

**Demonstrating the Technical Capabilities of Mixed Reality Presentations**

**The Influence of UX Design on User Experience with Websites**

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By

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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## Introduction

In August of 1991, the first website was officially launched at the European Organization for Nuclear Research by Tim Berners-Lee, a British computer scientist. In Berners-Lee memoir, he writes that “the ultimate goal of the Web is to support and improve our weblike existence in the world” (Berners-Lee, 1999, p. 133). The creation of the internet transformed the way data is shared and people are. 200 million websites are considered active (maintained and visited), however including inactive and stagnant websites more than *quintuples* this number to 1.13 billion, according to a recent Forbes report (Haan, 2023, para. 1). User Experience (UX) design focuses on interaction between humans and digital systems and has become a large factor in determining the success and effectiveness of websites and software platforms.

In the early stages of the internet, simplicity was key, as web designers focused their efforts on delivering information and ensuring accessibility. As computers became more and more prevalent and users' expectations continued to grow, the concepts of UX design started to be established. The term was first coined in 1995 by Apple Computer cognitive psychologist Don Norman, in search of a term that would “cover all aspects of the person’s experience with a system, including industrial design, graphics, the interface, the physical interaction, and the manual” (Viera, 2020, para. 9). As the internet has evolved, it has become increasingly important for websites’ success that information is presented and interacted with in a way that is pleasing to users. While it may have been different when the internet had just been invented, sites can not rely solely on the quality of their content to be considered successful. This can help explain why Craigslist, with its 191 million monthly visits, falls far behind Facebook Marketplace, boasting 1.12 billion monthly visits despite being founded almost 10 years later (Similarweb LTD, 2023;

Capital One, 2023). This shift has since brought forth a new era where UX design principles are not just recommended but essential for creating engaging, effective, and user-friendly online experiences.

This paper will dive into UX design, techniques that UX designers use, and the outcome of those techniques, as it relates to software like websites and mobile applications. Additionally, this technical project will discuss the capabilities of extended reality and the implications that it will have on the professional workforce.

### **Technical Topic**

When acknowledging the techniques that websites and applications employ to be more usable, it is important to also consider the implications that this has on the future of technology with the dawn of augmented, virtual, and mixed reality, which differ slightly. Augmented reality puts digital overlays on top of real-world vision, virtual reality fully immerses the user in a digital environment, and mixed reality uses a view of the real world but allows physical and digital content to interact. The term extended reality (XR) serves as a comprehensive framework, encompassing augmented, virtual, and mixed reality simultaneously. XR is poised to redefine work processes by offering a glimpse into the future of the professional landscape. In the context of this technical project, our focus is directed towards understanding the methods and implications of XR in shaping the future workplace, aimed at exploring how these immersive technologies are set to revolutionize how we work and collaborate in the years to come.

For my technical report, I recently had the opportunity to spend a summer interning with Raytheon, a major U.S. defense contractor. While working, I utilized several different programs to create mixed reality demonstrations for the Microsoft HoloLens 2 as well as augmented reality demonstrations compatible with iOS. My work was primarily focused on a technical support

program called VirtualWorx<sup>®</sup>. VirtualWorx<sup>®</sup> is a software compatible that exists to provide remote technical support anywhere in the world, via satellite communication. With this program, a user located in remote areas of the globe can interface live using goggles or tablets with a technical support user, located thousands of miles away. Depending on the configuration of devices, support technicians can make live annotations on the virtual feed or tablet screen being viewed by the user. This could be anything from simply decoding error messages, indicating which button to press, or helping to diagnose further issues by viewing faulty wire connections or misconfigured setups. While similar commercially available software exists (e.g., Zoom, FaceTime, Skype), VirtualWorx<sup>®</sup> is set apart by two main factors. First, it delivers secure, rich, high-definition information across a variety of device configurations. Second, it can function in environments where bandwidth is low, which could be critical in remote areas of the world.

As an intern, I was a part of the team that helped demonstrate the capabilities to corporate leaders, so they can understand more about how effective this technology can be. My work consisted of 3 stages. First, I was responsible for helping to build 3D models and animations of different objects, like engine parts. Second, I helped leverage the models built to create 3D environments with a user interface to be used on both iOS and augmented reality headsets, showcasing the interactive functionality of the software. Finally, I was able to help demonstrate my team's work to leadership during monthly review meetings, where I was able to showcase the capabilities of the software.

## **Two Frameworks in Software Design**

Software design is responsible for crafting the feel and functionality of websites and applications. The relationship between software designers and end users is moderated through UX designers, who are tasked with building software that people will find usable, enjoyable, and

accessible (Coursera, 2023). Understanding how UX design affects software is crucial for creating experiences that are not only efficient, user friendly, and aesthetically pleasing.

Ultimately, UX design helps dictate a given software's success.

Hughes's (1987) theory of technological momentum is an apt framework for understanding the interactions between software and its users. The idea of technological momentum is that when a technology begins to grow and gain momentum (popularity, influence, etc.), it becomes increasingly challenging to alter its course or change its direction. In the context of software design, this implies that software is guided by the technological landscape at any moment and is unreceptive to human control. Another example lies in design paradigms. Once a particular user interface design trend gains momentum and becomes popular, it often continues to influence subsequent software applications. For instance, the trend towards minimalist and flat design in interfaces has demonstrated strong technological momentum, shaping visual aesthetics of various software products in recent history.

However, it is also worthwhile to consider the idea of soft determinism, which recognizes that technology is not all controlling. Instead, it emphasizes technology's reciprocal influence, that technology is subject to ongoing adaptation by human design and social perceptions. This paradox relating to the influence that human control over software design makes it incredibly interesting to study. With regards to the relationship between UX designers and users, soft determinism seeks to understand the ever-changing nature and responsiveness of technology over the course of time. By understanding this, we can understand how software designs are not just products of technological development, but instead they incorporate needs and preferences of users in the digital landscape.

This paradox between technological momentum and soft determinism makes the realm of UX design incredibly interesting to study. For example, UX designers make initial design choices influenced by technology and industry standards. However, the concept of soft determinism emphasizes that these choices are not fixed. As users interact with the software, their feedback becomes a driving force for adjustments. This ongoing dialogue between designers and users challenges the idea that software development follows a predetermined path solely dictated by technology. This leads to regular updates and modifications in response to user needs. Design choices are adaptable, ensuring that the software remains responsive to evolving user expectations. This perspective embraces an ongoing dialogue between designers and users, highlighting the collaborative and flexible nature of software development in adapting to user feedback and changing technological landscapes.

### **Research Design**

This relationship between different social groups and technology is multifaceted. As users' expectations continue to grow, developers must learn how to not only meet but exceed user needs and desires. Understanding the influence of UX design techniques is crucial for businesses seeking to remain competitive and relevant in the digital world. In the realm of UX design, a fundamental research question arises: How can the application of design techniques impact the overall user experience of digital products?

To investigate this question, I will conduct extensive literature reviews to gain insights into the history as well as the future of the latest trends and emerging UX design techniques. This foundational research will provide a comprehensive understanding of the current landscape. I will conduct usability tests and interview users to gather qualitative data on how certain UX decisions are perceived.

This will provide a holistic view of the subject, enabling businesses and designers to make informed decisions that prioritize the user experience in the design and development process. The technological frameworks described earlier will help serve as a lens to understand and analyze these findings. As Hornbæk addresses in his article, usability testing methods typically aim to quantify three major areas: effectiveness, efficiency, and satisfaction (Hornbæk, 2019). I plan on relying on a large amount of user survey data to answer this research question of how UX design can affect a website. This research aims to shed light on the understanding of UX design, and to inform how to create digital products that are effective, efficient, and satisfying.

## **Conclusion**

In conclusion, the research that will be conducted has been driven by a fundamental question: How can UX design techniques influence the user experience with regards to websites and applications? This question is more relevant now than ever, where user-centric design is a necessity for businesses striving to remain relevant. The application of innovative UX design techniques has the potential to transform the way we interact with and perceive digital interfaces. As user experiences continue to shape our interactions with technology, improved design techniques can lead to enhanced usability, higher user satisfaction, and increased engagement. Ultimately, this can result in a more user-friendly digital environment, benefiting individuals, businesses, and society at large.

The insights learned from this paper will help to offer practical guidance to UX designers, businesses, and developers seeking to create usable pieces of software. The research will also contribute to a broader understanding of the evolving field of UX design, shedding light on the correlation between specific design techniques and key UX metrics. This knowledge will

empower designers to create usable programs that prioritize the user experience by being effective, efficient, and satisfying.



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