

A usability analysis of e-commerce systems: Prestashop, Magento and Joomla

Analiza użyteczności systemów e-commerce: Prestashop, Magento oraz Joomla

Marcin Wijaszka*, Mariusz Dzieńkowski

Department of Computer Science, Lublin University of Technology, Nadbystrzycka 36B, 20-618 Lublin, Poland

Abstract

This article focuses on the analysis of available open-source e-commerce systems in terms of their usability in the context of factors such as website consistency, interactivity, interface memorability and the level of aesthetics. The study compares the Prestashop, Magento, and Joomla with the HikaShop module. An experiment was prepared, consisting of three elements: a test scenario, during which the task completion time was measured, an eye-tracking study, providing objective results showing how users look at a given system and a survey aiming to obtain opinions on the analyzed systems. Each e-commerce platform was tested by a different research group of 10 people who had not used these systems before. The results of the study indicate that the Prestashop system offers the most efficient interfaces, presenting content and providing functions that are more easily assimilated and better understood by users compared to the other two tested systems.

Keywords: e-commerce systems; usability analysis; eye tracking

Streszczenie

Niniejszy artykuł skupia się na analizie dostępnych systemów e-commerce typu open source pod względem ich użyteczności w kontekście czynników takich jak: spójność strony, interaktywność, zapamiętywalność interfejsu czy też poziom estetyki. W badaniach porównano ze sobą system Prestashop, Magento oraz Joomla z modułem HikaShop. Przygotowano eksperyment, który składał się z trzech elementów: scenariusza testowego, podczas którego dokonano pomiaru czasu wykonania zadań, badania eyetrackingowego, dostarczającego obiektywne wyniki, pokazujące sposób patrzenia użytkowników na dany system oraz badania ankietowego mającego na celu uzyskanie opinii na temat analizowanych systemów. Każda platforma e-commerce była testowana przez inną grupę badawczą składającą się z 10-ciu osób, które wcześniej nie korzystały z tych systemów. Wyniki badań wskazują, że system Prestashop oferuje najwydajniejsze interfejsy, prezentując treści i dostarczając funkcje, które są łatwiej przyswajalne i bardziej zrozumiałe przez użytkowników w stosunku do dwóch pozostałych testowanych systemów.

Słowa kluczowe: systemy e-commerce; analiza użyteczności; eyetracking

*Corresponding author

Email address: marcin.wijaszka@pollub.edu.pl (M. Wijaszka)

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1. Introduction

User usability is one of the key elements in the process of creating a clear and understandable interface for users of websites. An important characteristic of a well-designed web application is designing an interface that is understandable and simple enough for users who are not proficient in computer and internet usage. This issue is particularly important in the context of developing e-commerce systems, where the created website aims to encourage potential customers to make purchases.

The essence of creating a relatively good e-commerce system is the costs that the owner of the online store can afford. In the case of e-commerce, suitable systems can be divided into proprietary and open-source licensed ones. The former are costly, and in the case of self-implementation, they require specialized knowledge. Systems based on open licenses have free to use codes and, in the case of e-commerce, utilize basic components of a CMS (Content Management System), which includes fundamental content management functionalities such as creating, editing, modifying content or

entries, extending these components with commerce elements like orders, carts, or multi-step purchasing processes. An additional challenge for such systems is developing an administrator panel that is simple enough for users without additional IT skills to manage the website smoothly and without fear. Usability in the context of websites is one of the indicators of user experience while navigating through the website. Usability factors include coherence, readability, interface aesthetics, and system interactivity with the user.

A usability analysis is conducted in many ways. It is most commonly done through questionnaire surveys. Lately, eye-tracking techniques have been increasingly used for such research, involving tracking the attention of individuals during interactions with the tested interface. This allows the generation of heat maps overlaid on displayed stimuli, which can be views of applications or web pages and enables the identification of elements that interested the participant or caught their attention.

2. Literature review

In the context of e-commerce stores based on popular CMS platforms, there are several common elements that are essential for websites responsible for online sales. These include payment systems, delivery management, the purchasing process, and an administrative panel for sales management.

Article [1] focuses on identifying common usability functions in e-commerce stores operating on popular open-source CMS platforms such as Shopify, OpenCart, Magento, and WooCommerce. After selecting and analyzing 36 usability functions, the authors categorized them into 16 groups such as accessibility, customization, navigation, and system aesthetics. The study found that Magento offers the highest number of usability design quality functions.

Another study [2] focused on developing a set of heuristics for evaluating user experience in online stores. 64 heuristics were selected based on three different studies. Participants rated interface-related questions and post-interface experiences on a yes/no or 1 to 5 scale. The results covered six distinct stages of the purchasing process, including need recognition, information search, decision making, transaction progress, after-sales service, and factors affecting user experience.

Another study [3] focused on analyzing user behavior in online stores, considering server logs. The correlation between website navigation and user actions was examined. A server log analysis identified areas requiring improvement in website design.

In another study [4], metrics were developed to assess the usability quality of e-commerce websites. Adaptive neuro-fuzzy inference system (ANFIS) and Analytical Hierarchy Process (AHP) techniques were used for usability evaluation. A user survey identified five key parameters affecting usability: user satisfaction, attractiveness, simplicity, speed, and efficiency.

In another study [5], the impact of website interactivity on user attitudes and understanding of content was examined by means of eye-tracking technology. The research procedure included device calibration and respondent surveys. A heat map analysis demonstrated a positive impact of highly interactive pages on content comprehension.

Study [6] focused on analyzing website design elements and their impact on user experience. Metrics such as click-through rates, time spent on the site, and conversion rates were considered. Respondents expressed preferences for intuitive navigation, image responsiveness, and page layouts.

In study [7], the usability and accessibility of e-commerce websites were evaluated using Nielsen heuristics and the System Usability Scale (SUS). The analysis was supported by a questionnaire regarding website quality, identifying areas requiring improvement.

The usability analysis of ready-made CMS systems on mobile devices was the subject of article [8]. This work included a heuristic evaluation of existing systems for their mobile application and the design of a prototype of an optimized CMS system.

Another study [9] focused on usability principles in designing responsive websites. The authors considered general principles of designing responsive interfaces such as coherence, flexibility, feedback, and aesthetics.

Study [10] examined the relationship between website usability and purchase intention. A website usability survey showed that usability was the primary factor influencing the purchase intention.

Study [11] focused on examining the impact of usability mechanisms such as interruption of operations and feedback on efficiency, effectiveness, and user satisfaction in websites. Operation interruption mechanisms significantly improved user performance and satisfaction.

The analysis of usability elements affecting purchase intention was the subject of study [12]. A questionnaire-based study showed that website readability and store credibility directly positively influence website perception.

The authors of study [13] conducted research of existing usability and security evaluation models for e-commerce sites. The analysis revealed a lack of a comprehensive model that considers both aspects. There was a need for a comprehensive usability and security evaluation model for e-commerce websites.

In the study [14], an analysis of the usability of four websites was conducted, taking into account the principles of universal design, of which only two sites met the principles of universal design. The results of the study showed that incorporating universal design principles significantly improves their intuitiveness, usability, and accessibility, considering people with visual impairments. Websites compliant with universal design allow for faster content discovery and execution of specific actions.

3. Aim and scope of study

The aim of this study is to examine three e-commerce systems: Prestashop, Magento and Joomla with the HikaShop module. The selection of the analyzed e-commerce applications was justified by the following factors: open-source code, free implementation allowing for easy research conduct, and common features shared by each of the analyzed e-commerce solutions. The main goal was to determine which of these systems is the most useful. This was done based on the opinions of users who had little or no experience with CMS systems.

The study was divided into three stages. The first stage involved the use of a test scenario. Eye-tracking technology was used in the second stage. Finally, in the last stage, a questionnaire evaluating e-commerce system interfaces was utilized.

Two research hypotheses were proposed:

- The layout and presentation of tools in the e-commerce system interface affect efficiency, usability, and user satisfaction.
- Systems using operation cancellation mechanisms help to reduce the number of mistakes made by users.

4. Research method

A three-stage experiment was designed and conducted. In the first stage, a test scenario was implemented, aimed at providing participants with a brief introduction to the e-commerce system under study and familiarizing them with its operation. Participants were tasked with performing several basic actions offered by the analyzed platform. In the second stage of the experiment, each participant carried out planned tasks while using eye-tracking technology, enabling the observation of where the participants looked at within the interface, how long, and in what order their attention was directed. Finally, opinions regarding the specific e-commerce system were gathered through a survey. Due to the length of the study and to eliminate the learning effect, participants analyzed and evaluated only one shopping platform.

4.1. Research subjects

This study examined three popular platforms containing components of an online store: Prestashop, Magento and Joomla with the HikaShop module. An e-commerce platform is a system that includes functionalities used in online commerce, such as product management and shipping, order processing, and payment handling [15]. The analyzed systems are offered under an open-source license, which provides high flexibility due to full access to the store's source code. Open-source licensing also entails free access for every user. The tested systems were evaluated using default settings and themes provided by the software manufacturer.

Prestashop platform, version 1.7.8, is owned by PrestaShop S.A. and is the most popular system among the three examined systems, with 220,379 active stores across the internet. Joomla, version 4.0.0, requires the installation of the HikaShop addon, the starter version by Hikari Software, which extends Joomla's basic functionalities with components used in e-commerce. The market share of the Joomla system based on HikaShop amounts to 11,992 active online stores. On the other hand, Magento, version 2.4.7, is an e-commerce solution owned by Adobe. According to statistics, over 124,071 online stores utilize this system [16].

4.2. Research group

The study involved 30 participants aged 20-25, divided into 3 groups of 10 individuals each. Each participant tested only one shopping platform. Regarding the gender of users, males dominated. In the case of Prestashop, the percentage of males was 60%, for Joomla 90%, and for Magento 80%. Before starting the study, users were asked about their general knowledge of e-commerce and CMS systems. It turned out that the majority of respondents (66.7%) had no experience with these systems. 30% of respondents indicated moderate familiarity, while only 3.3% indicated good familiarity with e-commerce systems. The lack of experience with the systems reported by the respondents allowed for obtaining more realistic and objective data in the form of evaluations, opinions, and user perceptions.

4.3. Test scenario

In the first stage of the research, the time needed by the user to familiarize themselves with the given system was measured. While learning to operate the system, respondents memorized its operational scheme and familiarized themselves with the graphical interface. In this part of the study, users performed two tasks:

- *While on the main page of the administrator panel, navigate to the page with the list of products, and then add a new product.*
- *Navigate to the list of products and delete a product previously added by yourself.*

4.4. Eye-tracking study

The study utilizing eye-tracking technology aimed to obtain results in the form of heat maps and gaze paths, which illustrate the areas of interest for the participants. In addition to heat maps, results were obtained showing the traces of human eye movement on the displayed stimulus and its reaction to elements relevant from the scenario's perspective, which were present on the displayed page and sought by the user.

The oculographic analysis was conducted using the GP3 HD eye tracker by Gaze-Point in a dedicated room suitable for this purpose. The basic information about the device used is presented in Table 1.

Table 1: GazePoint GP3 HD eyetracker specifications

Sampling frequency	60/150 Hz
Device accuracy	0.5 - 1°
Permissible range of head movement	35 x 22 cm
Weight	125 g
Device dimensions	23.5 x 4.5 x 4.7 cm
Supported interfaces	USB

The eye tracker was connected to an Acer Nitro 5 laptop. Data regarding this computer are specified in Table 2.

Table 2: Computer specifications

Processor	AMD Ryzen 7 5800H
Graphics card	NVIDIA GeForce RTX 3060
RAM	32 GB
Operating system	Windows 10
Screen diagonal	15.6"
Screen resolution	1920 x 1080 px
Refresh rate	144 Hz

Figure 1 below shows the research setup used to conduct the eye-tracking study. The software used for building and controlling the experiment and data recording, allowing for the subsequent analysis, was the program iMotions version 9.1.

Heat maps or eye-tracking paths can assist interface designers in understanding how to design an interface to be user-friendly and easy to master, while also avoiding overwhelming amounts of content and features that pose a challenge for novice users who want to make online purchases without major difficulties.



Figure 1: Eye tracking experiment

During the eye-tracking study, for each of the analyzed systems, 5 analogous commands were prepared for users to execute. Their content is presented in Table 3.

Table 3: Tasks constituting the eye-tracking study scenario

No.	Prestashop	Magento	Joomla
1.	Please locate the <i>Preferences</i> button.	Please locate the <i>System</i> button.	Please locate the <i>Configuration</i> button.
2.	Identify the button for filtering products by category.	Identify the button for filtering displayed products on the list.	Identify the button for filtering orders on the list.
3.	Identify the <i>Payment error</i> message content.	Identify the <i>Processing</i> order status.	Identify the <i>Created</i> order status.
4.	Verbally state the number of the products in the cart.	Verbally state the number of the products in the cart.	Verbally state the number of the products in the cart.
5.	Point out the delivery cost displayed in the purchasing process.	Point out the delivery cost displayed in the purchasing process.	Point out the delivery cost displayed in the purchasing process.

4.5. Survey

The final stage of the study was a survey aimed at gathering user opinions on the analyzed systems. It consisted of 10 following questions:

1. *I feel confident using the system.*
2. *Navigating through the system poses no difficulties for me.*

3. *The order status messages displayed in the table are clear.*
4. *The navigation layout proposed by the system in the administrator panel is easy to remember.*
5. *The price of the product in the cart is easy to locate.*
6. *The system interface is visually appealing.*
7. *Information about the status, availability, price and category of products is presented clearly and can be easily modified.*
8. *Checking the latest placed order is not problematic.*
9. *The icon symbols used in the administrator panel facilitating navigation on the site are intuitive.*
10. *The cancellation mechanisms implemented in the system help reduce the number of mistakes.*

5. Results

5.1. Test scenario

Tasks related to adding a new product and finding and deleting it were completed by users without major issues. Based on the obtained completion times, it was found that the most efficient system in terms of performance was the Prestashop platform. Research participants required an average of 92.7 seconds to complete 2 tasks in this system. The overall results regarding the time indicator for the 3 systems are shown in Figure 2.

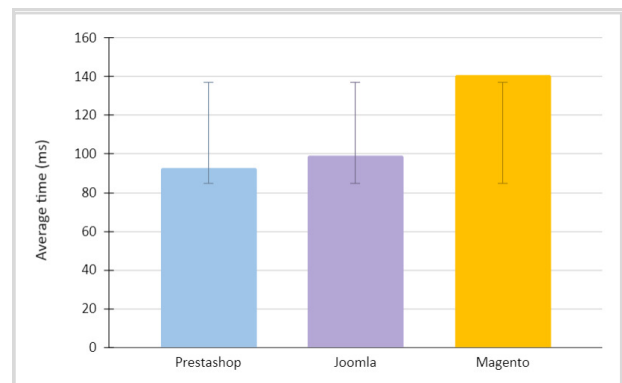


Figure 2: Average task completion times from stage I of the study.

From Figure 2, it is evident that users required the most time to complete tasks in the Magento system. The average completion time was 140.9 seconds, with a standard deviation value represented on the chart as "whiskers" of 58.6 seconds. Magento's poor performance was attributed to the solutions it employs. For instance, navigating between tabs in this system took significantly longer than in Joomla and PrestaShop, which are less resource-intensive in terms of computer resources.

5.2. Eye-tracking results

In this part of the study, two types of results were obtained: qualitative results in the form of heat maps and scanning path maps, and quantitative results in the form of average task completion times.

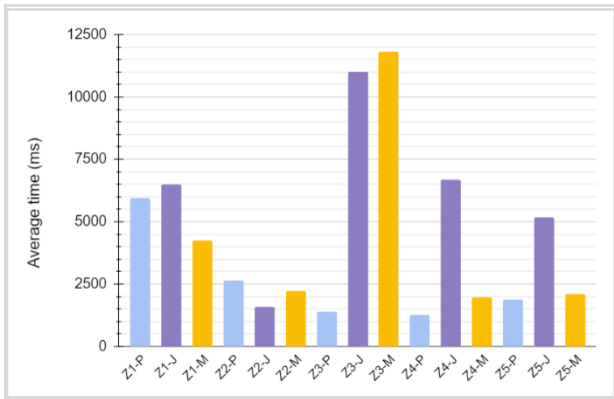


Figure 3: Average task completion time.

Heat maps were used to determine whether research participants correctly and quickly executed a given command or if they wandered around the page, requiring a longer analysis of a larger area of the page. Figure 3 depicts the average completion times for specific tasks for systems labeled on the graph with abbreviations, where the letter "Z" denotes the task, "X" denotes the task number, and the letters "P," "J," and "M" represent the respective platforms: Prestashop (ZX-P), Joomla (ZX-J), and Magento (ZX-M).

For most tasks, the completion times were similar and ranged from 1.5 to 6.5 seconds. The only task that had a significantly larger spread of completion times across the analyzed systems was task number 3, where the time ranged from 1 to 12 seconds. The reason for such a large difference was that in the Prestashop system, order statuses, in addition to textual representation, also have appropriately contrasting colors compared to the overall color scheme of the page. As a result, users quickly directed their gaze to the sought-after object, as indicated by the single hot spot on the heat map in Figure 4.



Figure 4: Heat map for task number 3 for the Prestashop system.

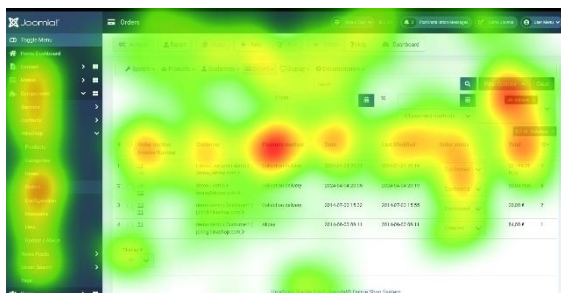


Figure 5: Heat map for task number 3 for the Joomla system.



Figure 6: Heat map for task number 3 for the Magento system.

In Joomla and Magento solutions, there are no mechanisms facilitating the quick differentiation of a given status. This situation is illustrated by the heat maps in Figures 5 and 6, where numerous hot spots can be observed, indicating difficulties in locating the desired element.

The results of the eye-tracking analysis also include gaze plot maps illustrating the eye movements (lines) and fixations (circles) of the participant. Figure 7 depicts the gaze path of one participant who successfully located the target element specified in the task. In cases where the study participant did not find the expected element within 90 seconds, or gave up by skipping the task stage, they were automatically moved to the next instruction. Such an instance was recorded by the eye tracker, as shown in Figure 8.

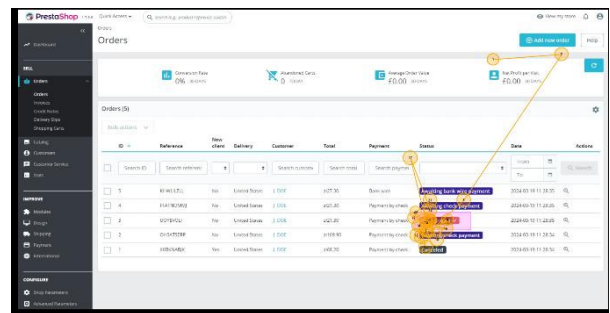


Figure 7: Scanning path for task 3 for the Prestashop system.

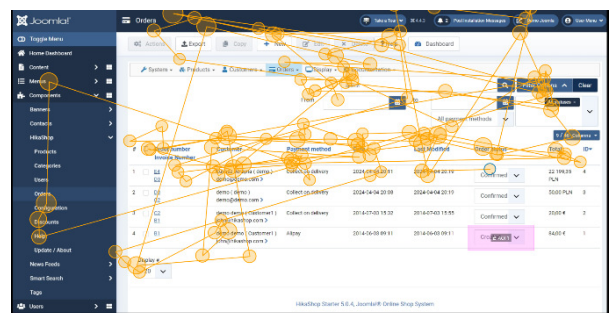


Figure 8: Scanning path for task 3 for the Joomla system.

The striking red color caused the participant in Figure 7 to be confident in their response and did not need to review other areas of the displayed image, as was the case with the scanning path in Figure 8.

5.3. Survey results

The participants expressed their opinions regarding the e-commerce system they analyzed through a survey

consisting of 10 questions. Responses to each question were numerical on a Likert scale, where number 1 corresponded to "strongly disagree," and number 6 represented "strongly agree." Table 4 presents the survey results for each system along with the calculated median rating. The most significant differences between systems were observed in task number 5, which states: "The price of the product in the cart is easy to locate." In this case, Joomla received the lowest median rating, scoring 3 points, while Prestashop achieved the best result with a score of 7 points. Such disparities are attributed to the fact that the Joomla system, with the additional HikaShop module, does not inherently possess an extensive cart section compared to Prestashop or Magento. Additionally, in the Joomla system, the cart section lacks any pictograms that could guide the users.

Upon analyzing the collected survey data, it was noted that Prestashop received the highest average rating, with an average score of 5.8. Figure 9 illustrates the overall average ratings for each tested e-commerce system.

Table 4: Survey study results

No.	Task Content	E-commerce system	Median
1.	I feel confident using the system.	Prestashop	5.5
		Joomla	4
		Magento	5
2.	Navigating through the system poses no difficulties for me.	Prestashop	6.5
		Joomla	5
		Magento	5.5
3.	The order status messages displayed in the table are clear.	Prestashop	6
		Joomla	4.5
		Magento	5
4.	The proposed navigation layout in the admin panel is easy to remember.	Prestashop	6
		Joomla	5
		Magento	5.5
5.	The price of the product in the cart is easy to locate.	Prestashop	7
		Joomla	3
		Magento	6.5
6.	The system interface is visually appealing.	Prestashop	5
		Joomla	6
		Magento	5.5
7.	Information about the status, availability, price, and category of products is presented clearly and can be easily modified.	Prestashop	7
		Joomla	6
		Magento	6
8.	Checking the latest placed order is not problematic.	Prestashop	7
		Joomla	5.5
		Magento	5
9.	The icon symbols used in the admin panel facilitate navigation on the site and are intuitive.	Prestashop	5.5
		Joomla	5
		Magento	4
10.	The cancellation mechanisms in the given system help reduce the number of mistakes.	Prestashop	5
		Joomla	5
		Magento	5.5

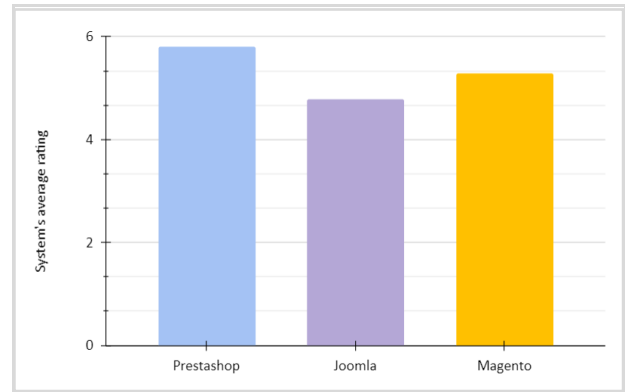


Figure 9: Comparison of results (Average Ratings) of surveyed e-commerce systems.

According to user ratings, the Magento system achieved the average score of 5.29. However, the Joomla system with the HikaShop module received the lowest rating (4.78).

6. Conclusions

The results of the conducted research on a group of 30 participants indicate that the best-performing e-commerce system among those tested was Prestashop, which consistently achieved the best results in every stage of the experiment. The second position was occupied by Magento, which scored slightly lower than Prestashop. This outcome is not surprising, as these systems have similar operating schemes and certain differences may have been caused by the high hardware requirements that Magento demands for smooth operation. Joomla was rated the lowest by the participants and obtained the lowest score in the eye-tracking study. This low rating may be attributed to the way Joomla presents data. Despite being content-rich, Joomla received the highest score for the overall appearance of the interface. Additionally, it offered a rich array of options, such as buttons, which unfortunately led to longer familiarization with the interface and prolonged the time to complete certain tasks. Furthermore, in Joomla with the HikaShop module, users were observed to be more engaged with content containing both text and graphics than with text alone, which sometimes led to erroneous localization of the desired element. In terms of learning the system and quickly finding expected statuses or messages, the use of contrasting colors played a significant role in attracting users' attention.

Based on the obtained results, the conducted analyses, and the presented conclusions, it can be confirmed that the first hypothesis, stating that the arrangement and presentation of tools in the e-commerce system interface affect its performance, usability, and user satisfaction, is valid. The second hypothesis, examining whether systems utilizing undo mechanisms help reduce the number of mistakes made by users, aimed to verify user behavior and confidence in executing irreversible actions such as deleting the product. The second hypothesis was

evaluated based on observations of user behavior during the execution of tasks from the test scenario and based on the ratings provided by respondents for the last question in the survey. The results indicate that this hypothesis was not confirmed, as the analyzed systems received similar average ratings. This situation may have arisen from the fact that each system only had a basic mechanism informing about the deletion action.

Considering the entirety of the conducted research, it can be concluded that for users with little or no experience with e-commerce solutions, system authors should reconsider the redesign of the mechanism for displaying the list of recent orders, due to the information overload that this mechanism offers. Additionally, it is recommended for authors to use appropriate button labeling using understandable text and suitable colors, as moments of uncertainty in task execution by the participants were observed during the study, leading to a prolonged page analysis. The research results also indicated the participants' familiarity with a schematic page layout, which caused confusion when using a layout with a non-standard arrangement of functional buttons. Therefore, it can be inferred that color selection, as well as appropriate condensation and layout of content on the page, along with system optimization, are crucial, and their implementation would facilitate easier use of such a tool by users unfamiliar with it.

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