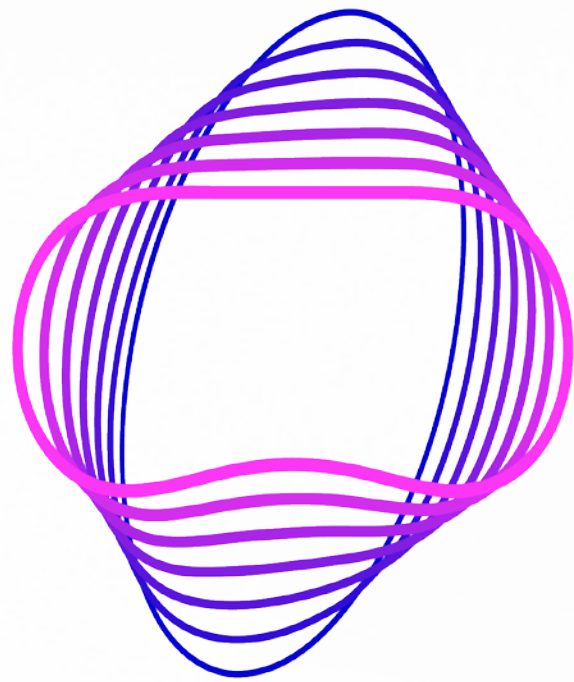




METaverse ACADEMY

Module 4: Human-Centered Design & HCI in Immersive Startups

Designing XR solutions users want and need requires a deep understanding of how humans interact with immersive technology. This module explores the principles and practices that help create meaningful experiences in extended reality.



Co-funded by
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Learning Objectives



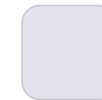
Understand Human-Centered Design and HCI

Master the fundamentals of designing with users at the core and learn how human-computer interaction shapes successful XR experiences.



Apply XR-Specific Design Principles

Recognize the unique considerations and challenges when designing for immersive environments rather than traditional interfaces.



Implement User-Focused Design Methods

Explore practical tools, techniques, and frameworks that startups can leverage to create user-centered XR solutions with limited resources.

What Is Human-Centered Design (HCD)?

Human-Centered Design is an approach that places real human needs at the foundation of the development process. Rather than beginning with technology capabilities, HCD starts by understanding the people who will use your product.

Empathy

Understanding users' needs, contexts, behaviors, and pain points through direct observation and engagement.

Co-Creation

Involving users throughout the design process as active participants rather than passive subjects.

Iteration

Continuously improving designs based on user feedback through rapid prototyping and testing cycles.



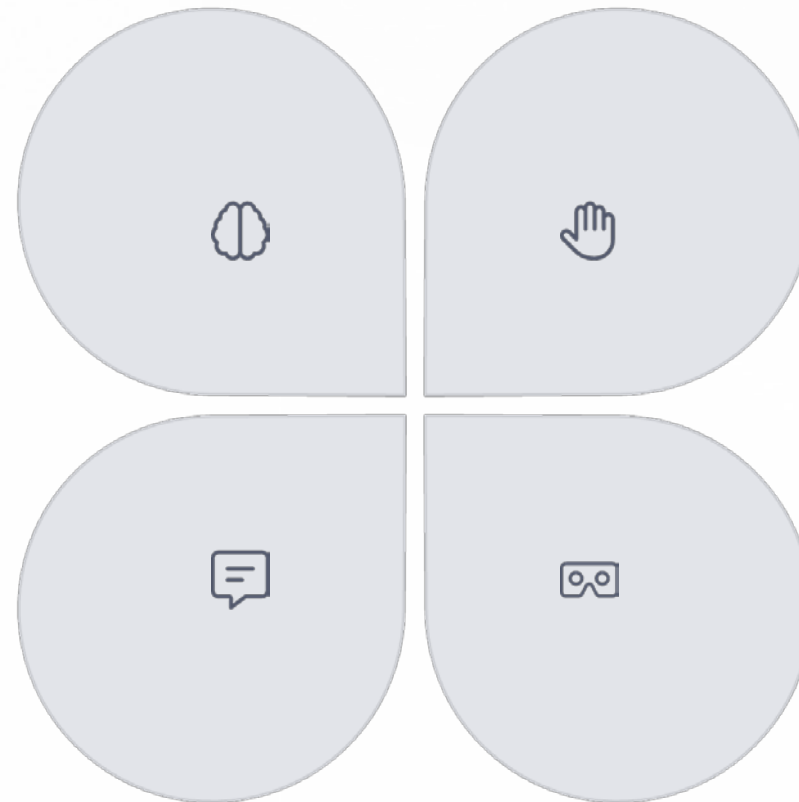
What Is HCI (Human-Computer Interaction)?

Cognitive Models

Understanding how users perceive, process, and respond to digital information.

Feedback Systems

How systems communicate status and responses through visual, audio, and haptic channels.



Interaction Design

Creating intuitive ways for humans to communicate with technology through natural interfaces.

XR-Specific HCI

Multisensory interactions including voice, gaze, gesture, motion, haptics, and spatial awareness.

Why HCD and HCI Matter in XR Startups



❌ **90% of startups fail**, and poor user experience is frequently cited as a major contributing factor.

In XR environments, poor design isn't just inconvenient—it can cause physical discomfort or make products completely unusable. Startups face unique challenges:

- Limited resources demand efficient design processes
- Immersive design must balance novelty with usability
- Early testing helps avoid costly redesigns later
- First impressions are critical for adoption and retention

XR-Specific Design Challenges

Motion Sickness

Vestibular discomfort caused by visual-physical mismatch can make users abandon products immediately.

- Stable horizon lines
- Consistent frame rates
- Reduced artificial locomotion

Spatial UI Complexity

3D interfaces introduce new dimensions of complexity in navigation and interaction design.

- Reachability constraints
- Field-of-view limitations
- Depth perception challenges

Accessibility Barriers

Immersive experiences may unintentionally exclude users with different abilities or body types.

- Physical mobility variations
- Sensory processing differences
- Equipment fit and comfort



Immersive Interaction Types



Gaze Control

Using eye tracking to select or interact with objects by looking at them, creating intuitive but potentially fatiguing interactions.



Hand Gestures

Natural hand movements for grabbing, pointing, swiping, and manipulating virtual objects that mimic real-world interactions.



Voice Commands

Speech recognition for hands-free control, especially useful when users' hands are occupied or for accessibility needs.



Haptics & Spatial Audio

Tactile feedback and directional sound that create a sense of presence and physical interaction with virtual environments.



Body Movement

Full-body tracking that translates physical movements into virtual actions, creating immersive embodiment experiences.

Design Principles for Immersive UX

Minimize Cognitive Load

Keep interactions simple, consistent, and intuitive to avoid overwhelming users in already complex 3D environments.

Provide Clear Feedback

Ensure users understand what's happening through visual, audio, and haptic cues that confirm their actions.

Maintain Comfort & Safety

Design with physical and psychological comfort in mind, avoiding eye strain, motion sickness, and disorientation.

Respect Boundaries & Consent

Give users control over their experience, especially regarding personal space, data collection, and sensory intensity.



XR Usability Testing: What to Observe



Navigation & Wayfinding



Can users understand where they are, where to go, and how to get there in 3D space without frustration?

Interaction Affordances



Do users intuitively understand how to interact with elements? Are interactive objects clearly distinguishable?

System Feedback



Does the system provide appropriate feedback to user actions through visual, audio, or haptic responses?

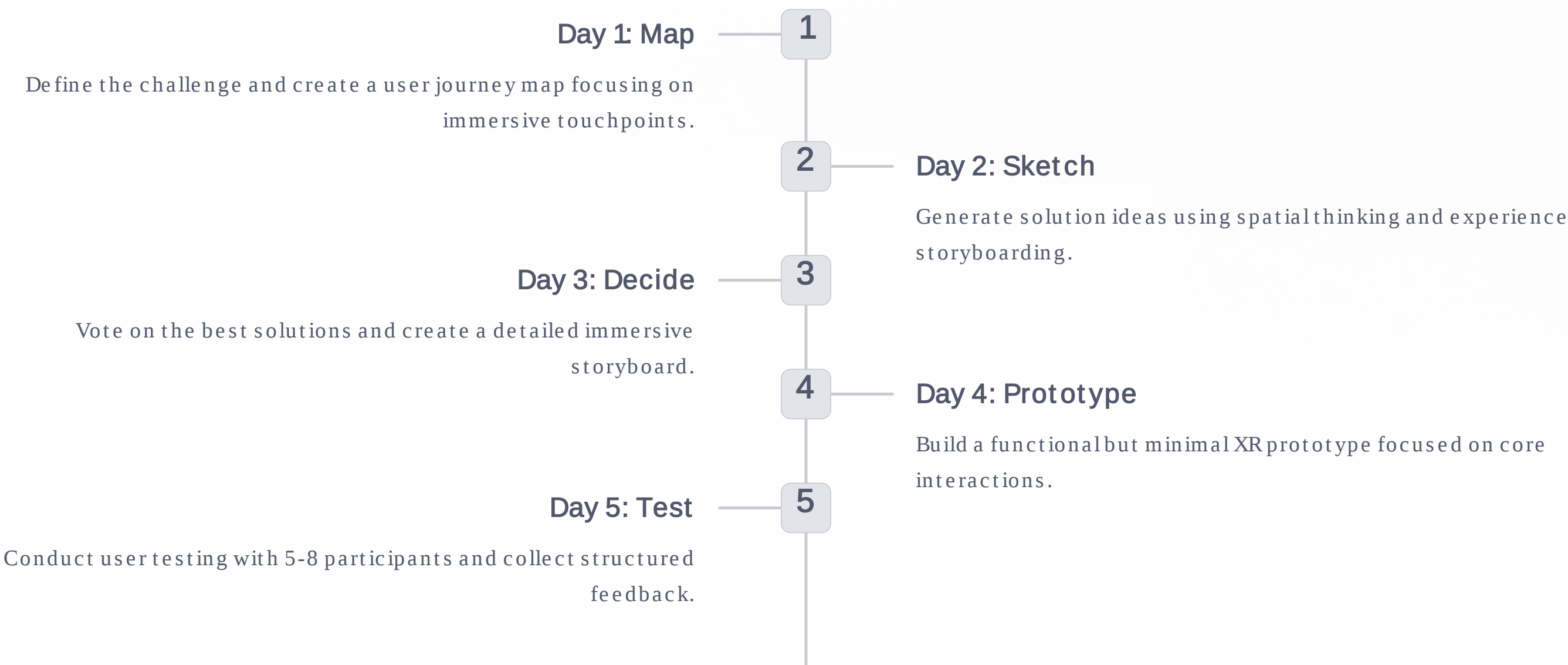
Comfort & Engagement



Do users show signs of discomfort, fatigue, or motion sickness? Do they remain engaged throughout?

Tool: Design Sprint for XR Prototyping

The Design Sprint methodology, pioneered by Jake Knapp at Google Ventures, has been adapted for XR development to help startups rapidly test ideas before committing significant resources.



XR Design Sprint Example



Case: Medical Training VR App

Day 1: Journey Mapping

Team mapped current medical training flow, identifying pain points in traditional learning.

Day 2: Solution Sketching

Generated ideas for interactive anatomy models and practice scenarios with haptic feedback.

Day 3: Experience Storyboard

Created detailed sequence showing first-time user orientation through guided procedure practice.

Day 4: Low-Fi VR Prototype

Built simplified interactive model focusing on hand tracking for surgical tool manipulation.

Day 5: Medical Student Testing

Five students tested prototype, revealing critical insights about spatial orientation needs.

Tools for XR Prototyping and Testing



Figma

Create 2D wireframes and interactive prototypes that can be viewed in VR using plugins like Figma to AR.

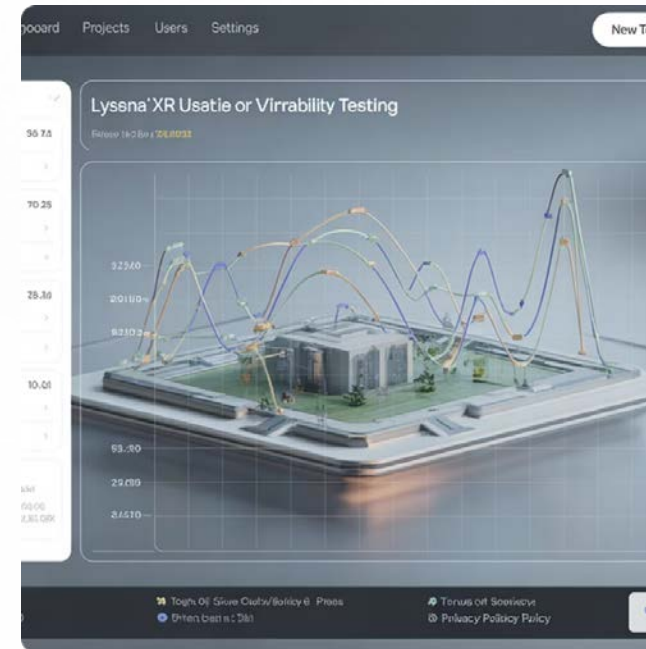
figma.com



Gravity Sketch

Design directly in VR with intuitive 3D modeling tools, allowing for natural spatial design thinking.

gravitysketch.com



Lyssna

Collect and analyze user testing data from immersive experiences with specialized XR analytics.

lyssna.com



Unity & Unreal

Create functional XR prototypes using specialized toolkits like XR Interaction Toolkit or UE VR Template.

unity.com/solutions/xr

Accessibility in XR



XR has the potential to either exclude or empower users with disabilities, depending on thoughtful design choices.

Visual Accessibility

- High contrast UI elements
- Audio descriptions of environments
- Haptic feedback for navigation

Auditory Accessibility

- Visual cues for audio content
- Subtitles and captions
- Adjustable audio frequencies

Motor Accessibility

- Single-handed operation modes
- Adjustable interaction zones
- Voice command alternatives

 **Resource:** [XR Access Initiative \(xraccess.org\)](https://xraccess.org) provides guidelines and best practices for inclusive XR design.

Inclusive Persona Building

Creating diverse user personas helps ensure XR experiences work for everyone, not just the "average" user. Inclusive personas should consider variations in:



Technical Literacy

From tech novices to power users, with varying familiarity with spatial computing concepts and terminology.



Physical Abilities

Different mobility ranges, heights, arm lengths, hand dexterity, and stamina levels that affect interaction capabilities.



Cultural Context

Diverse cultural backgrounds that influence spatial perception, gesture interpretations, and comfort with certain interactions.



Cognitive Processing

Different learning styles, attention spans, and information processing preferences that impact tutorial effectiveness.



Case Study: Inclusive XR Design



Oculus Quest Accessibility Improvements

01

Challenge Identified: Users with limited mobility struggling with standard controller-based interfaces

02

Research Conducted: Dedicated testing sessions with disabled users across various impairment types

03

Solutions Implemented: One-handed mode, voice commands, seated position calibration, customizable reach zones

04

Results: 22% increase in session time for users with disabilities and 15% improvement across all users

"By redesigning our interface based on feedback from users with mobility challenges, we not only improved the experience for them but discovered improvements that benefited all our users."



How Incubators Can Support HCD in XR

Facilitate Early User Testing

- Maintain a diverse user testing pool that startups can access
- Create dedicated testing spaces with recording equipment
- Offer templates for user testing protocols and consent forms

Provide Design Expertise

- Connect teams with XR design mentors for regular reviews
- Host workshops on immersive design principles
- Create shared resource libraries of design patterns and guidelines

Foster Design Culture

- Encourage teams to include design milestones in their roadmaps
- Celebrate and showcase user-centered design success stories
- Evaluate startup progress based on user metrics, not just technical ones

Ethical Considerations in XR UX



Safety & Privacy

- Physical safety in room-scale experiences
- Clear data collection notifications
- User control over identity presentation
- Appropriate content warnings



Ethical Design

- Avoiding manipulative "dark patterns"
- Respecting user autonomy and consent
- Designing for digital wellbeing
- Transparent communication of limitations



Inclusion & Access

- Addressing hardware cost barriers
- Mitigating algorithmic bias in spatial AI
- Culturally sensitive design choices
- Designing for diverse body types



Key Takeaways



User Experience Is Business-Critical

In XR, poor UX doesn't just reduce engagement—it can make products physically uncomfortable or unusable, killing adoption immediately.

XR Design Is Multi-Dimensional

Designing for immersive environments requires thinking beyond screens to consider spatial, physical, auditory, and social dimensions.

Test Early, Test Often

Rapid prototyping and frequent testing are essential to avoid costly redesigns and ensure products address real user needs.

Inclusive Design Expands Markets

Designing for diverse users from the start creates better products for everyone and opens up new market opportunities.



Reflection Prompt

"How can your incubator help startups test usability early and often?"

Consider your existing resources, potential partnerships, and how you might integrate user testing milestones into your program structure.

Questions to Consider:

- What testing resources could you provide to make user research more accessible?
- How might you help startups incorporate user feedback into their development process?
- What metrics could you track to measure improvement in user experience over time?

What's Next



Module 5

XR + AI + Web3: Emerging Technologies Stack

In our next module, we'll explore how XR intersects with other frontier technologies to create new possibilities for immersive applications.

You'll learn how artificial intelligence can enhance XR experiences through spatial understanding, natural interactions, and personalization. We'll also examine how Web3 technologies like blockchain might influence the future of digital ownership in immersive worlds.