

Possibilities for Testing User Experience and User Interface Design on Mobile Devices

J. Berčík, A. Mravcová, J. Gálová, K. Neomániová

Abstract—In an era when everything is increasingly digital, consumers are always looking for new options in solutions to their everyday needs. In this context, mobile apps are developing at an exponential pace. One of the fastest growing segments of mobile technologies is, obviously, e-commerce. It can be predicted that mobile commerce will record nearly three times the global growth of e-commerce across all platforms, which indicates its importance in the given segment. The current coronavirus pandemic is also changing many of the existing paradigms both socially, economically, and technologically, which has a major impact on changing consumer behavior and the emphasis on simplification and clarity of mobile solutions. This is the area that User Experience (UX) and User Interface (UI) designers deal with. Their task is to design a sufficiently attractive and interesting solution that will be available on all mobile devices and at the same time will be easy enough for the customer/visitor to get to the destination or to get the necessary information in a few clicks. The basis for changes in UX design can now be obtained not only through online analytical tools, but also through neuromarketing, especially in the case of mobile devices. The paper highlights possibilities for testing UX design applications on mobile devices using a special platform that combines a stationary eye camera (eye tracking) and facial analysis (facial coding).

Keywords—Emotions, mobile design, user experience, visual attention.

I. INTRODUCTION

DUE to the number of commercial applications available for smart phones and tablets, its popularity is becoming more and more significant. In terms of development, Asian markets have seen a very strong 240% growth in their mobile e-commerce over the past year, which was six times more than the growth rate in the United States. European markets experienced a 71% growth over the previous year, indicating that visitors are increasingly accessing these technologies and are buying from their mobile devices still more often [1]. In Slovakia, 3.5 million people (76%) aged between 12 and 79 years were online in 2020. Most people still access websites via a computer (2.7 million users), mobile devices as a platform for tracking the pages of online stores are used by 2.3 million people and the lowest number of visits is through tablets (1 million) [2]. Thus, in the long term, it can be seen that online shopping is very popular among Slovaks, and timely also as a response to the COVID-19 pandemic, as consequence of which an increasing trend is to extend e-shops to brick-and-mortar

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establishments. And this is where customized UX solutions tailored to the client's specific requirements can play a key role.

II. THEORETICAL BACKGROUND

The term e-commerce has been defined by several authors, but all of them are presenting it in a slightly different way. We can consider e-commerce a modern business methodology which is efficient when used to target the needs of not only organizations and businesses, but consumers as well. Its aim is to cut costs and at the same time to ensure improving the quality of goods and services offered as well as increasing the speed of service delivery, by using the internet [3]. According to [4], e-Commerce is perceived as a part of eBusiness that includes the act of selling products and services on the internet. Another point of view is focused on commodity exchanges by electronic means, the internet in particular, by companies, factories, enterprises, industrial undertakings and consumers [5]. E-commerce can be seen also as business over the internet, where we are able to sell goods and services delivered offline as well as products which can be 'digitized' and delivered online [6]. However, the definition of e-commerce should not be primarily associated with the activity of buying and selling goods, but should also include activities such as pulling and pushing of information, e.g. content delivery on a website. This activity may not provide direct monetary value, but can offer indirect commercial benefits, such as potentially increasing sales or providing savings on operational costs [7]. Wider range of e-commerce activities include also shopping, banking or investing [8]. Some of these e-commerce activities can also be achieved via internet enabled mobile devices which opens up the opinion that e-commerce and m-commerce share certain similarities [9]. In m-commerce, we are talking about mobile devices being paired with commercial transactions, which enables providing consumers the opportunity to carry out transactions by using wireless internet enabled devices or even personal digital assistant (PDA) [10], [11]. M-commerce is defined also as "any direct or indirect transaction with a potential monetary value via wireless telecommunication networks" [12]. Other authors agree that m-commerce activities involve business transactions conducted over mobile devices for the purpose of gaining monetary value, e.g. product and service ordering, e-auctions [10], [13], [14]. In contrast, [12] and [15] posit that m-commerce includes a wider range of

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activities such as sending and receiving emails, downloading music/graphics/animations, playing interactive games online, trading stocks, booking tickets, finding friends, and conducting financial and business transactions. Key features of m-commerce include ubiquity, immediacy, localization, instant connectivity, pro-active functionality and simple authentication procedure [16], [17], but also features such as comfort, spontaneity and mobility [18]. However, mobile devices pose a challenge regarding usability and perceivable UI to ensure consumer's experience [19]. The UI is part of the computing system used for interacting with users [20], but in e-commerce and m-commerce it focuses on the elements provided on web pages in order to support navigation and information acquisition. A well-developed UI is essential to satisfy the user's functional needs as well as the effectivity level of an information system [21] and it also plays a significant role in influencing the user to return to using the app, brand, or product [22]. An important aspect in m-commerce design is to focus on the systems usability not only through UI, but also through UX [23] and in all aspects of user interaction the UX is beyond UI design and usability [24]. Moreover, [25] refers to UX as the quality of interactive technology, focusing on the human and not on the product. UX is the effect or effects felt by a user as a result of interaction and the usage of a system, device, or product, including the influence of usability, usefulness, and emotional impact during interaction which embraces seeing, touching, and thinking about the system or product, including admiring it and its presentation before any physical interaction [26], [27]. Understandable UX design as a complex and ambiguous process includes, in addition to the stages of analysis and design, poorly formalized procedures, such as surveys, user work monitoring, performance testing and analysis of activity logs, focus groups, etc. [28].

UX design and the whole functionality can be verified and tested through various methods and techniques. Users' experience can be tested by using biometric methods that are involving measurements of physiological responses of the body such as eye tracking and facial analysis and not directly the brain [29]. Eye tracking is an oculographical method that allows to track a person's gaze and determine its coordinates which has been actively used for the analysis of UI and web design [30], [31]. Eye tracking measures movements and dilated pupils when viewing different stimuli and has also multiple use in neuromarketing [32]. According to the data received from the devices, a heat map is compiled — which represents a spatial characteristic of the eye movement, reflecting the density of the gaze fixation points [33].

To identify user feedback or support exported data from eye tracking can help another biometrical method – facial analysis [34]. Facial analysis is a method of measuring emotional responses based on facial expressions recognized on a human face by a software called FaceReader™. It detects six basic emotions (plus neutral) in real time, emotional arousal and valence, provides also information about the respondent's gender, age and ethnicity status [35].

III. MATERIAL AND METHODS

The aim of the paper was to identify the UX with selected parts of the website in the mobile device of the company GymBeam.sk. The purpose was to identify problematic aspects of the perception of the purchase process of the selected consumer segment. Due to the fact that the results of online analytics did not provide a sufficient picture of the problematic aspects of product selection and ordering process, a qualitative ad hoc research was conducted using neuromarketing tools. The assignment for the 30 participants (50% men and 50% women interested in healthy lifestyles aged 18-40) who took part in the testing was: "Imagine you want to buy nutritional supplements. Visit www.gymbeam.sk [36] on your mobile device and order any number of nutritional supplements."

During the test (Fig. 1), a special platform for testing UX and UI design in mobile devices was used. Respondents' visual attention was monitored using a stationary eye tracking camera (Tobii X2-30), and emotional response was also captured using facial analysis (FA) - FaceReader 7. After the test, respondents answered questions about their perception of the buying process through the mobile device on a conscious level.

The survey was conducted on the 23rd, 24th and 27th November 2021 in the Laboratory of Consumer Studies of FEM SUA in Nitra.

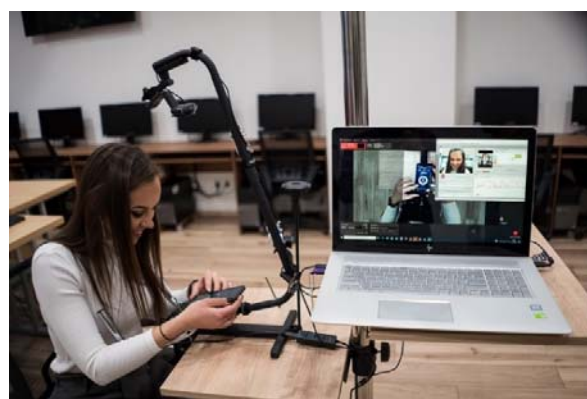


Fig. 1 Testing the UX design of Company X

IV. RESULT AND DISCUSSION

From the results obtained through the online analytical tool Hotjar and the qualitative research conducted using a special platform, the perception of the GymBeam website on a mobile device was identified. For some respondents, problematic aspects of the ordering process itself were identified, which is mainly related to the UX design of the website.

From the data collected through Hotjar online analytics and eye tracking, heat maps were created and compared with each other. In the case of eye tracking, if the requirement of 30 respondents is fulfilled this indicator is considered as a relevant statistical indicator. Looking at the two heat maps (Fig. 2), we can see the difference between where visitors click and what they actually look at on the site. From the heat map through the Hotjar tool, it can be seen that visitors immediately go to the menu or the search box when they arrive on the homepage,

without performing any interaction with other parts of that site. From the heat map obtained through eye tracking, we can see that in addition to the menu and the search box, respondents also viewed the actual competitive advantages displayed on the site, as well as the image of the first product. The comparison shows that eye tracking can significantly add information about the respondents' real visual attention when viewing the page on a mobile device. Also, in the case of a product category, it is possible to see a significant difference between what the visitor views on the page and where he/she clicks. From the online analytics results, we can see that visitors are clicking on the cart and scrolling through the individual product images. Just as it is not possible to see what detail they were interested in on individual images, it is not possible to see the other details they were interested in. In fact, in addition to the images, respondents were also looking at the product name and producer, as shown by the heat map obtained through eye tracking. The different parts of the web interface that attracted the attention of the respondents can be seen in Fig. 3. The results show that visual attention was also attracted by the number of reviews and the short description of the product, which can be seen after going to the product detail.

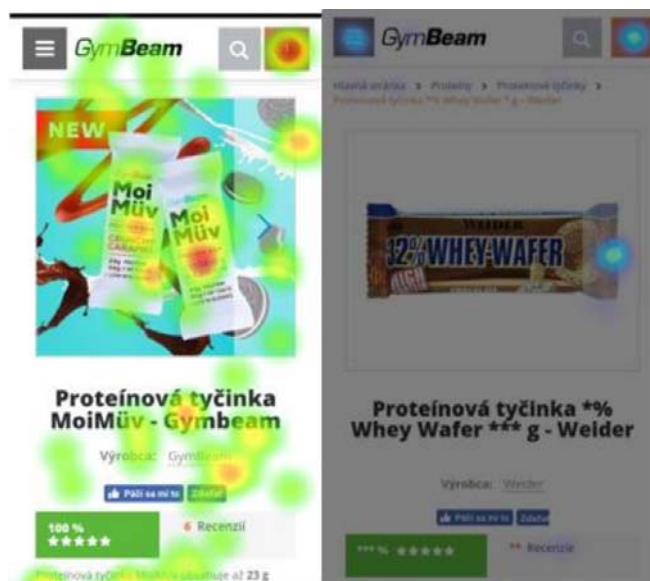


Fig. 3 Comparison of visual attention recorded by eye tracking and the online analytical tool Hotjar – product category I. display on a mobile device



Fig. 2 Comparison of visual attention recorded by eye tracking and the online analytics tool Hotjar – homepage displayed on a mobile device

At the same time, we also decided to analyze other details within the open specific product (protein bar). After prescrolling below within the product category from Hotjar analytics, we are unable to evaluate any interaction, while from the eye tracking results it can be seen that the customer is interested in the product description besides the name and producer. Another aspect that visitors are interested in is the information whether the product is in stock, which is clearly shown below the product description. The last product detail which the visitor usually sees is the shipping information, the choice of the product quantity and the option to add it to the cart, where the heat maps are very similar as this is the last interaction before the purchase itself (see Figs. 4 and 5).

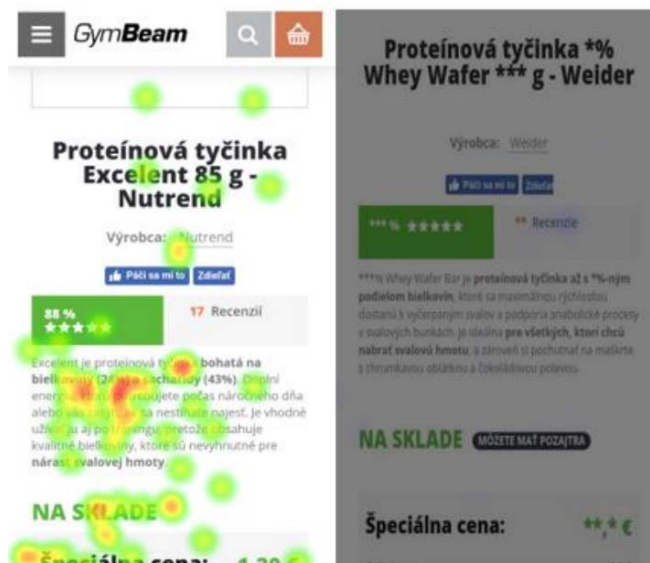


Fig. 4 Comparison of visual attention recorded by eye tracking and the online analytical tool Hotjar – product category II. display on a mobile device

On the last part of the open product category, there is an "add to cart" button, see Fig. 5. In this case, it can be seen that the button itself is a place that respondents often clicked on, but it also caught their visual attention in a significant way, as well as the quantity setting or the choice of packaging option.

The qualitative testing via eye camera included a guided interview immediately after the completion of the set task. When asked "Is there anything you didn't like about the site displayed on your mobile device?" the majority of respondents (18) indicated that there was nothing they did not like about GeamBym's site on their mobile device; (4) respondents reported a problem with intuitiveness and (3) with complexity,

which is probably related to the process of making the order itself. Also, (3) respondents were not satisfied with the overall layout of the site, and (2) respondents were not satisfied with the design of the site. The structure of the individual responses can be seen in Fig. 6.

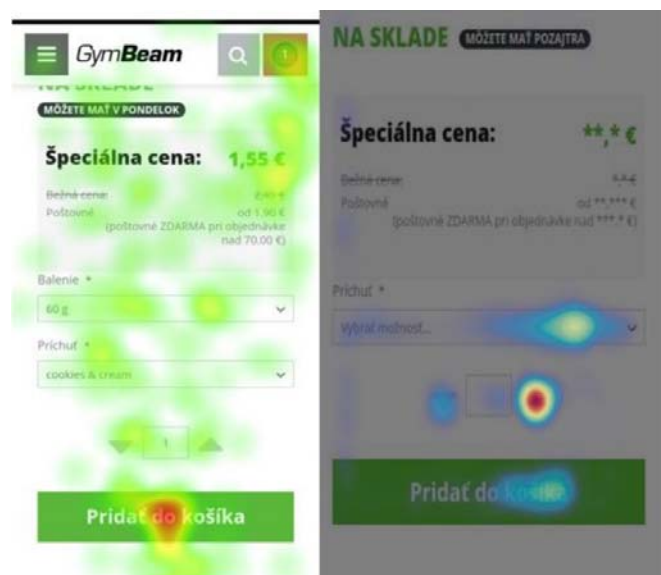


Fig. 5 Comparison of visual attention recorded by eye tracking and the online analytical tool Hotjar – product category III. display on a mobile device

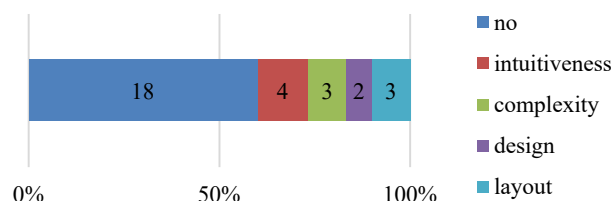


Fig. 6 Graph visualizing responses to the question: Is there anything you didn't like about the site displayed on your mobile device?

V.CONCLUSION

Based on the conscious feedback, we can conclude that the GymBeam website on a mobile device fulfilled its purpose as the majority of respondents (25) were able to correctly find the product and add it to their shopping cart without any major problems. The use of implicit methods suggests that some improvements need to be made. This implies that not only online analytics, but also innovative approaches in the form of neuromarketing tools should be emphasized when improving the UX and UI design of a mobile site. From the results, it is possible to see significant differences in the data in terms of monitoring consumer browsing behavior on a mobile device. While online analytics on mobile provides a comprehensive picture of where consumers click the most, heat maps point to the places where people actually look (visual attention). Even in some, steps when scrolling through a page viewed on a mobile device, no data from online analytics can be seen, and

therefore neuromarketing tools can be an effective tool for improving the UX and UI design of a website viewed on a mobile device. We recommend GymBeam to maintain the quality of product images, as respondents spend the most time looking at them and it is a significant Eye catcher, which was confirmed in the conducted study. Another suggestion for improvement may be to simplify the process of adding products to the shopping cart as respondents, after adding a product to the cart, spent time checking whether the product was actually added to the cart and then performed this action several times, which resulted in multiple items being added at the same time, as confirmed by the frustration map (valence -0.075). Based on the above, the solution could be to introduce a simple information window after adding a product to the cart, with information that the product has been added to the cart, which would provide a better UX and lower frustration level. These changes would particularly contribute to improving the user interface (UI) but also the experience (UX). Incorporating neuromarketing methods into mobile device site perception testing revealed a variety of detailed consumer perception information that is further useful in the marketing management and communications process.

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