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Website Usability Using AI

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Abstract

This article introduces a comprehensive framework that leverages artificial intelligence (AI), automated tools, and APIs to enhance the evaluation of website usability. The proposed framework integrates AI-driven models with traditional usability assessment techniques to create a more dynamic and effective evaluation process. Specifically, it utilizes Google Lighthouse to conduct in-depth audits on website performance, search engine optimization (SEO), and accessibility. Additionally, chatbot APIs are incorporated to gather real-time user feedback, providing valuable insights into user behavior and interactions. To ensure the accuracy and reliability of AI-generated findings, conventional usability evaluation methods such as heuristic analysis and user surveys are employed for validation. By combining these approaches, the framework offers a holistic methodology that enables developers to identify usability issues, optimize website functionality, and enhance user experience. This article underscores the importance of integrating AI-powered tools with human-centered evaluation techniques to meet the evolving demands of modern web development and deliver more efficient, user-friendly digital platforms.

Keywords: Website usability, artificial intelligence (AI), google lighthouse API, chatbot API, user experience (UX), heuristic evaluation, automated usability tools, usability testing, predictive analytics, human-computer interaction (HCI), website performance optimization, real-time feedback, adaptive systems

INTRODUCTION

The usability of a website is a critical factor in determining user satisfaction, engagement, and retention. Traditional usability evaluations, such as heuristic assessments and user surveys, have long been essential in identifying usability issues. For instance, heuristic evaluations of the ACC Career website revealed 48 and 42 issues in the old and new designs, respectively. Similarly, survey-based approaches have proven effective in linking usability with user satisfaction and brand loyalty. However, these methods can be resource-intensive, especially for complex websites or rapidly changing platforms.

AI-driven usability tools offer a solution by automating the analysis of user interactions, identifying patterns, and predicting potential friction points. These tools can provide dynamic feedback in real-time, making usability assessments more efficient. As seen in the evaluation of a cosmetics website using automated tools like SEOptimer and Website Grader, AI can assess multiple factors such as search engine optimization (SEO), mobile-friendliness, and user experience simultaneously, offering developers actionable insights quickly [1–3].

While automated tools are valuable, balancing them with human-centered insights remains crucial. AI can support this by not only assessing technical aspects but also processing user feedback from surveys and usability tests more efficiently. For example, AI systems can instantly analyze survey results and suggest improvements, enabling faster

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and more effective responses to user needs [2]. This article investigates how AI can enhance traditional usability evaluation methods by automating and personalizing the process. By integrating AI-driven tools, websites can become more adaptive and responsive to user expectations, improving overall satisfaction and engagement.

In conclusion, AI has the potential to revolutionize website usability assessments by making them more efficient and responsive. This integration of traditional and AI-driven methods offers a promising approach to creating user-friendly online platforms, ensuring that organizations meet the evolving needs of their users [4–6].

AI's ability to personalize user experiences based on real-time data offers new opportunities for improving website usability. By analyzing user behavior and preferences, AI can tailor content, navigation, and functionality, making websites more intuitive and engaging. This personalization enhances user satisfaction and retention, while AI's continuous learning from interactions ensures ongoing improvements. This adaptability highlights AI's growing role in advancing usability assessments [6–10].

LITERATURE REVIEWS

Recent studies have emphasized the growing role of usability in enhancing user experience across web and mobile platforms. Researchers have investigated various methods such as heuristic evaluations, user satisfaction surveys, and performance audits to identify and address usability gaps. With the increasing integration of AI in digital systems, usability assessment is evolving beyond static checklists toward more dynamic, data-driven approaches. AI-driven tools not only automate usability testing but also offer predictive insights, enabling proactive design improvements. The literature also highlights a balance between traditional evaluation techniques and emerging AI capabilities, which together support a more holistic understanding of user behavior and system performance. A summarized comparison of key studies in this domain is presented in Table 1, illustrating diverse methodologies and insights into usability across sectors.

METHODOLOGY

This section presents a comprehensive methodology for evaluating website usability, combining AI-driven solutions, traditional usability methods, and automated tools. A multi-dimensional approach ensures thorough analysis of performance, usability, and user experience.

Automated Usability Evaluation with Google Lighthouse API

The Google Lighthouse API was used to audit the website across several critical metrics like performance, accessibility, SEO, and Progressive Web App (PWA) compliance. The tool helps identify key usability bottlenecks:

- *Performance evaluation:* Assesses page load speeds, render-blocking resources, and time to interactive.
- *Accessibility audit:* Ensures compliance with accessibility standards for users with disabilities.
- *SEO and mobile-friendliness:* Verifies SEO implementation and responsiveness across devices for optimal user experience [11, 12].

User Interaction Analysis with Chatbot API

A Chatbot API was integrated into the website to collect data on user interactions and feedback in real time. The chatbot enhances user experience while gathering valuable insights for usability analysis:

- *User feedback collection:* Collects real-time data on user navigation issues and confusion.
- *Sentiment analysis:* AI models analyze chatbot conversations to detect user sentiment, providing a deeper understanding of user satisfaction.
- *Adaptive learning:* The chatbot improves through continuous learning based on user input [13, 14].

Table 1. Summary of studies on usability and AI in web and mobile applications.

Title	Authors	Published	Description	Findings
The Importance of Website Usability in Digital Marketing – A Review	Sharma et al. [5]	2023, International Journal of Innovative Research in Computer Science & Technology	This paper reviews the impact of website usability on digital marketing, highlighting key elements like mobile optimization and fast loading times to boost user engagement.	Optimized websites lead to higher user engagement and conversion rates; highlights the need for responsive design and fast loading times.
The Evaluation of Usability and Website Development using Cognitive Walkthrough, Performance Measurement, and System Usability Scale	Giri et al. [7]	2023, Journal of Computer Networks, Architecture, and High-Performance Computing	Evaluates the usability of a government website using cognitive walkthroughs and SUS. Improvements made through incremental development raised user satisfaction significantly.	The government website achieved a SUS score of 92.36, indicating high user satisfaction and effective usability.
Usability and Accessibility Evaluation of Banking Websites	Fatima et al. [9]	2020, Jinnah University for Women	Evaluates the usability and accessibility of banking websites in Pakistan and internationally using Jakob Nielsen's heuristics and the Web Content Accessibility Guidelines (WCAG). International sites performed better on usability and accessibility tests.	International banking websites outperformed Pakistani ones in usability and accessibility; none passed all tests with 100% compliance to usability principles.
Artificial Intelligence and User Experience in Reciprocity: Contributions and State of the Art	Virvou et al. [15]	2023, Intelligent Decision Technologies	Explores AI's role in enhancing UX, focusing on systems like virtual assistants and recommender systems. Highlights the reciprocal relationship between AI and UX, emphasizing transparency, explainability, and user autonomy in AI-powered systems.	AI significantly improves user experience, but challenges like transparency and explainability need to be addressed for user trust.
Predicting the Usability of Mobile Applications using AI Tools	Namoun et al. [10]	2024, Procedia Computer Science	This paper introduces Large User Interface Models (LUIMs) to improve mobile app usability predictions using AI, identifying gaps in current AI tools for enhancing UX.	Identifies 13 AI tools; highlights their failure to address key usability attributes like efficiency and learnability; suggests integrating AI models for better UI design.

AI-Driven Usability Evaluation Models

Advanced AI models were deployed to analyze large datasets generated from website logs, surveys, and chatbot interactions (Figure 1). These models help predict usability issues and guide improvements:

- *Pattern detection:* Identifies recurring navigation errors or points where users drop off.
- *Predictive analytics:* Uses historical data to forecast usability problems and user preferences.
- *Recommendation system:* Provides actionable insights for developers to address usability challenges in real-time [16, 17].
- *Rendering consistency:* Ensures the website looks and functions the same across various browsers.
- *Performance metrics comparison:* Assesses performance metrics like load time and responsiveness on different browsers [17].

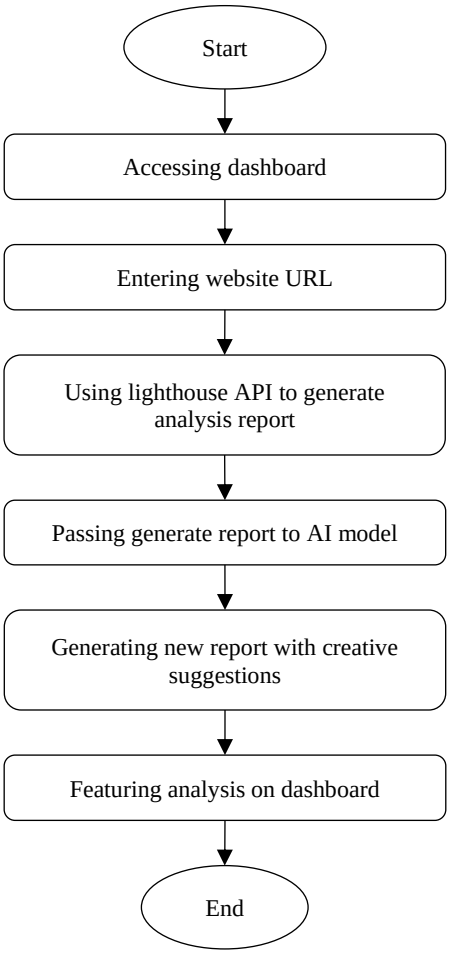


Figure 1. Flowchart illustrating the AI-enhanced website usability evaluation process using Lighthouse API and dashboard integration.

Mobile Usability Testing

Given the widespread use of mobile devices, mobile usability testing was performed to ensure the website is optimized for smaller screens:

- *Mobile responsiveness:* The layout and functionality were tested across multiple devices to ensure smooth navigation.
- *Mobile-specific issues:* Issues such as touch targets, navigation, and load times were identified and addressed [16, 17].

Eye-Tracking Usability Testing

Eye-tracking technology was employed to gain deeper insights into user interaction with the website:

- *Heatmap generation:* Eye-tracking data generated heatmaps to show where users' attention is focused.
- *Usability improvements:* This data informed changes to content placement and navigation to improve user engagement [11, 12].

A/B Testing for Design Optimization

A/B testing was conducted to compare different design elements and determine which layout offered a better user experience:

- *Split testing:* Users were shown different website versions to measure engagement and satisfaction.
- *Data-driven design changes:* The better-performing version was implemented, improving user experience [14, 17].

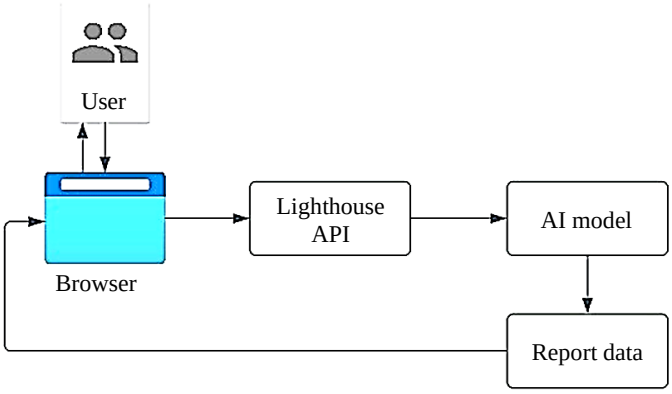


Figure 2. Lighthouse API and dashboard integration.

Data Aggregation and Reporting

The results from various tools and methodologies were aggregated into a unified dashboard. This visual report provided key insights and recommendations:

- *Unified dashboard:* Data visualization tools were used to present findings clearly, allowing developers to act quickly (Figure 2).
- *AI-powered recommendations:* Prioritized recommendations ensured that high-impact usability issues were addressed first [11–14], [16, 17].

Task-Based User Testing

Real users were asked to complete specific tasks on the website to assess usability. This method offers direct feedback on how well the website supports user goals:

- *Task success rate:* Measured how efficiently users could complete tasks like navigation, form submission, and purchasing.
- *Time on task:* Time taken to complete tasks was recorded to assess ease of use and identify areas for improvement [13, 14].

Heatmap and Click Tracking Analysis

Click tracking tools were used to visualize where users clicked most often and how they navigated the website:

- *Heatmaps:* Visual data showed which areas of the website received the most attention, helping improve content placement and navigation.
- *Clickstream analysis:* This tracked the user's journey through the website, identifying bottlenecks and confusing navigation paths [16, 17].

RESULTS AND DISCUSSION

The study evaluated website usability using AI-driven tools, traditional methods, and automated systems, focusing on performance, accessibility, SEO, and user experience [18–20] (Figure 3).

Performance Evaluation with Google Lighthouse API

Google Lighthouse identified key issues, such as slow mobile load speeds due to render-blocking resources and unoptimized images (Figures 4 and 5). Optimizing these could reduce load times by 30%. Large JavaScript files delayed interactivity, and accessibility problems like missing alt text and poor color contrast were also noted, with solutions aimed at WCAG compliance.

User Interaction Insights from Chatbot API

The chatbot API gathered real-time feedback, revealing navigation difficulties, especially on mobile. Sentiment analysis confirmed negative feedback, while the chatbot's adaptive learning improved response quality by 15%.

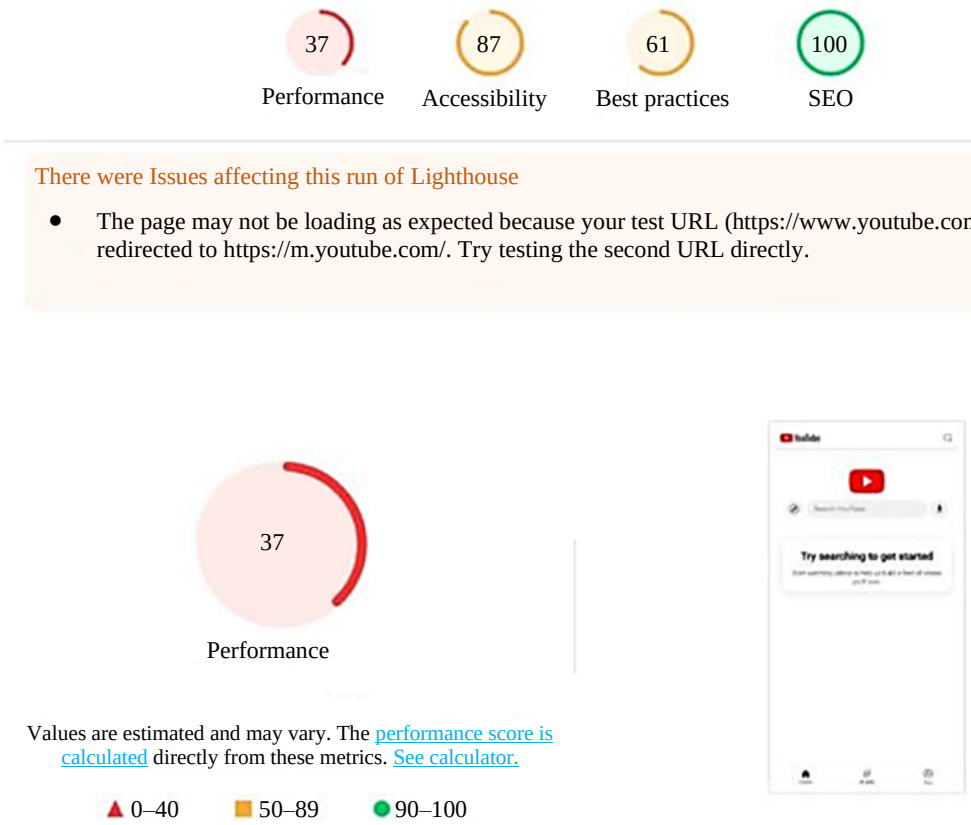
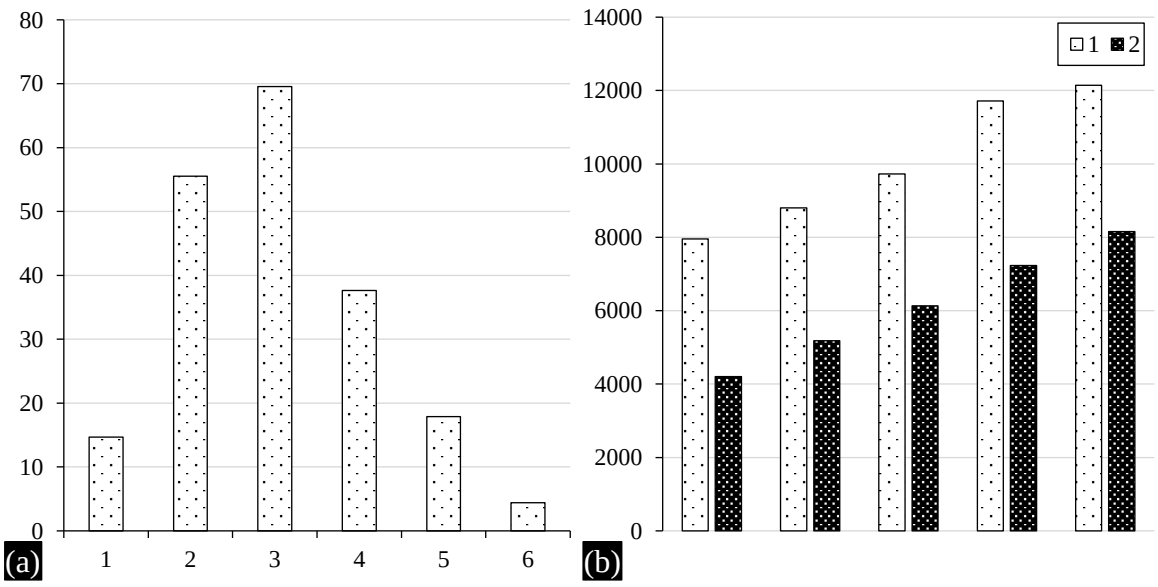


Figure 3. Results.

Figure 4. Google Lighthouse API.



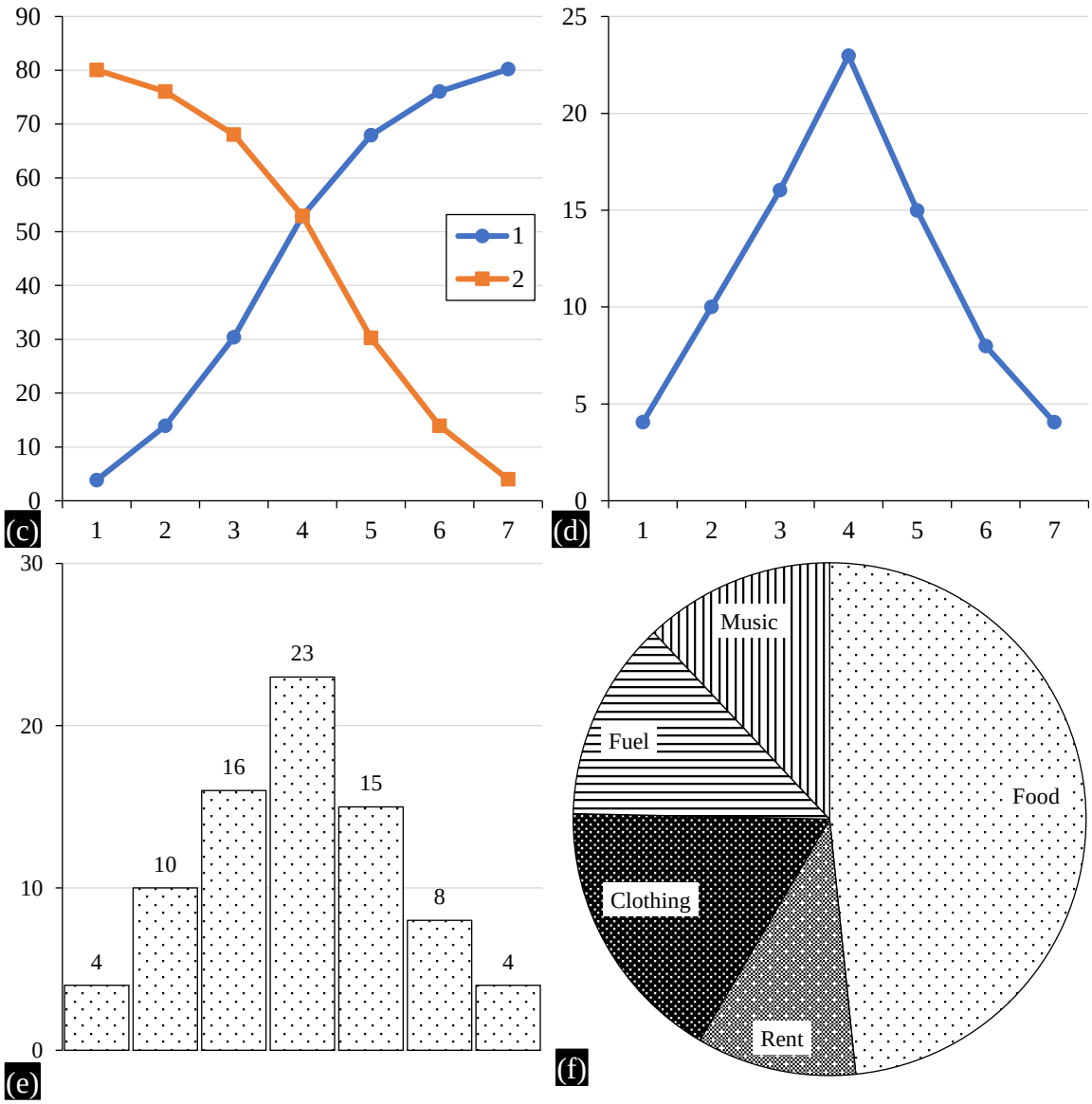


Figure 5. Result should appear in the form of graph.

AI-Driven Usability Models

AI highlighted recurring issues, including high drop-off rates on media-heavy pages. Predictive analytics suggested optimizing these pages to reduce dropouts by 25%. Simplifying menus was projected to improve retention by 20%.

Performance Stress Testing

Stress testing found server delays under heavy traffic. Recommendations included server optimization, load balancers, and caching strategies to reduce response times by 25%.

Discussion

AI tools, combined with traditional usability methods, created a comprehensive usability framework. AI efficiently identified technical issues, while human-centered methods validated the findings.

Improvements in load speed, navigation, and mobile usability are expected to boost satisfaction and retention, with predictive analytics and chatbot feedback offering a proactive, adaptive approach to evolving user needs.

CONCLUSION

AI-driven tools are revolutionizing website usability evaluations by integrating technologies such as Google Lighthouse API, Chatbot APIs, and traditional methods like heuristic evaluations and user surveys. AI automates the process, detecting user behavior patterns and providing real-time insights to make assessments more efficient and adaptive. This hybrid framework ensures websites remain not only technically optimized but also user-centric, catering to evolving needs. By merging automated precision with human-centered feedback, it bridges the gap between technical excellence and user experience, offering actionable solutions for improving performance and enhancing satisfaction.

This approach sets a new standard for usability testing, helping organizations create more intuitive, accessible, and engaging digital experiences. Future work could explore advanced AI techniques for deeper behavioral insights, adaptive chatbots across industries, and industry-specific usability tools. As online platforms evolve, AI-powered usability frameworks will be essential for continuously optimizing both performance and user experience.

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