HELSINKI XR CENTER

Guide to Buying XR

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Leverage from the EU 2014–2020

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Opening Words

"Hello, I would like to purchase one XR!"

XR (eXtended Reality) is, of course, not a ready-made product that can be bought as units, but rather a broad term encompassing virtual technologies that expand our physical environment. The end product utilizing XR is a virtual implementation, experienced through a device that supports XR applications, such as a VR headset or a smartphone. Simplified, an XR buyer needs to acquire a virtual application (files, code) and consider the device on which it will be used.

In this compact guide, we aim to provide a quick overview of the topic for those of you who are planning to utilise XR but are not entirely certain about what to do first and what to take in consideration.

We hope that after reading this guide, you would have an understanding of how an XR project is constructed, what stages it includes, and how to move forward.

STEPS

1. Brainstorm

2. Explore

3. Buy

1. Brainstorm

The brainstorming phase might have taken place before the XR angle has even been brought up. Then we can explore the advantages of virtuality in relation to the idea. During the ideation process, it's recommended to consider the broader context before diving into detailed plans.

Clarify the Idea!

In the early stages of procuring an XR solution, it's important to clarify for oneself what the desired end goal is. At this point, one might realize that XR technologies might not be the best way to bring the end product to life. It's crucial to distinguish whether the focus is on the hype around a certain device or technology or if the use of XR technologies genuinely supports one's own idea. Planning XR solutions usually should not *start* with deliberations about the specific device used for the final product.

Important questions for brainstorming:

- What need does the XR solution respond to?
- What additional value does virtuality bring?
- How do you determine the added value that different forms of virtuality bring?
- Who is the target audience for the end solution?
- What should the end user gain from the use of the XR application?
- Under what conditions will the XR application be used?
- Is the XR application disposable, for example, for events like exhibitions, or for long-term use?
- What distribution channels are required for the application?
- How many people do you want to engage with the application?
- Is the focus on displaying an artwork, or are you concentrating on functionality?
- Do you want an active or passive user experience?
- Is gamification desired?
- Will there be one user at a time or multiple users simultaneously?
- Is the XR application primarily informative or entertainment-oriented?
- Is the end solution entirely virtual, or does it incorporate virtual elements into a physical environment?
- Will data be collected from the application's use?
- Do you want real-time data from external sources to be integrated into the application?
- Do you want to integrate the application with other technologies or hardware?

2. Explore

If you have no prior experience with XR solutions or devices, it is advisable to conduct research and familiarize yourself in advance. XR technologies encompass many possible implementation options. In this section, we will briefly go through the general characteristics of XR technologies and the devices suitable for experiencing XR.

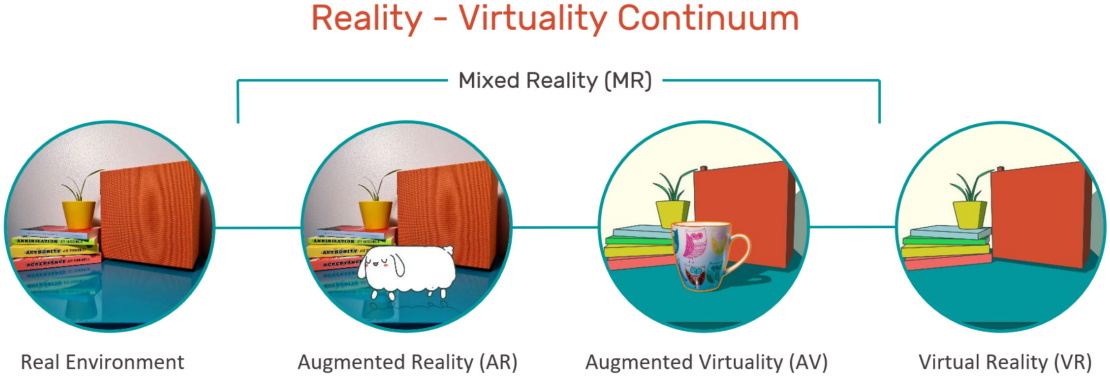
Tip: *Helsinki XR Center organizes workshops where you can familiarize yourself with both the basics of XR and various XR solutions and devices. These workshops are also an excellent way to make potential new contacts within the XR industry.*

Investigate the Possibilities!

Find out if someone has already done something similar to what you're planning. Familiarize yourself with various XR devices and the content created for them. Based on this information, you can consider what kind of solution might be suitable for your idea.

General Characteristics of XR Technologies

XR technologies can be placed on what is called the Reality - Virtuality Continuum, or just Virtuality Continuum (introduced in Milgram et al. 1994). At one end of this continuum is our physical reality, and at the other end is virtual reality. All XR solutions can be positioned on this continuum depending on how much reality and virtuality they involve. Commonly used terms include AR (augmented reality), MR (mixed reality), and VR (virtual reality). In some contexts, the term AV (Augmented Virtuality) may be used. These terms may also mean slightly different things to different people. Besides the degree of virtuality, especially AR and VR differ in terms of their technical implementations. Additionally, various virtual environments require different types of devices. (For more information on devices, please see page 10)



Images: Kira Vesikko, modifications: Janina Rannikko.

AR - Augmented Reality

Virtual elements are added to the physical environment.

The elements can be of any digital format, such as 3D models, video, audio, or text.

Interactive and in real time.

From the screens of smartphones or tablets, or through AR glasses.

For example, a mobile game that operates on a smartphone, where you can move around in a space, and virtual objects appear on the smartphone screen depending on your location. Or a training application for AR glasses that allows you to see instructions and virtual elements while using a physical device.

VR - Virtual Reality

In a computer-modeled virtual implementation, you can do almost anything.

Immersion, or the feeling of being deeply engaged in an experience to the point that it feels genuine, is one of the key features of VR when considering its added value.

VR content can be passive viewing experiences or interactive gaming experiences.

The scanning and transfer of the physical world into virtual form is continuously improving. Still, these scans need to be processed and cleaned up manually, but it is faster than modeling entirely from scratch.

360-degree images and videos can also be utilized in VR implementations.

360-degree images and videos

No actual 3D modeling.

Need for cameras suitable for capturing 360-degree images and videos.

One can create an AR or VR solution or use a more traditional computer or mobile screen.

For example, an educational application in which you can be in a 3D classroom, and information texts or written tasks have been placed on different objects, which you can open and complete on the screen.

Immersive spaces

A virtual experience created in a physical space.

It can include images and videos projected with a projector, but also physical components or sensory experiences.

AR glasses can be used to bring virtual elements into the space.

For example, a relaxation room where videos of forest are projected onto the walls, the floor is covered with real moss, and speakers emit forest sounds.

XR Devices

XR devices are devices that allow people to experience virtual elements and environments. These typically include VR and AR headsets (also known as glasses, goggles or head-mounted-devices), as well as their peripherals such as controllers and motion sensors. Additionally, some XR applications can be used with smartphones, tablets, computers and handheld gaming consoles.

It's important to keep in mind that the majority of consumers do not have their own XR devices, with the exception of smartphones. Therefore, the necessary XR devices for the application need to be acquired, and they should be properly maintained (cleaning, user profiles, updates etc.).

The following questions can help consider the type of device solution to be chosen:

- Is it desired to make the content accessible to everyone?
- Is the goal to provide an immersive experience for the content?
- Does the content need to work on as many devices as possible?
- Is visually impressive content desired?
- Is accessible movement necessary?
- Is stationary content sufficient?
- Is a completely created virtual world needed, or are additional elements in the real world required?

In the following, we will take a closer look at augmented reality (AR) and virtual reality (VR) devices.

AR Devices

There are roughly two types of AR devices. The first type involves using cameras to bring the physical space onto a 2D screen, and virtual elements are added in real-time to the view on the screen. These devices include smartphones and tablets. The second option is to use a transparent screen through which the physical environment is seen, and virtual elements can be overlaid onto the view, making them appear as if they are part of the physical space itself. These devices are called AR glasses or sometimes also referred to as smart glasses that utilize AR technology.

- The possibility to utilize GPS for real-world navigation.
- Information can be brought into the field of view while keeping hands free.
- Control can be achieved through simple handheld controllers, via a smartphone, or through hand gestures.
- Examples of devices include Microsoft Hololens 2, Magic Leap 2, Xreal Light, Vuzix4000, and Rokid Max.

Microsoft Hololens 2 AR-lasit

VR (MR) Devices

VR devices are typically wearable VR glasses (VR headset) and their controllers. They immerse the user in a virtual 3D environment, isolating them from the physical surroundings. Users view the virtual world through lenses inside the device, feeling as if they are in the center of a virtual world. Most current VR headsets have cameras that can provide real-time image of the physical world inside the device (a.k.a. passthrough), and in such cases, they can be referred to as MR headsets. Applications can be developed for these devices that leverage this feature of combining the virtual and real worlds.

Many VR headsets use separate handheld controllers with buttons to control hands and cursors in the virtual world, but especially in newer headsets, it is possible to use hand gestures for control. Gesture control has become more common with the integration of internal cameras in the devices.

Some VR headsets use an external tracking method (outside-in tracking), requiring separate base stations to operate. In this system, both the headsets and controllers can be tracked from all sides of the operating area. Most of the latest devices use internal tracking (inside-out tracking) with their cameras and sensors, eliminating the need for external base stations. However, tracking may be interrupted if the controllers or hands move out of the field of view of the headsets' cameras.

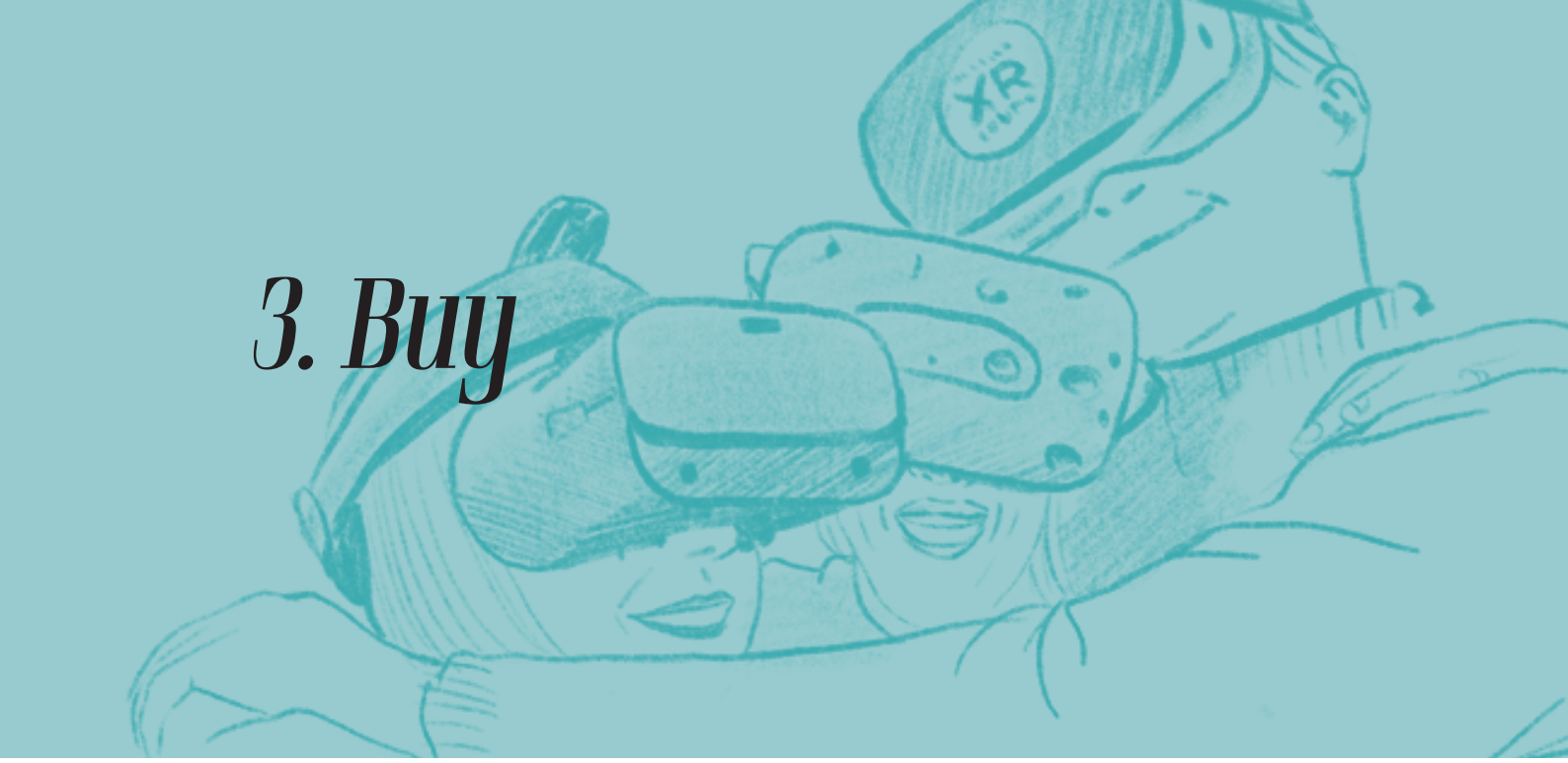
Standalone VR Headsets:

- They do not require a separate computer.
  - No wires.
  - Battery life and charging options should be considered during device usage.
- Some devices can be connected to a computer when needed to utilise its power.
- Example devices include Meta Quest Pro & Quest 2, Pico 4, HTC Vive Focus 3 & XR Elite, Apple Vision Pro.

VR Headsets with Computer:

- Enables powerful computation and, therefore, more demanding visual implementations.
- Attention must be paid to the arrangement of the device's cables during use.
- Do not function without a suitable computer and a its power source.
- Example devices include HTC Vive Pro 2, HP Reverb G2, Valve Index, and Varjo Aero.

HTC Vive Focus 3



3. Buy

There are several alternative ways to create XR content. Lighter content can be produced by anyone with a bit of self learning. To create larger productions, a team of experts from various fields and time are needed. In this relatively young field, a lot of time is spent on problem-solving during production, as ready-made methods and solutions may not necessarily exist. Some things may be done for the first time ever.

Choose the Production Method!

The production of an XR solution can be divided into at least three possible approaches:

1. Purchase a license for a platform and create the content yourself.
2. Hire a team of experts to create the solution.
3. Buy the production of the solution from a company specializing in the field.

SKILLS NEEDED TO BUILD AN XR SOLUTION

PROJECT MANAGEMENT

- An XR producer between the buyer and development team for continuous communication.
- Multidisciplinary teams need clear and constructed communication.
- The end solution is built from many different parts put together.

DESIGN AND END USER ENGAGEMENT

- Strategy
- Use context expertise
- User experience and interaction design (UX & UI)
- Special user groups
- Scriptwriting
- Sound design

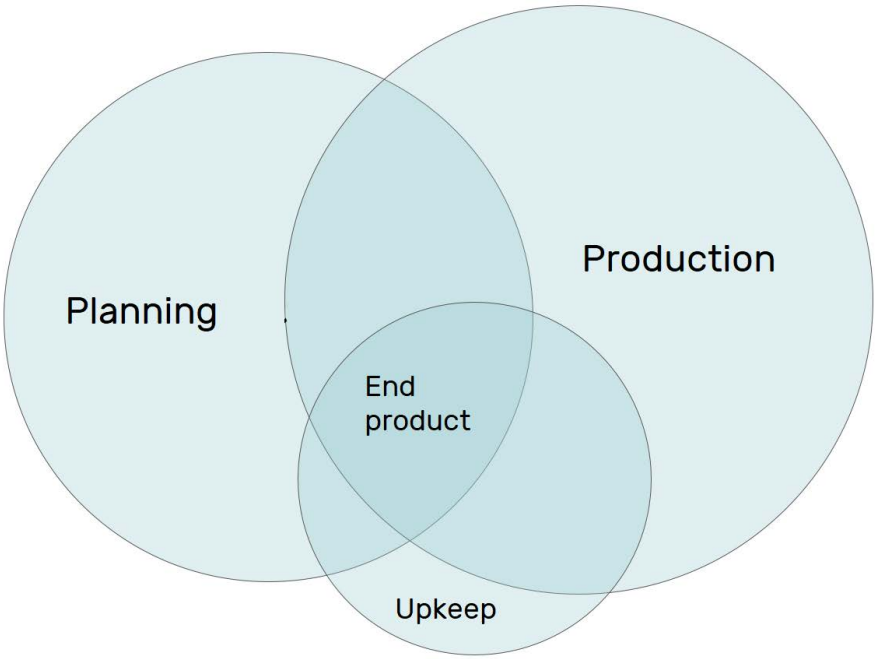
SKILLS IN DEVELOPMENT TEAM

- 3D modeling and animation
- Environment building
- Visuals and user experience (UX & UI)
- Sound implementation
- Game engine knowledge (Unity, Unreal Engine, WebGL)
- Coding (C#, C++, Javascript)
- Networking and server architecture expertise (TypeScript, CSS, Git, Node.js, HTML)

Buy from a Company

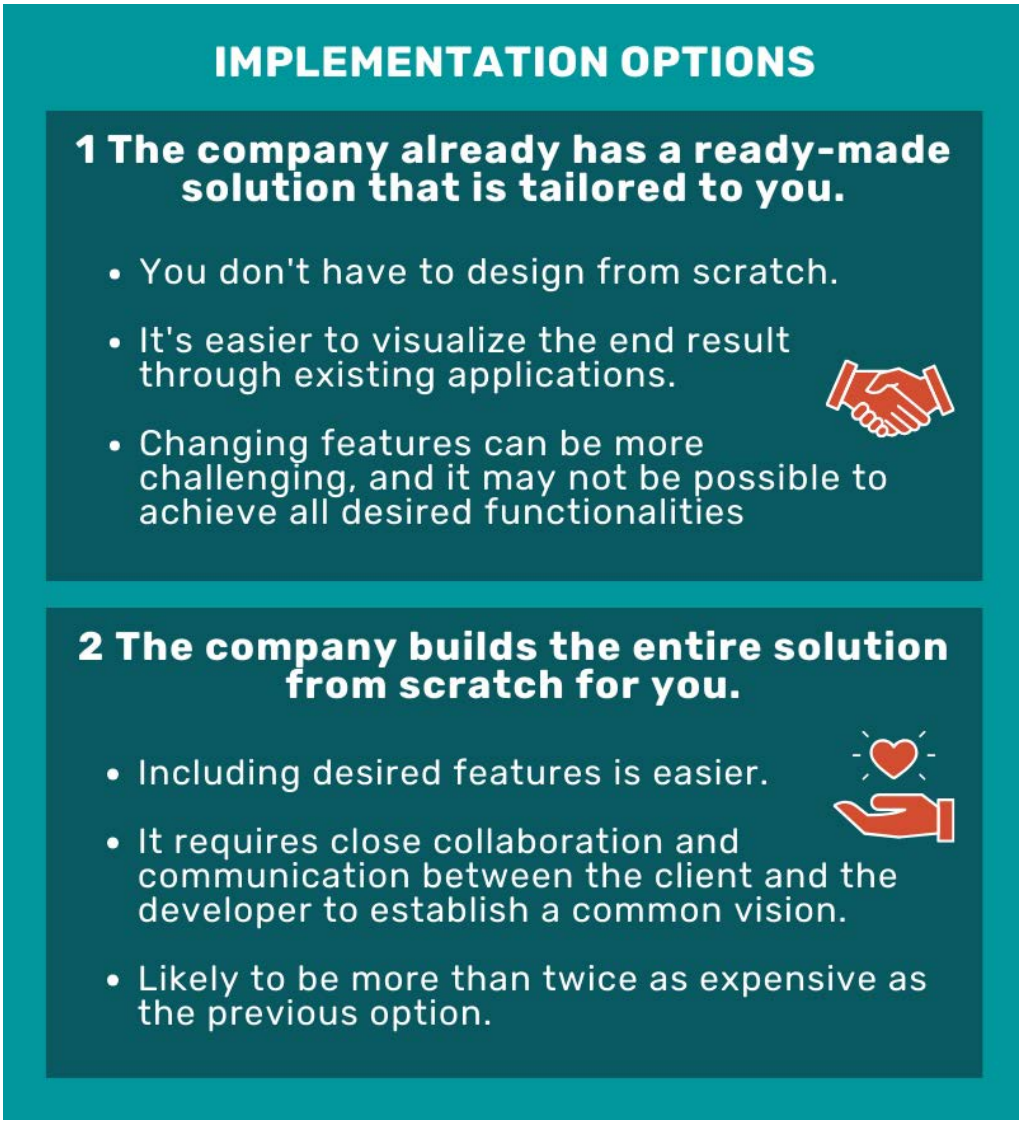
Purchasing the solution directly from a company can be profitable in many ways. Companies already have a ready team full of experts, so you don't have to spend time and effort searching for them yourself. Additionally, the company may have expertise in a similar production or even ready-made solutions that can be leveraged for your XR project. Companies also possess a wealth of professional experience in managing XR projects and knowing where to start the project, especially if a similar application has never been done before.

Typically, purchasing an XR solution involves two essential components that can be considered separate acquisitions and can, therefore, be obtained from different companies if needed: planning and production. In addition to this, it's important to consider the continuation of the solution, as few applications function without regular upkeep.



Planning can involve the following aspects:

- Understanding the entirety of the project
  - Utilizing XR materials also in traditional media
  - Reusability of the solution
- Scriptwriting
  - Evoking emotions
  - Impactfulness
- Planning the technical production



It's important to remember that, no matter how one wants to implement their XR solution, it doesn't happen overnight. Planning alone takes a lot of time, even if the idea is already in place. After that, the solution must be built, tested, and continuously improved based on feedback.

Very simple demos (proof of concept) or small projects on existing platforms can be created within weeks. However, for usable, visually appealing, and user-friendly applications, it takes months, and in large projects, even years.

4 EXAMPLES OF RESOURCES

LEVEL 1

- Simple marker-based AR or social filter
- 360 degree material
- VR in an existing platform
- Schedule: 1 week – 1 month
- Cost: 500€ - 5 000€
- Team of 1-3 persons

LEVEL 2

- Limited training or education software
- Customized virtual event location
- Guided AR or 360 tours
- Immersive documentaries
- Schedule: 2-6 months
- Cost: 5 000€ - 40 000€
- Team of 2-4 persons

LEVEL 3

- AI-assisted AR solutions
- AR Navigation
- Training simulators
- VR games
- Schedule: 3 months – 1 year
- Cost: 30 000€ - 150 000€
- Team of 3-10 persons

LEVEL 4

- Immersive content with mocap or volcap
- MR simulators
- Medical or engineering simulations
- Metaverse applications
- Large scale VR games
- Schedule: 6 months – 3 years
- Cost: 100 000€ - 2 000 000€
- Team of 10-50 persons

Funding and Networks

Funding for utilizing XR can be sought, for example, from Business Finland (Innovaatioseteli), Ely-keskus (Yrityksen kehittämisavustus) or European Union (EU-rahoitusneuvonta).

> ***Tip:*** *Helsinki XR Center maintains the HXRC Network where you can find industry players from both Finland and abroad. On the platform, you can, for example, familiarize yourself with companies' products and services and send requests for proposals.*
> *https://network.helsinkixrcenter.com*

This guide is just a superficial introduction to the XR world. It should awaken the desire for more information. If you want to get information, for example, about upcoming networking events or what's happening in the Finnish XR ecosystem, join the Helsinki XR Center's email list (https://uutiskirje.helsinkixrcenter.com).

And follow our social media accounts!

LinkedIn - Facebook - Twitter - Instagram

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