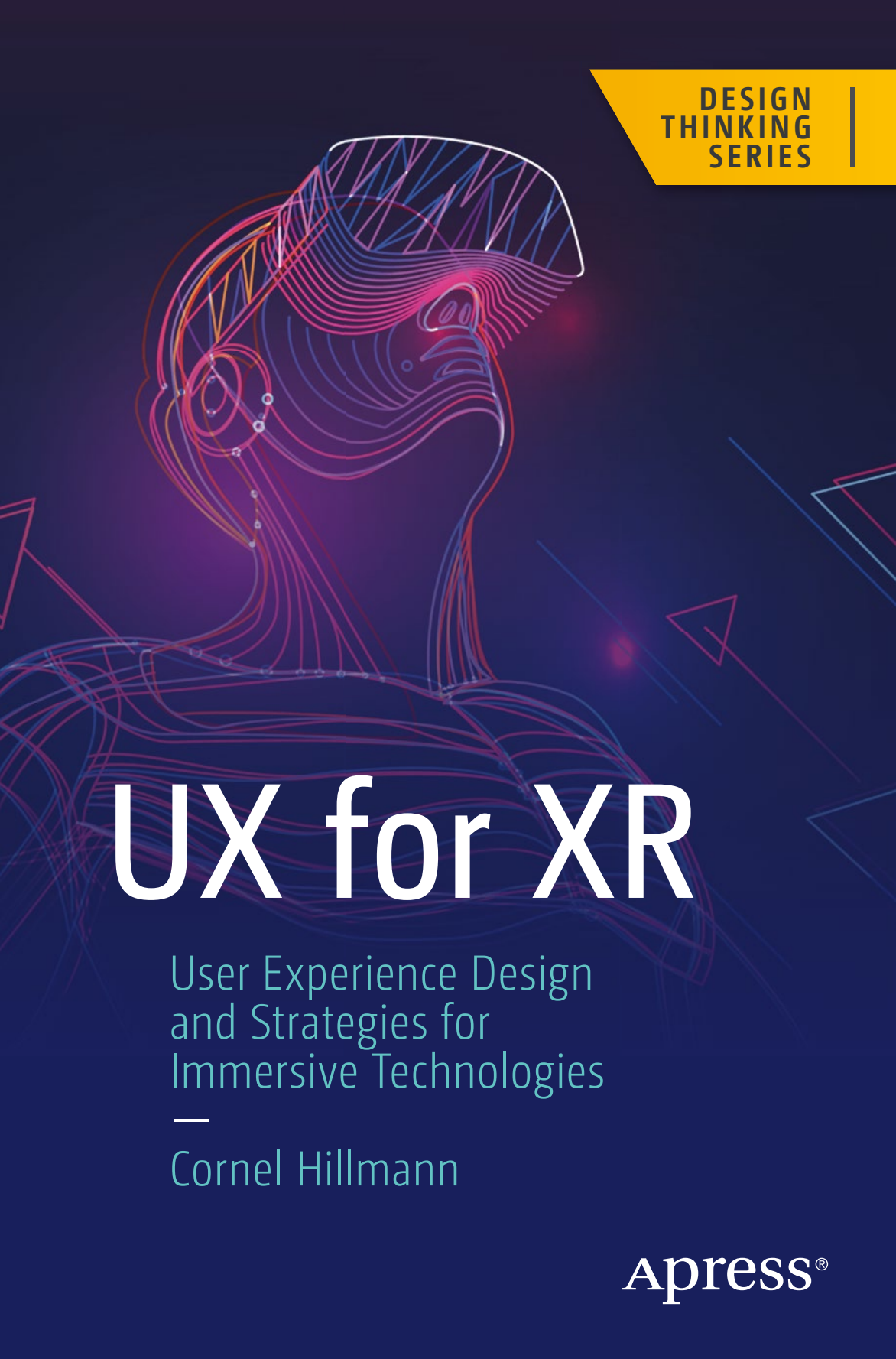




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User Experience Design and Strategies for Immersive Technologies

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Cornel Hillmann
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For Audrey, LeNoir, LeMorbier, and LeInky

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About the Author



Cornel Hillmann is a CG artist and XR designer with over 20 years of experience in the media and entertainment, advertising, and design industry. He's worked with brands including Panasonic, Jaguar, The Future Is Wild, the Singapore International Film Festival, Razor, and many others. Cornel started his career as an art director in Los Angeles after receiving his diploma in computer

graphics. He founded CNT Media GmbH in Hamburg, Germany, and Emerging Entertainment Pte. Ltd. in Southeast Asia, before establishing studio.cgartist.com as a design studio in Singapore. Cornel has lectured master classes for immersive media postproduction and advanced 3D, VR, and media design courses at Limkokwing University and is the author of *Unreal for Mobile and Standalone VR* (Apress, 2019). Cornel spends most of his time using the Unreal engine for XR productions and enterprise visualizations.

During his spare time, you will find him in the VR multiplayer classic *Dead and Buried II* and occasionally in *Population: One*, *Hyper Dash*, and *Altspace*, unless jamming in his virtual synth studio, working on his personal passion projects, or writing software and creative tech reviews for his network partners.

About the Technical Reviewer

Tino Kuhn is a UX design lead and digital creative director, known to effortlessly combine creative storytelling and modern-day experience design with UX strategy and creative direction of digital marketing in different media and industry verticals. He has won several awards in creative advertising and digital marketing for his innovative ways in implementing impactful product experience on mobile platforms. His work includes UX design and strategy for such clients as Emirates, Vodafone, and Nando's, with a recent focus on education marketing and EdTech for innovative social platforms.

Tino established a new media design studio in his hometown Hamburg before moving to Melbourne, Australia, where he has continued his career as an early adopter of emerging technologies in the creative marketing space. He is currently working with Open Universities Australia, one of the biggest education and academic provider platforms in Australia. His passion for 360 video and VR gaming motivates him to develop a future gamified learning platform and a mental health app as a side gig.

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And last but not least, thanks to the people who bought my previous book and inspired me to keep going with their appreciation and friendly encouragement.

Preface

This book is an exploration into the challenges and opportunities of designing for XR, an emerging space with a constantly changing landscape and almost daily breaking news of innovation. Therefore, it is an attempt to find a balance between landscape analysis and practical use case design evaluation. But other than pitching the dichotomy of academia vs. practice or hierarchical taxonomy vs. heuristic evaluation, the goal of this book is to capture all the elements that are driving the XR evolution forward, including history, ideas, platforms, as well as economic context and focus on the important concepts, very often lifted from toolsets or frameworks, that help designers, in their role as product designers, navigate the XR universe and give them a head start on the wider subject.

The book also reflects my journey as an XR designer coming from interaction and game design and adapting UX methodologies to XR projects that were previously governed by game design techniques, standards, and methods, typically centered around the game design document (GDD) as the product development hub. XR product design owes the majority of its tools and techniques to game design, which has evolved over the last decades from a tiny niche to the dominating entertainment industry that it is today. A development that could be repeated with XR products, if we get the user experience right.

I was first introduced to virtual reality by the late Timothy Leary, out of all people. Don't put down the book just yet. Leary was, at that point in the early to mid-1990s, way past his earlier role as the pied piper of the psychedelic generation; instead, he, in his senior years, advocated virtual reality as a vehicle for his bigger ideas. I met him at the very beginning of my career, while on my first real job as a designer in LA, introduced by a

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close friend. His enthusiastic techno utopian vision about the liberation of mankind through VR seemed wild and way over the top, to my job-focused mind at the time. Back then he wrote: “Electronic reality is more real than the physical world! This is a profound evolutionary leap. It can be compared to the jump from ocean to shoreline, when land and air suddenly become more real to the ex-fish than water!” (Timothy Leary, *Chaos & Cyberculture*, 1994, page 48). Even two years earlier, in 1992, at the age of 72, he explained in a press conference of the Travel and Tourism Research Association in Minneapolis that “Virtual reality will one day make business travel all but obsolete, since people will be able to come together electronically to create...telepresence” (a quote from an article in the *Baltimore Sun*, from June 16, 1992).

People at that time, including my youngster self, were reacting with skepticism: “Great ideas, but it’s not going to happen in our lifetime.”

Nevertheless, hanging out with such a counterculture icon taught me a lesson: Never underestimate the power of big ideas. As it turned out, he was right on a lot of his predictions that became a reality 20 years later. When I was able to get my hands on the DK1 (Development Kit 1) for the Oculus Rift in 2014, my mind was blown. Once I stepped into a life-scale 3D space that I had modeled and designed earlier and was able to move around in it using the DK1, I was more than sold. It was a life-changing moment to be able to live in your own virtual creation. The idea of being able to build your own reality echoing back conversations that took place 20 years earlier gave me more than nerd chills; it injected me with a new dose of purpose and vision.

UX design, on the other hand, was an acquired taste for me, after I first discovered it about a decade ago. Like an exotic fruit, it first tasted sweet and bitter at the same time and had to grow on me over time. Bitter, because it forced me to rethink a lot of ways in which I previously worked. Sweet, because I began to appreciate the elegance and depth of its systems and the advantages of a shared language that brings everyone together on the same page. Game design has a lot of similar components as UX

design – user research, stakeholder interviews, prototyping, and focus group tests – but the UX design process is embedded into a whole canon of product design systems and philosophies that, navigating it under the general ideas of design thinking, makes it satisfying and results oriented, with the extraordinary success stories of the digital economy partly owed to it. Game design used to put less emphasis on user research and UX methods because the attitude was often “I’m not biased, I just happen to know what users want,” but that is also partially due to the fact that the game industry is often a very different animal and, to a great degree, genre driven.

The mission of this book is to map the territory, take a snapshot of where we are in the XR department of the digital transformation process, lay out approaches to XR design problems, and give hints and pointers to problem-solving ideas. The two biggest groups this book approaches are, on one hand, XR game designers interested in adopting UX design principles and, on the other hand, UX designers coming from web and mobile design, ready to take on XR. Covering the two different angles means either party will find some information they already know. Game designers most likely understand the role of visual scripting for frameworks, while UX designers probably don’t need an explanation of the double diamond. Nevertheless, it is important to cover both angles, because the mission of the book is to bring both of these loose ends together. The beauty of applying the UX design process to digital product design in the XR space means working with a winning formula that is proven to be successful. A special shout-out in this context is due to my technical reviewer, Tino Kuhn, whom I’ve been following for a long time, observing his inspiring career as a UX lead. Tino went well out his way to spend extra time and effort to evaluate the ideas of the book and guide the workshops that led to the practical examples, especially those covered in the last chapter. His extensive knowledge and experience as a workshopper for enterprise projects helped to keep the focus on the main goals.

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The goals are to get people started in XR design, to give an overview over ideas, platforms, tools, concepts, and useful design systems and interaction patterns.

Looking back at how design patterns have evolved over this incarnation of VR, which started back in 2013 with the Oculus Rift on Kickstarter, gives an idea of how much has happened since.

During the early baby steps, when the Oculus Rift was launched in 2016, the buzzword was “presence,” and the UX focus was on what not to do: Don’t break immersion, don’t make people sick, don’t do anything unnatural if possible. Fast forward to 2021 and no one talks about “presence” anymore; instead, we keep using the term *immersion* in its place, because it is more useful in differentiating the context. The paranoia about immersion breaking actions and unnatural motion has been contained, because we understand it much better now and are instead starting to embrace the opposite by often endorsing superpowers.

The intention of this book is to be a primer on the subject, including the important contextual information. XR game designers will hopefully understand how UX thinking is beneficial to a production, while UX designers, coming from web and mobile design, will get a complete overview of where things are coming from and are headed toward and what techniques, tools, or platforms to use.

The book identifies prototyping as one of the main pain points for UX designers. The game engine-based process for fully functional and interactive prototypes is still a very complex and technical enterprise with a steep learning curve, or a “bag of hurt” as Steve Jobs would have said. But there is hope on the horizon, for example, the upcoming version of the XR design tool Tvorì with basic interaction simulations. To be able to design in context using a spatial design app is ultimately the best long-term scenario for designers.

Finally, we should acknowledge that UX design for XR will only be mastered if one understands the secrets and wisdom of the *exit burrito*.

What is the *exit burrito*? Turns out, it's not your last meal before leaving this planet, but instead the way to end a game in the VR title *Job Simulator*. You have to grab a burrito from a suitcase and stuff it into your face with two bites to confirm your intentions to exit the game. The wisdom behind it is: The weirdest interactions can become surprisingly satisfying when paired meaningfully and playtested properly. The secret to unlocking XR creativity is: The idea of literal gestures triggering meaningful action opens the door to endless opportunities. How about literally kicking a can down the road in VR to extend playtime or to literally hold a stake in a VR meeting to identify a stakeholder, when raising hands? Well, this can get pretty silly, but at the same time fun and inspirational, and that is what XR is all about. It's playtime for the mind.

We are currently moving into a mature state of the industry, but the innovations are just getting started to hit big time. The VR-associated gaming platform Rec Room has become a unicorn, currently valued at US\$ 1.25 billion, and a US Army deal has secured Microsoft a US\$ 21.88 billion contract for the HoloLens. In the meantime, Snapchat, Niantic, and Apple are preparing the launch for their own AR glasses, while designers were recently provided with a Figma UI toolset for the HoloLens MRTK (Mixed Reality Toolkit). All these are signs that things are coming together and doors are opening to an XR future full of opportunities.

The Metaverse is on its way in, alongside technologies that will change our life. In the last part of the book, the topics blockchain and NFTs (nonfungible tokens) are discussed in an XR context. A very polarizing subject, due to the rise of cryptocurrencies, speculative excess, and bubble fears. But before generalizing Bitcoin & Co and the underlying future technology, I would say: Hold...or better yet *hodl*...your horses. Blockchain technology will be part of our future in one way or another, apart from how hyperactive financial markets deal with it. It may even be devoid of greed and possibly become minerless, free, feeless, regulated, and green

PREFACE

or even help with climate change accountability – promising initiatives to accomplish that are on the way (including blockchainforclimate.org).

If this book inspires you to take it a step further and dive deeper into VR development using the Unreal game engine, I recommend you have a look at my first book, *Unreal for Mobile and Standalone VR* (Apress, 2019). The book covers all steps to create professional VR applications from scratch, using Blueprint visual scripting and efficient production pipeline techniques. It also includes two complete tutorials: a VR product presentation and a VR puzzle game.

Another resource worth mentioning is my own website, where I will be updating contextual information for this book, including updates on the Reality UX Lab project mentioned in Chapters 4 and 6. Please feel free to join the discussion and share your feedback and input at studio.cgartist.com.

—Cornel Hillmann

CHAPTER 1

Introduction

The extended reality (XR) era is here, and its rise will have an increasing visibility in the decade ahead of us. The 2020s is the beginning of a wider adoption of the next computing platform after years of experimentation and innovation.

The intention of this book is to give an overview of the opportunities in extended reality application for UX designers, as well as to evaluate the approaches and techniques of user experience (UX) design targeting virtual reality (VR) and augmented reality (AR) applications for XR developers and producers.

The reasons for that are obvious: UX design is a success story. The rise of UX design in the last decade is reflected in the overwhelming success of the mobile economy, which was to a large degree driven by the refining of UX standards, techniques, and tools for maximum efficiency and impact (Figure 1-1).

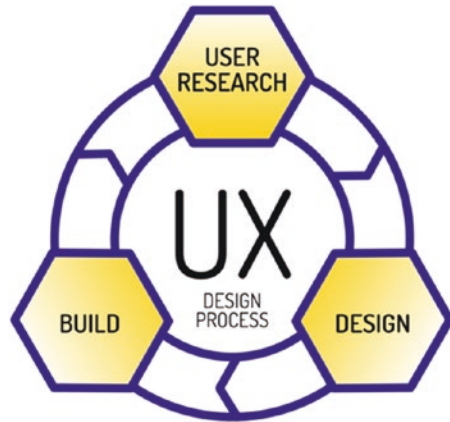


Figure 1-1. *The UX design process (image by C. Hillmann)*

UX design is now a well-oiled machine when it comes to web and mobile app development. It has been proven to work; it has been shown to create success stories and wealth in the digital economy. Over the last 10 years, we have seen the rise of a whole UX universe with conventions, industry bodies, training courses, literature, and a healthy demand in the job market. Even though the role of UX is constantly being refined and debated, it is here to stay, because it fulfills its promise to optimize the user experience, which in turn means to create successful digital products and to ensure user retention rates.

AR and VR applications, as part of an emerging XR industry, have had a mixed record when it comes to user retention numbers. Due to the constantly changing landscape of formats, technological breakthroughs, and software and hardware platforms, it has been difficult to establish a winning formula to attract a critical mass of satisfied users, with a number of notable exceptions.

Facing this situation, which as a whole is very typical for an emerging technology, makes it obvious that XR application development needs UX design and strategy more than ever. It is crucial for the success of an emerging industry to monitor user behavior and refine its key components based on that data.

The UX design approach that has worked so well for web and mobile applications is, to a great degree, transferable to XR application development, when it comes to its guiding principles. Nevertheless, when it comes to the practical application in the production process, it is faced with a number of obstacles due to technical and format hurdles.

The idea of this book is to identify what has been learned so far, regarding UX design for XR applications, and what areas still need to be refined in terms of UX standards while evaluating possible solutions for the inevitable pain points.

In this way, this book aims to help analyze UX practices for XR environments and review the techniques and tools for prototyping and designing XR user interactions. The objective is to approach the design for experiential state and spatial cognition, using established UX KPIs, while taking into account the social dynamics, emotional framework, and wider industry context.

1.1 Welcome to the Spatial Computing Era

Coined as “the next big thing” by Apple CEO Tim Cook on January 21, 2020, augmented reality will “pervade our entire lives” over the next 5–10 years. Virtual reality is already building momentum with the success of the Oculus Quest by Facebook, while AR devices such as the Magic Leap and Microsoft’s HoloLens are building their technical and usability frameworks and community. The rise of XR technology is redefining how humans interact with digital content, and new possibilities are bringing a major shift in UX strategies and design to revolutionize human-computer interaction (HCI). While user experience design has risen to the center stage of organizations to build meaningful and relevant experiences for their users on digital devices with flat screens, a new era of spatial interaction is transforming the design space and its techniques around storytelling, interaction design, strategy, research, and information architecture.

Extending traditional digital platforms to the new frontier of XR requires taking into account what best practices, new concepts, and conventions have been established and what learnings can be brought forward from case studies involving industry leaders. Looking at practical examples from the field of handheld AR (HAR) breakthroughs, VR success stories, and experimental interaction concepts of pioneering XR platforms allows us to map out a framework of UX guidelines, thus closing in on opportunities and challenges that lie ahead. Even though the XR landscape is constantly changing, it holds a set of promises to the user that are long term and are unlikely to change as the technology matures (Figure 1-2).

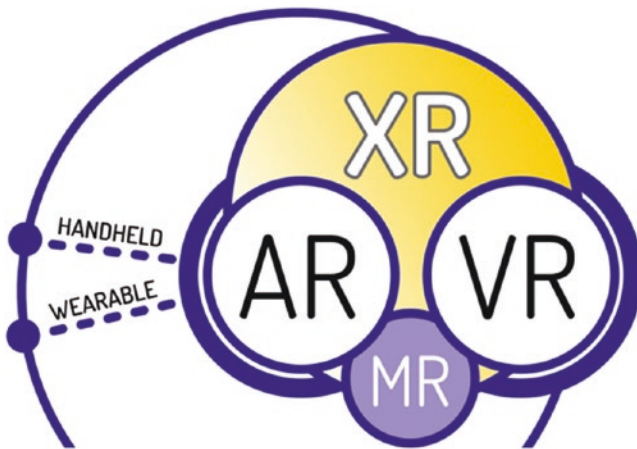


Figure 1-2. *Extended reality (XR) (image by C. Hillmann)*

The perspective of UX for XR is to focus on the user benefits, analyze what works best by having empathy for the user, and articulate solutions for design problems. While this mission is clear, it is very often the technical complexity and the novel prospects of the XR medium that carry an additional weight in the scope of work for UX XR design work. What it comes down to is the fact that a UX designer targeting XR applications does not have to be a coder, but does have to understand how the technology works and what implications design decisions have,

when it comes to technical dependencies. Once the groundwork is done, a wide space of opportunities opens up. It is very often the excitement of pioneering design work that builds momentum in emerging technologies. The passion of UX designers inspired by the new opportunities in XR is fueling innovation, and these designers, by taking user agency, are making sure that these ideas work for the intended audience.

1.2 Mapping the Territory: UX

The general concept of user experience design has been around for centuries, and, in hindsight, it seems logical that it culminated in a flourishing design industry that is shaping the digital economy today.

But, while UX design for electronic devices and digital applications has been around since the 1990s, it only took center stage in the last decade. The overwhelming success of the iPhone and the rise of the digital economy centered around mobile devices, plus the need to unify the design for web and mobile applications for consistency, made UX design an unparalleled success story. Taking a user-centric design approach, applying research, and testing routines turned out to be the right approach for the digital economy. It was the driver behind most of the ecommerce shooting stars and the secret sauce that helped disruptive unicorns to capture the platform economy era.

But let's not forget that the remarkable rise of UX design is a fairly recent phenomenon. Before 2009, the UX designer job description was practically unknown in the job market. Although it existed in the context of HCI research and usability testing facilities with a few larger organizations, it was, in the end, Apple that radically committed to the UX concept as a core process for developing new products. As a result, it turned the company into the most valuable public company in the world, dominating every industry it took on. As design legend Don Norman, who joined Apple in the early 1990s, pointed out: UX entails all aspects of the user's interaction with the company, its services, and its products.

This very holistic design approach is today very often overshadowed by the typical work of UX designers. Not out of ignorance, but out of practical considerations. Most designers in the UX field working on apps and websites have no control over the devices their design solution is used on. Their work is focused on the digital product and its user interaction alone, while the device UX is of course handled by the hardware developer.

This situation has created the misleading conception that UX design is actually UI design for the most part. Job descriptions very often underline this notion by advertising for UX/UI designers. Once again, not by ignorance, but out of practical considerations. A lot of UX design for mobile and web applications is centered around UI interaction. Typical examples are ecommerce and booking apps, where the user flow is directly mirrored in the interaction with the UI. As a matter of fact, it is a very common misconception that UX design means the design side of front-end development only. But that may only be a distorted perception, because it just happened to be where most of the work was.

With the transition into the XR era, this is going to gradually change, and UX design will actually find its way back to its holistic roots of considering all aspects of the interaction between a design and its user, due to the fact that this interaction will entail a lot more than just a UI (Figure 1-3).

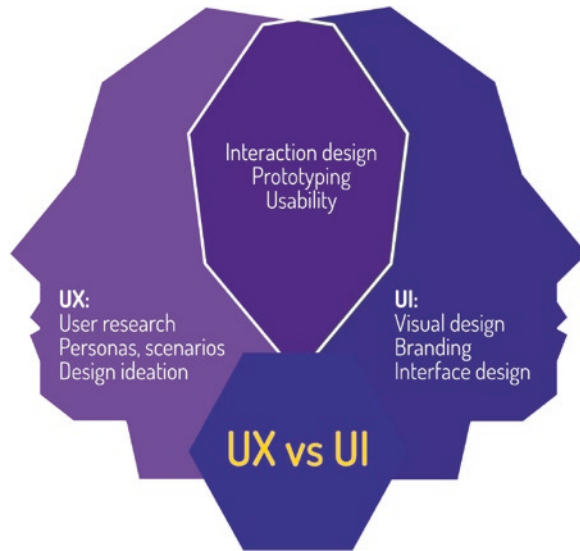


Figure 1-3. *UX vs. UI design (image by C. Hillmann)*

Spatial interaction, gestures, and speech are just a few of the new elements that will define the new paradigm. As a matter of fact, the X in UX, the experience factor, will weigh in on a new level and will refine what experience actually means in an XR context.

The term *experience* has been somewhat overused in the early wave of VR enthusiasm, when every company wanted one. Designing a VR experience instead of a VR app sounded more exciting and entailed a lot more promises of capturing the user's attention with immersive technologies.

Nevertheless, the frenzy of the early VR hype is way behind us, and the term *experience* is still a good and descriptive term for an XR app, as it expresses a user-centric interaction that entails more than a few finger swipes on a screen. It addresses multiple senses and has the potential to completely simulate the real world and the many ways a human interacts with it.