# Human Computer Interaction: How Website Developers Improve User Experience

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**ABSTRACT**

Every day, companies with great products and services lose out on potential customers due to poor web design choices. To effectively communicate goals and meet user needs, I propose integrating the principles of Human Computer Interaction into the web development process and testing user satisfaction throughout. Web developers should be relatively familiar with main HCI ideas, which should be integrated into Computer Science curriculums. Any website under development should continuously test user satisfaction to ensure the design choices are positively impacting efficiency and effectiveness. Through these improvements in the design process, companies may find a return on their initial investments in development. More satisfied users are more likely to return to the site and make additional purchases or generate more advertising revenue. In the future, the HMI design process could be automated to reduce cost and time spent in the development phase. New methods for testing user satisfaction can also be explored to ensure the website's design is effective before it is released.

## 1. INTRODUCTION

At some point in our online lives, essentially all of us have stumbled upon a painful website design. At a minimum, most of us have found ourselves wondering how to navigate through a confusing and directionless webpage. All these issues stem from the lack of thought towards Human Computer Interaction. Most importantly, a website is worthless if the intended users cannot navigate as desired, or if its design detracts from the company's main objectives. If a website experience results in a user clicking away to find other alternatives, the website has failed as a tool for the company - regardless of any complex functionalities or capabilities.

At the root of the issue, developers are often disconnected from the target demographic of users for the applications they are building. Further, they do not understand the fundamental principles of the psychology behind human and computer interaction. Companies spend hundreds of thousands of dollars on web developers to create a functional website but spend little to no resources on ensuring the design of that website complements the functionalities. These factors combined create a gap between what the ideal website design should look like and the actual developed website.

## 2. RELATED WORKS

Authors Nah and Davis (2002) focused their research specifically on HCI issues in the e-commerce realm, a subset of the overall scope I was interested in. Additionally, they researched aspects that gain user trust and

credibility, an element of online commerce that is extremely important for the customer. Selling products online presents a range of new variables for customers, such as the trustworthiness of the seller, the reliability of the buying process, privacy of the transaction, and buying satisfaction. These concerns can no longer be assessed through physically examining the business location or product, so they must be conveyed accurately by the company through their online website. This burden becomes a matter of design and usability of the website as it is the only interaction the user has with the company. Moreover, Nah and Davis discuss the criticality of easy-to-use navigation options to ensure that users can find the items they are searching for. They also highlight the value of giving the user a sense of control over the products they are searching for, which improves the user experience and increases satisfaction. The general usability engineering research is directly related to the focus of my research, but it deviates when examining the specific e-commerce connections to HCI.

Author Rogers (2004) inspects a unique angle of HCI diving into the different theoretical approaches to assessing human behavior. This paper includes the psychological perspective of HCI, which is much deeper than my research scope goes. Rogers examines multiple new HCI theories including ecological, activity theory, external cognition, and internal cognition approaches. All these theories have their own attributes and explanations for human behavior. For example, the ecological approach emphasizes the human's interactions with their surrounding environment and has two main components: ecological constraints and affordances which refer to external factors effect on behavior and how attributes of objects allow people to use them. Rogers' research is valuable to the advancement of HCI but takes a more theoretical approach, making it useful background information for my research into the application of common HCI techniques.

## 3. PROPOSED DESIGN

To maximize website efficiency, usability, and accessibility, web development teams should adequately test their user interface (UI) choices. The following research design acts as a template for developers to verify their website layout serves its intended target demographic and functions as expected. The setup and methodology can be altered as required to fit any specific web development needs, but the general structure should remain the same.

### 3.1 OBJECTIVES

Before any user testing can occur, teams need to explicitly define requirements for their application. It is essential that developers create a priority list containing important functions their website accomplishes. Since most website development timelines are tightly constrained, this priority list highlights what to focus testing efforts on within those constraints. Within those functions, teams can outline specific measures to assess efficiency and design effectiveness, such as time or minimum number of clicks to complete. Therefore, the objective of the user study is to minimize or maximize these measures to create a more usable website. Furthermore, participants can be surveyed to determine which design choices resulted in higher usability satisfaction scores.

### 3.2 PARTICIPANTS

To ensure a website maximizes its efficiency with users, developers must define a target demographic and comprehensively test with a subset of that group. For example, if a website is intended for educational learning with grades kindergarten through fifth, the developers are inherently disconnected from their target audience and should test such a

website with kids in this demographic. For broader use cases, website developers should intentionally select a sample test group with different cultural and educational backgrounds to reduce any potential biases in the final design. With a representative participant sample group, the tests will result in meaningful data points which lead to enhanced design decisions.

### 3.3 METHODOLOGY

Developers need to compile multiple styles and combinations of design choices to test with the users. During the tests, website selection for a user should be randomized to account for any miscellaneous external factors that may affect the outcomes. All participants should be randomly assigned a task corresponding to the prioritized functionalities in the list created by the developers. The users then should be monitored as they attempt to perform their tasks and can be measured based on any of the selected testing instruments outlined in the section below.

#### 3.3.1 TESTING INSTRUMENTS

Measuring any website design's effectiveness and efficiency requires numerical approaches to easily compare the data without bias. Tasks should be explicitly defined to include a completion step allowing testers to record stats such as time taken to complete and success rate. Other stats such as clicks to completion or eye movement location can be recorded to inform further design decisions. Lastly, user surveys are valuable insight into the user perspective on website design choices that worked well and those that did not. The result is a more positive experience for the website users and taking their feedback into consideration is of the utmost importance.

#### 3.3.2 DATA ANALYSIS

After performing the usability testing, the numerical data collected can be compiled and the statistics for each website design can be compared. Different designs may favor one task over another in terms of completion time and user satisfaction, in which case the task highest on the priority list should be favored. All methods of collected data must be taken into consideration during these steps, as it is not enough to rely on one testing instrument to verify overall performance.

After compiling the data, statistical tests, such as t-tests and ANOVA tests, can be performed to determine whether any differences are statistically significant and provide evidence that one design is more effective than another.

### 3.4 LIMITATIONS

Performing these tests provide helpful insight into the typical user experience, but the process heavily depends on the participants involved. If the participants chosen are abnormal and do not accurately represent the average user, the results of the testing may be skewed. Therefore, it is important to randomly select participants as well as take an adequate sample size to minimize this skewing effect.

The testing is also limited to the different website examples created by the development team. More effective designs may exist, but the process may never uncover them. Developer teams should survey the participants and consider any alternative approaches proposed, which may reveal better layouts and navigation flows for the website.

Lastly, the entire testing process is dependent on the timeline allocated to the developers to complete the website. If timing is too tight, testing may be reduced or omitted entirely in favor of completing the core functionality. The methods proposed are only relevant for teams with ample time to recruit

participants, create multiple test websites, and use the results to iterate on their designs.

## 4. ANTICIPATED RESULTS

After following the testing procedure outlined, development teams can expect to increase their website's overall user satisfaction. An adequate participant size representing an application's target audience will result in deep insights into how users realistically interact with design elements and their opinions on them. Design choices can be made around these insights, improving the efficiency of the website and positively representing the website owners. The increased workload to implement usability testing into website development pipelines is well worth the time spent. It ensures any website's users can perform their intended functions while minimizing user stress and resentment, which can potentially harm profits and reduce further user interaction.

## 5. CONCLUSION

The need for thoughtful and intuitive web designs is greater than ever. In today's digital world, millions of people rely on web applications in their daily lives. Focusing on designing usable websites will save users countless hours and benefits the companies that choose to invest in it. Studies have shown that user satisfaction is a major factor for gaining repeat customers, which is a massive financial benefit to increasing usability. Websites that attract and retain users are simply better for everyone.

## 6. FUTURE WORK

Usability testing is not only important for websites, and the core ideas expressed in the procedure are applicable to all types of user interfaces. Future work could expand this process to include other media forms. Furthermore, there exist many more methods of UI testing that can be added to my compiled list of testing instruments. These methods can also explore different metrics to determine which design is considered most usable. In a broader scope, there is always work to be done to create more accessible websites, such as tools for the visually impaired or deaf users. It is vital to consider these users when developing and testing new user interfaces, and further techniques to do so should be expanded.

## REFERENCES


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