website was not adaptable, which means that it did not automatically adjust (for example in terms of content layout or the quantity and quality of images) to the capabilities of the device with which it was viewed. It can therefore be assumed that any differences in the behaviour of shoppers resulted from the equipment which they possessed and used.

The study analysed the behaviour of shoppers who visited the analysed site for the first time. The proportion of new sessions was 74.86% for desktops, 70.05% for smartphones and 59.07% for tablets.

The first area in which the activity of consumers was compared related to the number of pages viewed and the average time spent on the site. In the case of stationary equipment, the visitors viewed 4.5 pages on average during one session, devoting 182 seconds to this activity. As regards mobile devices, the figures turned out to be different for smartphones and tablets. Smartphone users devoted an average of 146 seconds to viewing 3.37 pages, while tablet users stayed on the website for the longest time, as much as 258 seconds, viewing on average 5.65 pages.

Differences in the behaviour of customers can also be observed on the basis of bounce rate analysis. The bounce rate is the percentage of people who visit a website and leave it after a few seconds. These people were unable to thoroughly acquaint themselves with the information available on the site due to the short time they spent there. The bounce rate for desktops was 57.46%, for smartphones 60.45% and for tablets 54.97%. Smartphone users more frequently made the decision to leave the website in the first few seconds after entering it, so they were the fastest as regards taking the binary decision of whether to stay or leave the page.

Another area in which the behaviour of the users of the three devices can be compared and analysed is their activity on different days of the week and at different times of the day. Figure 3 illustrates the hours when the users of specific devices most frequently visited the website.

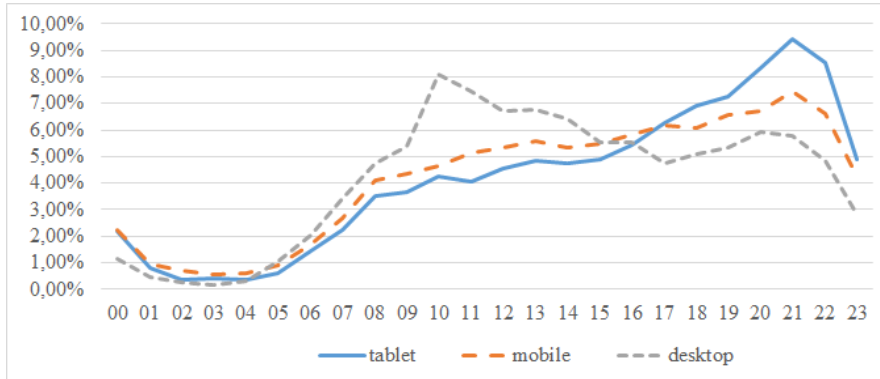


Fig. 3: Activity of users according to the time of day.

Source: own compilation

The people who used PCs displayed the greatest activity between 10 a.m. and 2 p.m. (for instance, at 10 a.m. the website was visited by 8% of the total number of visitors in a given day). Out of all the people using desktops, more than 35% entered the online store's website during this time bracket. In the case of mobile devices, the largest percentage of visits was recorded around 9 p.m. The largest percentage of shoppers using tablets was also active at 9 p.m.; nearly 10% of all tablet users visited the store's website at this time.

A similar analysis with respect to the days of the week (based on a period of 52 weeks) reveals a significant difference in the intensity with which the various devices were used (Figure 4).

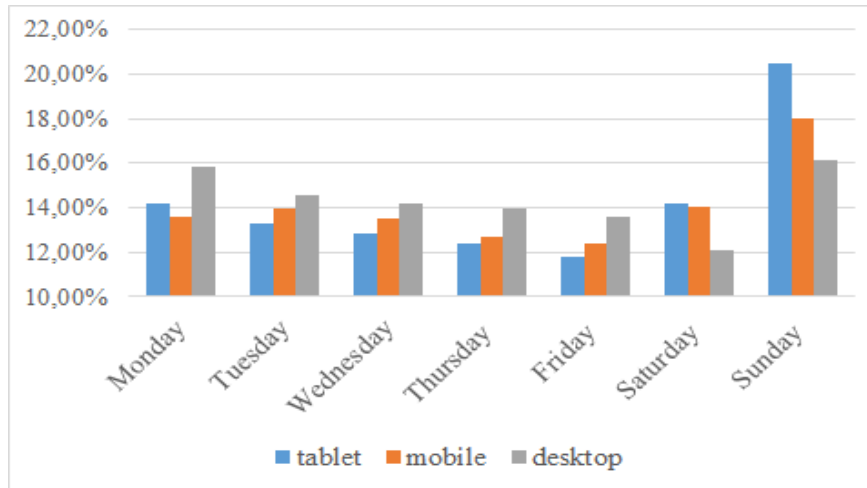


Fig. 4: Activity of users according to the day of the week

Source: own compilation

Looking at the activity of users on the seven days of the week, the most noticeable variation can be seen among the users of tablets. For all users the peak of activity occurs on Sundays; however, for tablet owners the increase in activity is the most significant as it reaches nearly twice the level of activity occurring on the remaining days of the week. Interestingly, the users of all three devices are the least active on the website on Fridays (except desktop users).

Conclusions

This paper presents a study which aimed to determine how the fact of using a desktop computer, a smartphone or a tablet affects the behaviour of the users of these devices. Although the analysis was basically one sided and covered periods of only one year, the data collected made it possible to unequivocally state that the buying behaviour of consumers varies depending on the device used. Therefore, it seems desirable to conduct further research analysing the owners of desktops, mobile phones and tablets, paying particular attention to the size and structure of the purchases made using the different devices.

Acknowledgments This work was supported by the National Science Center, Poland, Grant No. 2014/15/N/HS4/01326 and 2015/19/B/HS4/02287

References

1. Mckay, J. and Marshall, P. (2004), *Strategic Management of E-Business*, John Wiley & Sons, Brisbane
2. Gunasekaran, A. and Ngai, E.W.T. (2011), "The future of operations management: an outlook and analysis", *International Journal of Production Economics*, Vol. 135 No. 2, pp. 687-701
3. Hinman, R. (2012), *The Mobile Frontier: A Guide for Designing Mobile Experience*, Rosenfeld Media, Brooklyn
4. Yang, B., Kim, Y. and Yoo, C. (2013), "The integrated mobile advertising model: the effects of technology- and emotion-based evaluations", *Journal of Business Research*, Vol. 66 No. 9, pp. 1345-1352
5. Li, Y.-M. and Yeh, Y.-S. (2010), "Increasing trust in mobile commerce through design aesthetics", *Computers in Human Behavior*, Vol. 26 No. 4, pp. 673-684
6. Parker, Ch. J. and Wang, H. (2016), "Examining hedonic and utilitarian motivations for mcommerce fashion retail app engagement ", *Journal of Fashion Marketing and Management: An International Journal*, Vol. 20 Iss 4 pp. 487 – 506
7. Ngai, E.W.T. and Gunasekaran, A. (2007), "A review for mobile commerce research and applications", *Decision Support Systems*, Vol. 43 No. 1, pp. 3-15
8. Feng, H., Hoegler, T. and Stucky, W. (2006), "Exploring the critical success factors for mobil e-commerce", *Proceedings of the International Conference on Mobile Business, ICMB '06*, IEEE Computer Society Press, Los Alamitos, CA, pp. 40-46
9. Siau, K., Lim, E.P. and Shen, Z. (2001), "Mobile commerce: promises, challenges, and research agenda", *Journal of Database Management*, Vol. 12 No. 3, pp. 4-6
10. Wei, T.W., Marthandan, G., Chong, A.Y.L., Ooi, K.B. and Arumugam, S. (2009), "What drives Malaysian m-commerce adoption? An empirical analysis", *Industrial Management & Data Systems*, Vol. 109 No. 3, pp. 370-388
11. Tsalgatidou, A. and Pitoura, E. (2001), "Business models and transactions in mobile electronic commerce: requirements and properties", *Journal of Computer Networks*, Vol. 37 No. 2, pp. 221-236
12. Tiwari, R. and Buse, S. (2007), *The Mobile Commerce Prospects: A Strategic Analysis of Opportunities in the Banking Sector*, Hamburg University Press, Hamburg
13. Chan, F.T.S., Chong, A. Y-L. (2013), Analysis of the determinants of consumers' m-commerce usage activities, *Online Information Review*, Vol. 37 Iss 3 pp. 443 - 461
14. Jimenez, N. and San-Martin s. (2016), Trust and satisfaction: the keys to client loyalty in mobile commerce La confianza y la satisfacción: claves para la lealtad del cliente en el comercio móvil ", *Academia Revista Latinoamericana de Administración*, Vol. 29 Iss 4 pp. 486 - 510
15. Khan, H., Talib, F., Faisal, N. (2015), An analysis of the barriers to the proliferation of M-commerce in Qatar A relationship modeling approach ", *Journal of Systems and Information Technology*, Vol. 17 Iss 1 pp. 54 - 81
16. Stern, B.B. and Stafford, M.R. (2006), "Individual and social determinants of winning bids in online auctions", *Journal of Consumer Behaviour*, Vol. 5 No. 1, pp. 43-55

12

17. Zhang, P. and Von Dran, G.M. (2002), "User expectations and rankings of quality factors indifferent web site domains", *International Journal of Electronic Commerce*, Vol. 6 No. 2, pp. 9-33
18. Bhatnagar, A. and Ghose, S. (2004), "Online information search termination patterns across product categories and consumer demographics", *Journal of Retailing*, Vol. 80 No. 3, pp. 221-8
19. Global B2C e-commerce global report 2016, www.ecommercewiki.org/wikis/www.ecommercewiki.org/images/5/56/Global_B2C_Ecommerce_Report_2016.pdf