
Usability Assessment of E-commerce Portal Using Agent Framework

KDV Prasad

Assistant Professor (Research)

Symbiosis Institute of Business Management (SIBM), Symbiosis International (Deemed University) (SIU), Off Bangalore Highway, Kothur Mandal, Village: Mamidipally, Dist: Mahabubnagar, Hyderabad, Telangana, India, Email: kdv.prasad@sibmhyd.edu.in

Abstract

It's commonly known that evaluating e-commerce websites' usability is essential, and researchers have devoted a lot of time and resources to it over the previous decade. Commerce has increased dramatically as e-retailers interact with clients online. They expect a great user experience in addition to exceptional products and services. The user experience is influenced by branding, functionality, navigation, content, aesthetics, and usability. This study examines usability assessment of e-commerce portal using agent framework.

Key terms: *Usability assessment, E-commerce, Evaluation methods*

1. Introduction

During the 1990s, the media exaggerated the impact of the Internet on consumer shopping habits and predicted a meteoric rise in online sales. Because of this explosive growth in the previous ten years, e-commerce can finally be relied upon to deliver real business results. Customer buying habits have changed, and it's uncommon that you meet someone who does not have Internet access, whether it's in their home or place of business (Saphores & Xu, 2021)).

E-commerce extends its reach beyond the direct selling of products to have an impact on offline retail sales and cultivate stronger client relationships. Research shows that customers who do their homework online before visiting a store account for 40–50% of all offline retail sales. In addition, 70% of online customers believe that a poor company website affects their overall perception of the brand. Consequently, websites are critical brand touch points because they allow firms to interact with their clients while also integrating them into their brand identity. All aspects and approaches of human-computer interaction can be included under the umbrella term of human-computer interaction (HCI). Because of this, usefulness is built on it (Alao et al., 2019). To put it another way, HCI is a field that studies interactive computing systems for human use, including the design, evaluation, and implementation processes as well as the phenomena that surround them. Human-computer interaction encompasses a wide range of disciplines, including psychology, sociology, ergonomics, and industrial design (HCI). People use an interface to communicate with computers, as previously stated. Concerning human-computer interaction (HCI), this user interface's design and usability are critical (Miraz et al., 2021). Different authors have defined and measured usability in different ways.

Usability, according to Nielsen (2003), is one of the most critical aspects of any user interface because it gauges how simple or difficult it is to use. In other words, usability assesses how well a person feels when interacting with a product or system, whether that's through the usage of an app on their smartphone or a computer programme (Kortum & Sorber, 2015).

As an alternative, usability was defined by Brinck et al. (2001) as "the degree to which users can complete a set of required tasks". The five criteria already identified by Nielsen (2003) as well as another goal referred to as 'functionally right' are all part of what contribute to usability. System or product functioning means users can perform what they want or need with this feature. Usability goals can occasionally conflict with design aims for aesthetics, as demonstrated by Brink et al. (2001). Efficiency and safety were added to the list of usability design goals by Rusu et al (2015). When a system or product performs as expected, it is said to be effective; when a system or product is safe to use, it is said to be safe to use, safeguarding consumers from potentially dangerous situations. There are a variety of definitions for usability, but they all refer to a system/qualities product's or design goals. This definition of usability comes from the International Standards Organization (ISO) and states: "Usability is the extent to which [a product] can be utilised by defined users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO 9241-11 1998). Specific users, specific aims, and specific context of use are all included in this definition of usability because it describes how well a thing works. As stated in ISO 9241-11, the usability of a product is dependent on several factors, including the context in which it is used, including the people using the product, the tasks they are performing, the equipment they are using (hardware, software, and materials), and their physical and social surroundings. There are three ways to measure how usable a product is in a certain setting, according to the ISO 9241-11 standard. Efficacy and efficiency (which evaluate performance) as well as satisfaction are the focus of these three metrics.

2. Usability assessment methods

When evaluating the usability of a product's user interaction, methods like those used in usability testing look for problems or opportunities for improvement in order to make the product better for users. Techniques like these are used in User-Centred Design (UCD) (Marian et al., 2019). Usability-centered design (UCD) is a design and development philosophy that centres on making products and systems that people want to use. User feedback is gathered throughout the design process using the UCD method (Rubin 1994). Usability methods can be used to collect this feedback at any point in the design cycle (Rubin 1994).

A variety of evaluation approaches have been developed to detect usability issues. To group these strategies together, a variety of authors have ascribed different designations to them. Nagpal et al. (2017) employed four different types of usability evaluation approaches, according to the findings. Methods like this are used in usability evaluation procedures. Instead of software in the first example, real-world consumers who have interacted with a user interface are used in the second. A rule-based interface is more difficult to evaluate because it necessitates the application of rules in addition to the use of skills, knowledge, and experience. Gray and Salzman (1998) made a distinction between analytical and empirical methods. A user testing method or procedure is an example of an empirical approach; a

heuristic evaluation or cognitive walkthrough is an example of an analytical strategy. It was found that the most well-known methods of evaluating usability fall into one of three categories: users, evaluators, or tools. Because the study's goals and objectives were to look into and compare the usability issues identified from three different perspectives, this was the outcome.

Methods for measuring usability based on the evaluator's feedback

In this field, evaluators are involved in the detection of usability difficulties. Conducting user interface usability reviews or examinations is referred to as "usability inspection procedures," as outlined by Nielsen & Mack (1994).

Numerous strategies are used to discover user-experience issues when interacting with an interface and to make recommendations on how to improve the interface's usability.

Methods for evaluating usability based on user feedback

This group includes a wide range of tactics that involve the end user. As a result of these techniques, we may learn more about how people interact with an interface, and how satisfied they are with the results. The most widely used technique in this area is user testing. In addition to user testing methods, there are a variety of strategies that can be employed in conjunction with them.

Methods for assessing software's usability

Instead than depending on experts or end users, software tools can be used to evaluate the usability of an interface. A website's usability can be automatically tested using this method to see if it adheres to a set of usability guidelines (Brinck et al., 2001). The bulk of these tools use a set of standards to assess the HTML code quality of a website. An example of something they search for on a website's pages is the ALT property. As a result, these tools approximate professional inspection and evaluation methods (Lazar, 2007). The majority of individuals are concerned with a website's accessibility rather than its overall usefulness (Lazar, 2007).

Before, there was agreement that although usability evaluation methods have the same overall objective, namely to identify usability issues that prevent users from easily interacting with an interface, these methods differ in terms of the number and type of issues they identified, as well as in the cost of implementing them. Comparing several methods indicated which were the most efficient in discovering usability difficulties while considering various criteria, such as the number of problems, the type and the cost of using each method have been disclosed.

3. Evaluating usability for e-commerce websites

Few studies have evaluated e-commerce websites' usability, despite the fact that usability is critical for e-commerce sites. There were usability methodologies that included both users and assessors in the detection of usability issues. This section discusses the results of those investigations.

Researchers Hasan & Morris (2017) conducted a survey to learn more about how customers perceive the usability of e-commerce websites. 16 consumers conducted activities on each of 4 e-commerce websites (two of which offered clothing, and 2 of which sold products), expressing what they liked and disliked about each site, along with possible incentives or deterrents to purchase. Customer usability issues were identified by the researchers, who then

gave recommendations for improving the usability of e-commerce sites as a result of their results.

To their credit, they did not apply the observation approach in their study, despite the fact that observing actual user interactions with sites is the most effective way to judge the usefulness of them (Porat & Tractinsky, 2012). Three supermarket websites selling a variety of goods were examined by Freeman (2009), who involved customers in the review and comparison process. However, he used observation and a post-test questionnaire as a method of user testing. Observations and preferences of users helped identify numerous usability concerns on the three sites, and the results were utilised to generate guidelines for improving usability.

In previous studies, evaluators utilised the heuristic method to determine if e-commerce websites were usable (Chen & Macredie 2005). Chen and Macredie (2005) employed this technique to determine whether or not four electronic supermarkets were actually useful. Heuristic guidelines were drawn from Nielsen's (2003) list of ten heuristics from his study of user behaviour in 2000, as well as three additional heuristics: support and extension of the user's current skills, joyous interaction with the user, and protection of personal information. Each heuristic has criteria assigned to it so that the sites could be thoroughly analysed. By compiling the criteria into one handy check list, the severity of each interface's usability problem was quantified. A huge number of usability difficulties (weaknesses) as well as numerous positive design qualities (strengths) were identified using the heuristic evaluation method.

According to Panda et al. (2015), in order to analyse and identify usability issues and design concerns that were crucial for South African e-commerce sites from both experts' and users' viewpoints, it was necessary to utilise a combination of user testing and heuristic evaluation approaches. To analyse the usability of e-commerce sites, they devised a comprehensive set of e-commerce design standards that web specialists utilised as heuristics. Using heuristic evaluation and the user testing method (post-test surveys), experts and users discovered various usability issues on chosen South African e-commerce sites, demonstrating the efficiency of these methods in uncovering a comprehensive collection of usability issues. Each method's favourable correlation between identified problems helped to uncover major usability difficulties. When developing an e-commerce site in South Africa, the writers claim that these issues should be taken into account.

These studies, on the other hand, only looked at the post-test questionnaire to discover any usability difficulties from the perspective of the customers. In contrast to earlier studies (such as Nielsen 2003 and Sharp et al. 2007) that showed that content and navigation must be included to design usable e-commerce websites, a focus on e-commerce transaction usability (such as category and product pages and customer support) was developed instead of general guidelines such as content and navigation.

To be clear, previous research on e-commerce website user friendliness have all given frameworks or sets of rules for designing and evaluating e-commerce websites that were based on their findings and regardless of the method they used to assess usability (Rekik et al., 2018). Incorporating effective product tagging, in-depth product information and obvious links to orders are some examples of these design guidelines. Other examples include having the shopping cart total visible and easily accessible, as well as a search function that is both visible and easy to use (Rekik et al., 2018; Freeman 2009; Chen and Macredie 2005).

As a result of these results, it will be easier to create e-commerce websites that work well. Important design issues for establishing an accessible e-commerce site have also been discussed in other review sources.

4. Comparative usability assessment criteria

Comparative usability assessment criteria can be divided into two categories: those that apply to the evaluation target and those that apply to all UEMs. Alhadreti et al. (2021) look at layout, terminology, data entry, and comprehensiveness as examples of the first sort of criterion for evaluating a web-based digital library. The criteria associated with the target system, on the other hand, vary substantially depending on the system's user interface paradigm. Other criteria apply to all UEMs rather than just the target system. The following points are mentioned in the study as being particularly important (Table 1.).

Table 1. Criteria for usability assessment

Realness	To determine whether or not a usability discovery is a true usability issue, use the term "realness" (or "importance"). Usability findings can be verified using Oyekunle et al.'s (2020) method, which compares usability findings to an established problem list, expert opinion, and end-user feedback. There are advantages and disadvantages to every strategy in terms of application, cost-effectiveness, and dependability. Any strategy. Research into the severity of this problem will continue in the future (Agustina et al., 2019), as will studies into the combination of severity and likelihood of occurrence.
Validity	There is a ratio of true usability problems to total finds (i.e. real or "false alarms") that can be used to quantify validity (or accuracy) for each application of UEM.
Thoroughness	The degree of thoroughness is determined by the number of (actual) usability issues detected by a UEM compared to the total number of usability issues in the target system (or completeness). Validity needs a comprehensive cross-examination of all UEM results in order to identify all actual flaws.
Effectiveness	The "accuracy and completeness" with which users achieve specified goals has been established for UEMs, which is congruent with the definition of effectiveness in the

	<p>ISO 92412 standard for usability (Law & Hvannberg, 2004). As a result, the effectiveness of UEMs is directly related to their thoroughness and validity (Lewis, 2019). UEM predictive capability is introduced to the efficacy concept in a related study in relation to development teams' acceptance of usability findings. Because of this, development teams are far more likely to address usability concerns in usability reports with "objective" results than "subjective" outcomes (such as terminology discoveries). Additional methodological considerations must be addressed in the latter perspective.</p>
<p>Consistency</p>	<p>It's been proven to be linked to both reliability and consistency. We define UEM consistency at work as the degree to which successive applications of different useable inspection procedures produce "essentially identical" results, and we use this definition in practise. This is a working definition, similar to Molich et al. (2004). Another requirement is to establish trustworthy techniques to interpret similarity in usability data. This can be accomplished in the same manner as the realness issue.</p>

5. Agent Based usability assessment of e-commerce portals

Traditionnal ways of conducting usability tests are prohibitively expensive and time consuming because they necessitate the involvement of domain experts. For usability testing, our Agent-based approach focuses on providing tools that quickly investigate large parameters and a large audience.

The AUA Framework only makes use of HTML source code analysis tools. Begin with analysing e-commerce portal usability guidelines using the AUA framework. The first step is to insert the e-commerce portal's URL into the web servers after initiating the AUA framework. The e-commerce portal's HTML code is stored in the database after the URL is saved in the Framework. After then, the framework assesses the portal's usability based on a predetermined set of criteria. The Framework extracts the HTML code for the website's main page from the database and performs usability tests according to a set of standards.

Conclusion

This paper highlighted that there are several techniques for evaluating the usability of e-commerce websites from three perspectives: users, evaluators, and the tools themselves. There aren't a lot of research that look at how usable e-commerce sites are. On those that

were deemed to be usable, users or other assessors submitted input. Web analytic tools have been used to examine other types of websites and have been effective in identifying potential design or functioning problems; however, there has been minimal usage of these tools to automatically collect statistics on the detailed use of e-commerce sites to date. The research comparing various usability assessment approaches were studied in the next area. The purpose of these methodological research was to compare evaluator-based evaluation approaches with those that used actual users. The comparison included both user testing and heuristic evaluation, but they were not the only approaches studied in each area. To study the potential problem areas revealed by these tools, no comparisons have been made between web analytics software and user- or evaluator-based usability methodologies. The literature in this paper makes it abundantly evident that comparative research can aid in identifying the usability evaluation approach that most successfully detects flaws while also being the most cost-effective. These strategies were used to detect usability issues in a few research.

References

- Saphores, J. D., & Xu, L. (2021). E-shopping changes and the state of E-grocery shopping in the US-Evidence from national travel and time use surveys. *Research in Transportation Economics*, 87, 100864.
- Alao, O. D., Joshua, J. V., & Akinsola, J. E. T. (2019). Human Computer Interaction (HCI) and Smart Home Applications. *IUP Journal of Information Technology*, 15(3), 7-21.
- Miraz, M. H., Ali, M., & Excell, P. S. (2021). Adaptive user interfaces and universal usability through plasticity of user interface design. *Computer Science Review*, 40, 100363.
- Nielsen, J. (2003) "Usability 101: Introduction to Usability." Useit.com. Available from: <http://www.useit.com/alertbox/20030825.html>.
- Kortum, P., & Sorber, M. (2015). Measuring the usability of mobile applications for phones and tablets. *International Journal of Human-Computer Interaction*, 31(8), 518-529.
- Brinck, T., Gergle, D., & Wood, S. D. (2001). *Usability for the web: Designing web sites that work*. Elsevier.
- Rusu, C., Rusu, V., Roncagliolo, S., & González, C. (2015). Usability and user experience: what should we care about?. *International Journal of Information Technologies and Systems Approach (IJITSA)*, 8(2), 1-12.
- Marien, S., Legrand, D., Ramdoyal, R., Nsenga, J., Ospina, G., Ramon, V., & Spinewine, A. (2019). A User-Centered design and usability testing of a web-based medication reconciliation application integrated in an eHealth network. *International journal of medical informatics*, 126, 138-146.
- Rubin, J. (1994). *Handbook of Usability Testing* New York. ed: John Wiley & Sons, Inc.
- Nagpal, R., Mehrotra, D., & Bhatia, P. K. (2017). The state of art in website usability evaluation methods. In *Design Solutions for User-Centric Information Systems* (pp. 275-296). IGI Global.
- Gray, W. D., & Salzman, M. C. (1998). Damaged merchandise? A review of experiments that compare usability evaluation methods. *Human-computer interaction*, 13(3), 203-261.
- Lazar, J. (Ed.). (2007). *Universal usability: Designing computer interfaces for diverse user populations*. John Wiley & Sons.
- Hasan, L., & Morris, A. (2017). Usability problem areas on key international and key Arab E-commerce websites. *Journal of Internet Commerce*, 16(1), 80-103.

- Porat, T., & Tractinsky, N. (2012). It's a pleasure buying here: The effects of web-store design on consumers' emotions and attitudes. *Human-Computer Interaction*, 27(3), 235-276.
- Freeman, M. (2009). Experiences of users from online grocery stores. In *Self-service in the internet age* (pp. 139-160). Springer, London.
- Chen, S. Y., & Macredie, R. D. (2005). The assessment of usability of electronic shopping: A heuristic evaluation. *International journal of information management*, 25(6), 516-532.
- Panda, S. K., Swain, S. K., & Mall, R. (2015). An investigation into usability aspects of E-Commerce websites using users' preferences. *Advances in Computer Science: an International Journal*, 4(1), 65-73.
- Sharp, R. (2007). *Preece. Interaction design: beyond human-computer interaction*, 531.
- Rekik, R., Kallel, I., Casillas, J., & Alimi, A. M. (2018). Assessing web sites quality: A systematic literature review by text and association rules mining. *International journal of information management*, 38(1), 201-216.
- Oyekunle, R., Bello, O., Jubril, Q., Sikiru, I., & Balogun, A. (2020). Usability Evaluation using Eye-Tracking on E-Commerce and Education Domains. *Journal of Information Technology and Computing*, 1(1), 1-13.
- Agustina, B. N., Santoso, H. B., & Fadhilah, S. (2019, October). Usability evaluation of purchasing activity flow on three leading E-commerce platforms9 mobile version in Indonesia: Case studies shopee, Tokopedia, and Bukalapak. In *2019 International Conference on Advanced Computer Science and information Systems (ICACISIS)* (pp. 55-62). IEEE.
- Alhadreti, O. (2021). A Comparison of Synchronous and Asynchronous Remote Usability Testing Methods. *International Journal of Human-Computer Interaction*, 1-9.
- Law, E. L-C., & Hvannberg, E. T., 2004. Analysis of strategies for estimating and improving the effectiveness of heuristic evaluation. In *Proceedings of NordiCHI 2004, 23-27 October, Tampere, Finland*.
- Molich, R. Ede, M.R. Kaasgaard, K. and Karyukin, B., 2004. Comparative usability evaluation, *Behaviour and Information Technology*, Jan-Feb 2004, Vol. 23, No. 1, 65-74.
- Lewis, J. R. (Ed.). (2019). *Usability evaluation: A special issue of the international journal of human-computer interaction*. CRC Press.