

ESTONIAN VIRTUAL AND AUGMENTED REALITY INDUSTRY IN 2021



Estonian Virtual and Augmented
Reality Association, June 2022

Despite the ongoing Covid crisis, **2021 was a successful year for the entire Estonian VR/AR/XR field as well as the Estonian Virtual and Augmented Reality Association (EEVR)**. As part of sTARtUp Day, we officially **launched the activities of the EEVR Association on 25 August 2021** with a physical event and a video campaign. In the second half of the year, the expression "metaverse" was suddenly wildly used everywhere, and we took the opportunity at least a dozen times to explain it in the context of EEVR in the Estonian media: in newspapers, on the radio, and on TV shows. **Over the year, we organized seven events**, three of them with foreign partners. EEVR's social media channels gained new momentum. We conducted a study, the results of which are reflected in this report, and at the end of the year we recruited a community manager, the first employee of EEVR.



Picture 1 Märt Lume at the opening event of EEVR, which took place as part of sTARtUp Day on 25 August 2021

The two biggest success stories of the year are Wolf3D, which raised \$13 million in an A-round for the development of ReadyPlayerMe, a metaverse avatar platform, and **Creative Mobile VR game "Into the Radius"**, which was updated to a new version 2.0 and has received very positive feedback, staying at the top of sales charts of VR games. In addition, this report presents a whole series of other developments completed in Estonia throughout the year, as well as many other interesting facts from the annual survey in the field of XR.

We hope that Russia's attack on Ukraine and the general economic crisis will soon be resolved in a favorable direction for the free world, and that 2022 will be at least as successful as 2021 for both the world and Estonia's XR industry entrepreneurs. We also hope that the major risks related to Covid have now been mitigated and we can finally meet again more often in the real world, although it must be stated that meetings in the "metaverse" are more and more attractive with the constant development of hardware and software.

The EEVR team: Märt, Eva, Rein, Vladimir

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I – Introduction

EEVR Mission and Objectives

In 2016, EEVR, an organization bringing together virtual (VR) and augmented reality (AR) enthusiasts, was founded. Over the years, the field continued to develop in the world and the number of companies and institutions professionally working on VR and AR projects in Estonia grew larger. At the beginning of 2021, EEVR transformed to a completely new concept, **bringing together companies and institutions professionally operating VR and AR** and to represent their interests. The re-created EEVR had nine founding members, and at the beginning of 2022 EEVR included 20 member institutions.

EEVR's mission is to help **create a VR and AR ecosystem in Estonia that would grow as fast as the phenomenally successful startup sector at a rate of 25-30% per year**. The main actions to support this are:

- Covering Estonian XR success stories in the press and social media.
- Changing the image of AR and VR as technologies with serious use cases.
- Conducting an annual survey to map the development of the field.
- Organizing and participating in networking events and hackathons, and other community-building events.
- Establishing and maintaining relationships with high schools and universities to make youth aware of career opportunities in XR; potentially also co-creating XR courses.
- Sharing information between different parties related to the field, such as procurement, job announcements, consultation.

Goals of the Study

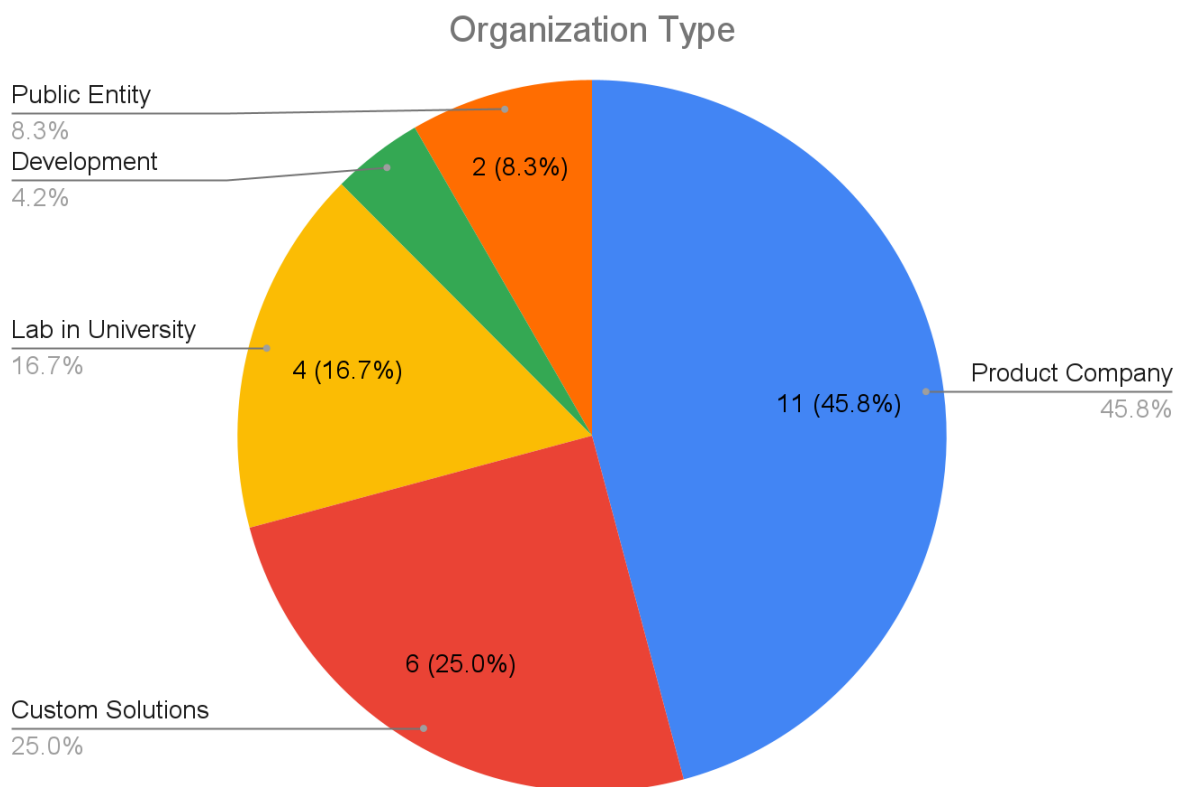
From December 2021 to January 2022, EEVR conducted a survey with companies and public sector organizations operating in the field of VR and AR in Estonia to map the current state and perspectives of the sector. It is hoped that this study will provide added value to EEVR members and others interested in the topic and will promote interaction so that the sector could develop even more strongly in the future. The main goal of the study – **reporting the total revenue of the sector, which was 4.1 million euros in 2021, a 102% increase compared to the previous year** – can be considered a success in every way.

II - Overview of Companies Operating in the Field of VR and AR

Participants in the Study

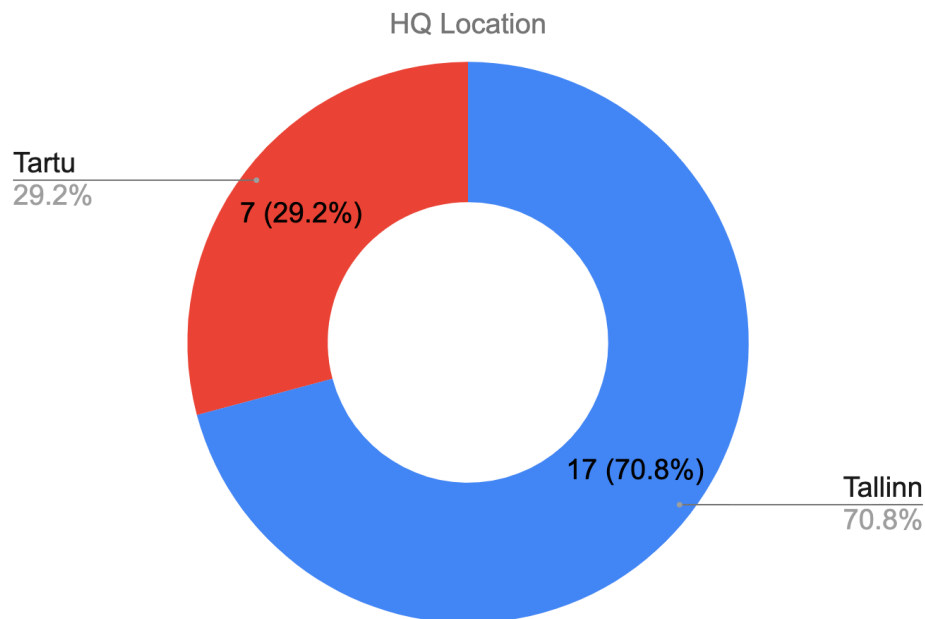
24 organizations operating in the field of VR and AR responded to the survey. The respondents included 18 companies, 4 higher education laboratories and 2 public sector companies.

Most of the companies (11) were product-based, which means that their activities are related to the provision of a specific product or service. Six companies offer special solutions, which means constant new different projects, and one responding company offers a development service. Four higher education laboratories were from the most prestigious universities in Estonia (TalTech, University of Tartu, Tallinn University, TTK University of Applied Sciences). The two public sector companies were the Estonian Natural History Museum and the Estonian Rescue Board, the last of which has been a well-known user of VR experiences for several years.



As many as **15 (63%)** of the responding institutions or their XR departments were **established in 2017 or earlier**. It can be concluded that most of them have managed to achieve sustainability in their XR activities.

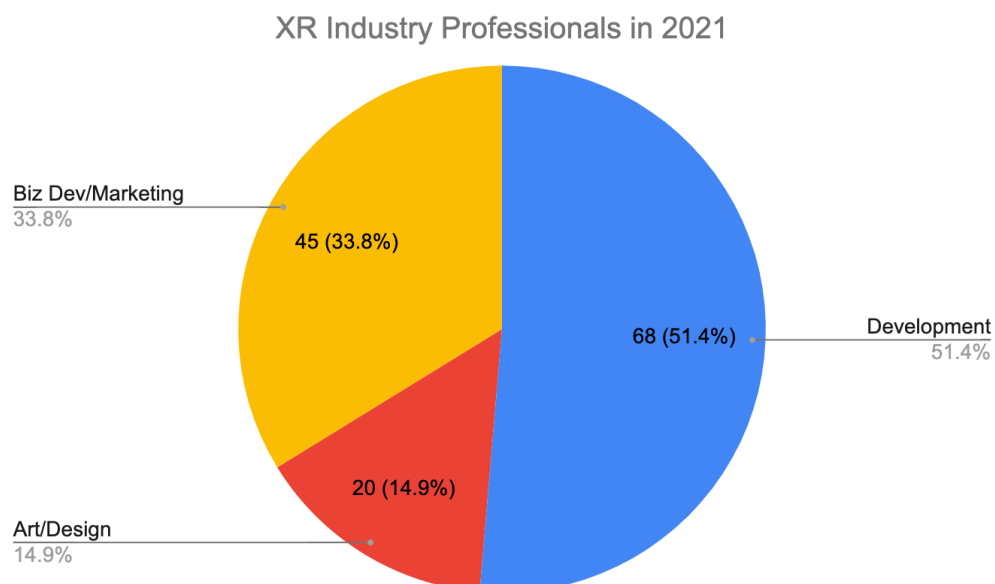
17 out of 24 respondents operate in Tallinn and 7 in Tartu. There are a few XR companies that operate in Pärnu and Võru, but unfortunately, they did not participate in the study.



The Number and Composition of Employees of Companies

Compared to the survey conducted last year, the number of employees involved in virtual or augmented reality has increased significantly. We asked how many employees are involved full-time in XR topics. Based on the respondents, the **number of full-time employees in the sector is 132** (96 last year: that is 37% higher than last year).

By function, approximately 51% of participants are software developers, 15% are artists/designers, and 34% are business development/marketing specialists.



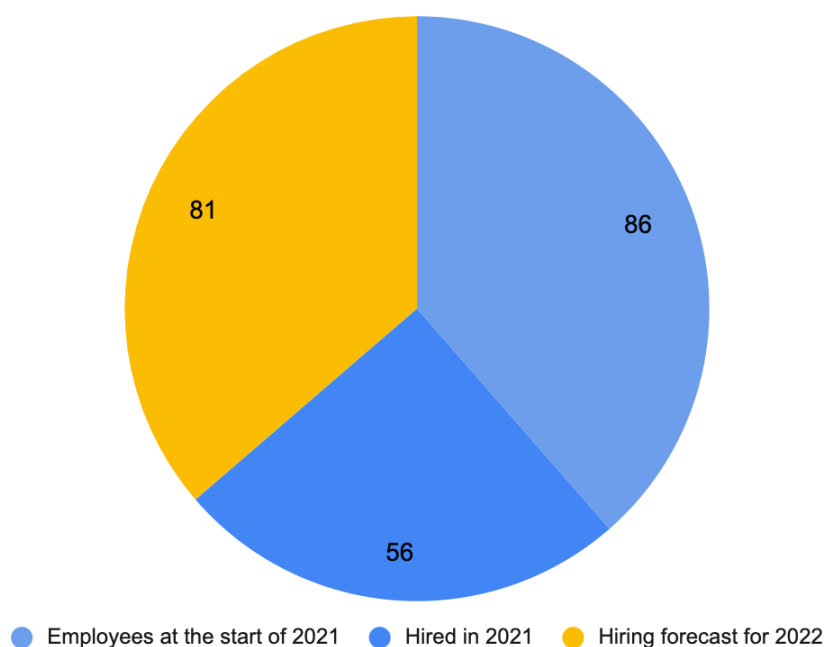
The two largest employers in the AR/VR field are Creative Mobile and Wolf3D, both of which employ approx. 30 employees in the field of XR.

TOP Employers 2021	
CM Games	30
Wolf 3D	30
Alpha AR	11
Mobi Lab	8
Futuclass	7

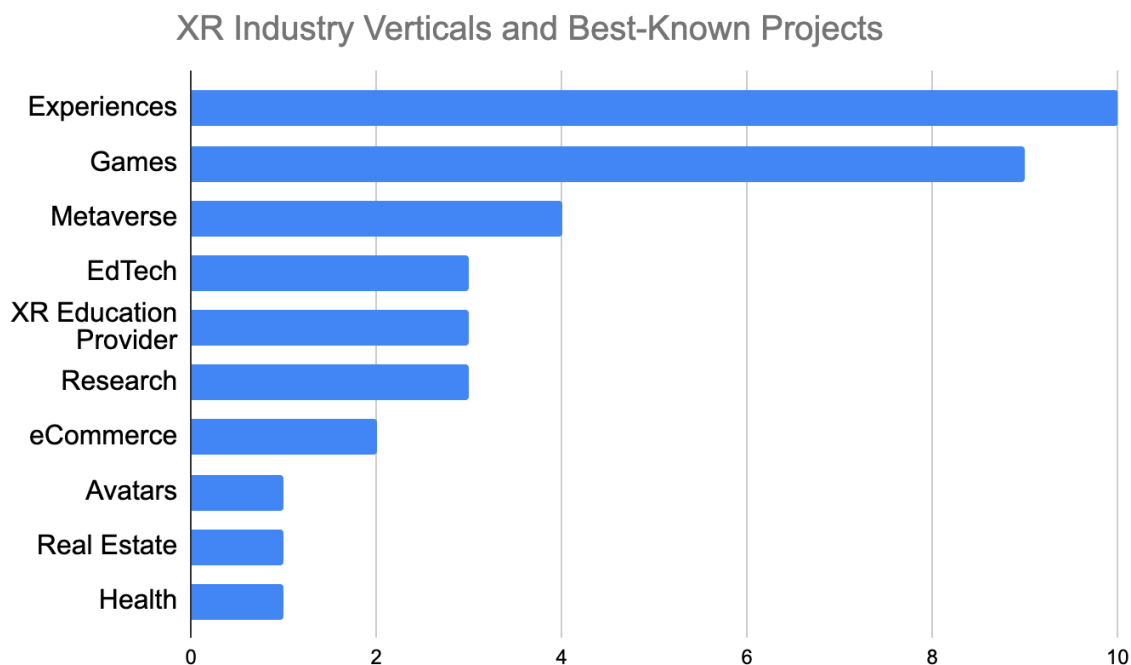
2022. Workforce Forecast

In 2022, the grow is expected to continue and, in connection with it, the recruitment of employees. If in 2021 approx. 56 employees were recruited and by the end of the year there were 132 employees in the sector, then **in the new year approximately 81 new employees will be needed for various roles.**

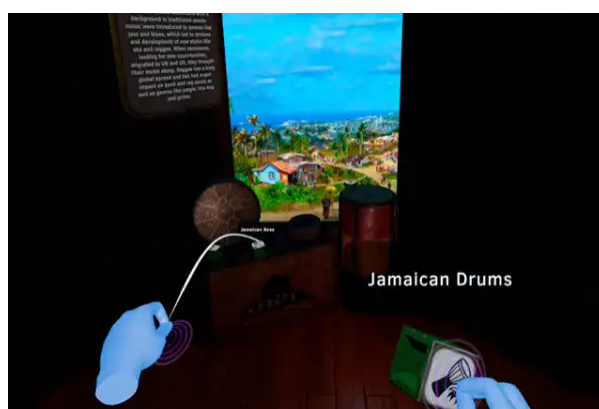
XR Industry Employee Growth in 2021 and Forecast for 2022



XR Industry Verticals and Best-Known Projects



Development of VR experiences and **development of VR games** are the most popular among those surveyed. A new category this year was the **metaverse**, which includes various applications with a social or blockchain component in virtual or augmented reality. Each institution could indicate more than one field of activity.



Picture 2 - "Interactive music table" created by MaruVR for Mondo NGO

VR experiences are game-like interactive solutions that offer visitors exciting experiences, e.g. the opportunity to visit attractions, special solutions in museums, demo solutions for companies in various fields, etc. Four experiences created by **Maru VR** in 2021 could be highlighted: "Interactive Music Table" in cooperation with Mondo NGO, and "Beach Safety", "Water Safety" and "Emergency Action" in cooperation with the Estonian Rescue Board. It is also worth mentioning **Mobi Lab**, which, in addition to several mobile AR applications, also launched the product "Reality Maker", which gives the opportunity to create such AR applications.



Image 3 - "Into the Radius" in the Steam PC Game Store

An equally popular field of activity of XR in Estonia was **developing games**. One of the most commercially successful games in Estonia now, which accounts for as much as 40% of the revenue of the entire Estonian XR sector, is "Into the Radius VR", which takes place in an open world Stalker-like universe. It was released by **CM Games** on 20 June 2020 (the original version of the game was already out for testing on 23 November 2019). Last year, the game was updated to a version 2.0, which greatly enriched the gaming experience. The game currently has nearly 3,900 very positive feedbacks in the Steam store, and the game is continuously updated. A Meta Quest 2 version is also rumored to be in development. During the next year or two, 3-5 more exciting VR games will be launched by Estonian developers to the world market, which are still under development.



Image 4 - Wolf3D avatar platform "Ready Player Me"

There are many definitions of the **metaverse**; for this study, this means companies whose products help people move between different XR experiences or purposefully spend time with other people. Now, the flagship of the Estonian XR industry is Wolf3D, whose avatar platform **Ready Player Me** is the most well-known, next to those of the world's big technology companies (Apple, Facebook, Nintendo, Microsoft). "Ready Player Me" interfaced with over 1,000 virtual worlds or apps in 2021, meaning that with just one selfie, you can create an avatar that can be used in all these apps. Wolf3D [brought in \\$13 million at the end of the year](#), and even bigger deals are expected to happen in 2022.

It is also worth mentioning the company **Alpha AR**, which has also raised money from venture capitals and solves the problem of content creation in the metaverse: how to automatically make 3D models from a 2D image.

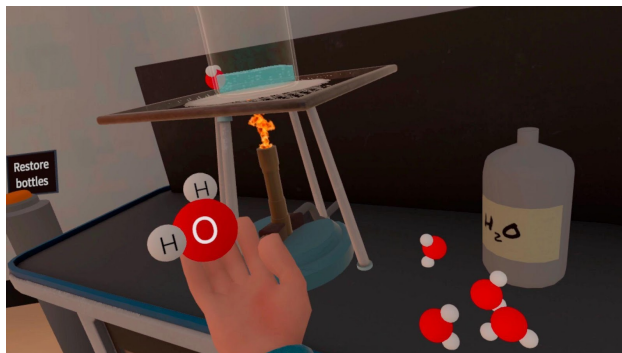
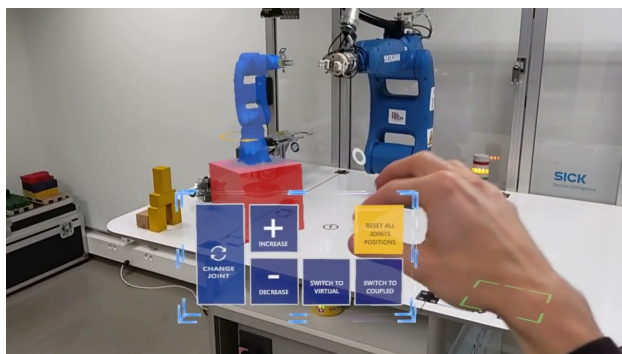


Image 5 - Futuclass Oxygen Combustion themed escape room

Another popular field of activity in the Estonian XR scene is **educational technology (EdTech) and the development of VR applications related to education**. Many museums and tourism-oriented AR and VR solutions can be considered educational technology because they help people educate themselves. In Estonia, **Futuclass** is a VR learning platform specially designed for schools, with which 7th-9th term students can study chemistry and physics. 20 schools have joined the platform, and the learning content and functionality are being developed every year. Recently, the "Teachers' Portal" facilitating the conduct of VR lessons and a VR school set as a "plug-and-play" for schools were added to the product range.



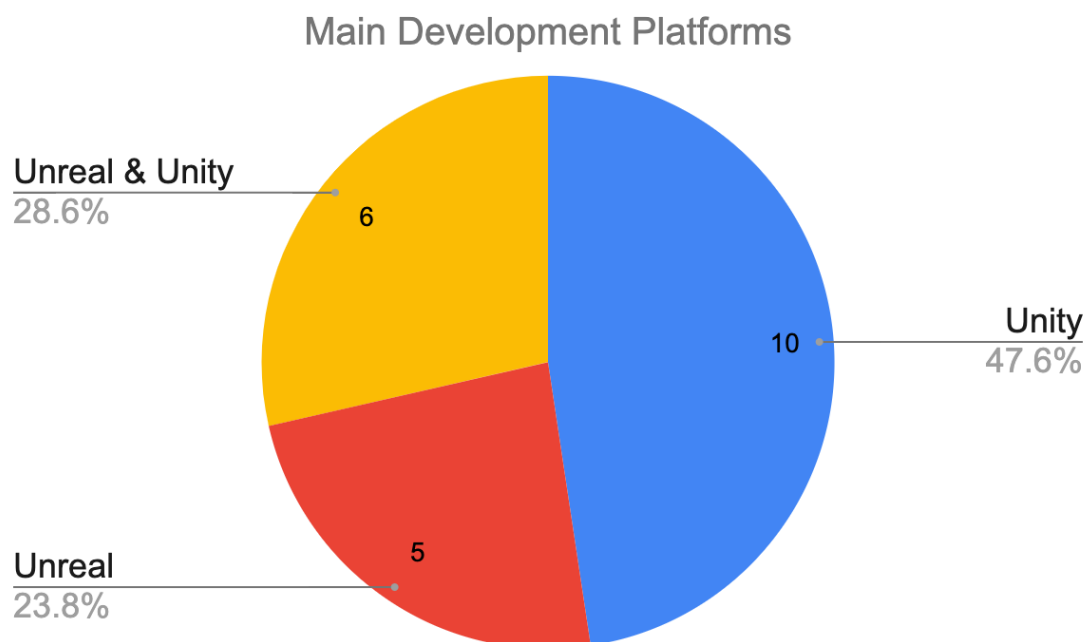
Picture 6 VR/AR laboratory on TalTech website, <https://ivar.ttu.ee>

As the respondents included representatives of many universities that offer specific XR-related education in their laboratories, the areas of **XR education** and **XR research** also received several votes. The Estonian higher education institutions that responded have XR laboratories with the following inclinations: TalTech – XR Center (consultations, training, teaching) and IVAR (with industrial application VR and AR), University of Tartu – CGVR (computer graphics and virtual reality), Tallinn University – MEDIT (media innovation and digital culture), TTK University of Applied Sciences – BIM Cave (construction, architecture).

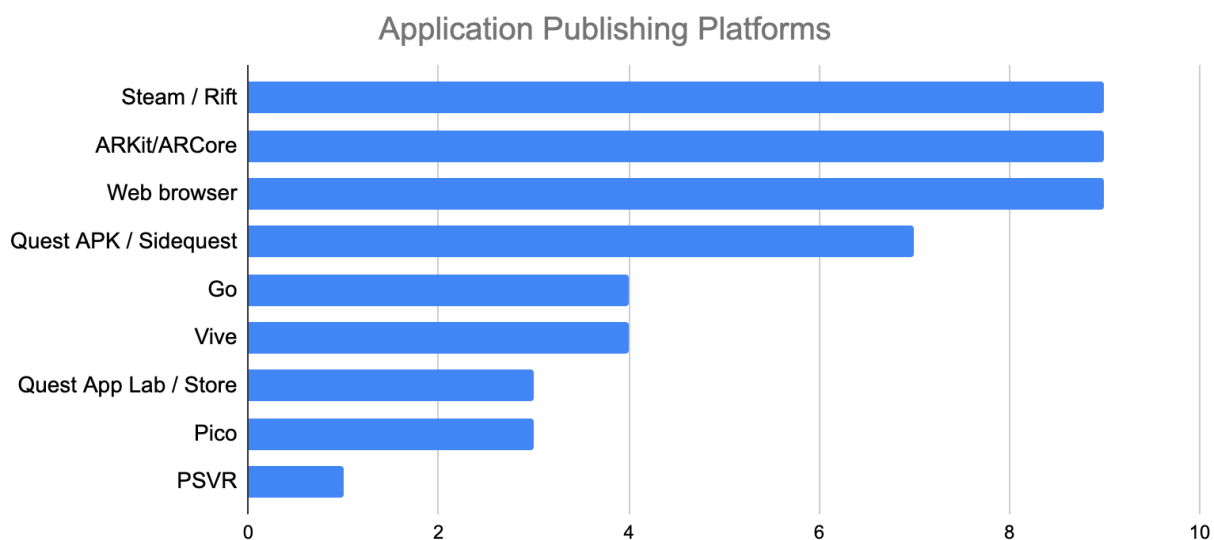
Among other XR fields being developed in Estonia, e-commerce, real estate, and medical solutions were highlighted.

Main Development Platforms

Unity (16 respondents) and **Unreal (11 respondents)** were mainly cited as development platforms, with five companies using both. Other tools mentioned include Arilyn, Blender, Scene, Studio, and various web development platforms.



Application Publishing Platforms



Most VR apps developed in Estonia are published on **Steam or Rift** platforms, AR apps on **Android and Apple** platforms, and several apps are also available simply through a web browser. It can be surprising to find out how very few apps made in Estonia are available in the stores of the increasingly popular wireless VR headsets **Quest and Pico**.

III – Economic Indicators of the VR/AR Sector

Total Revenue of Companies in the VR/AR Sector

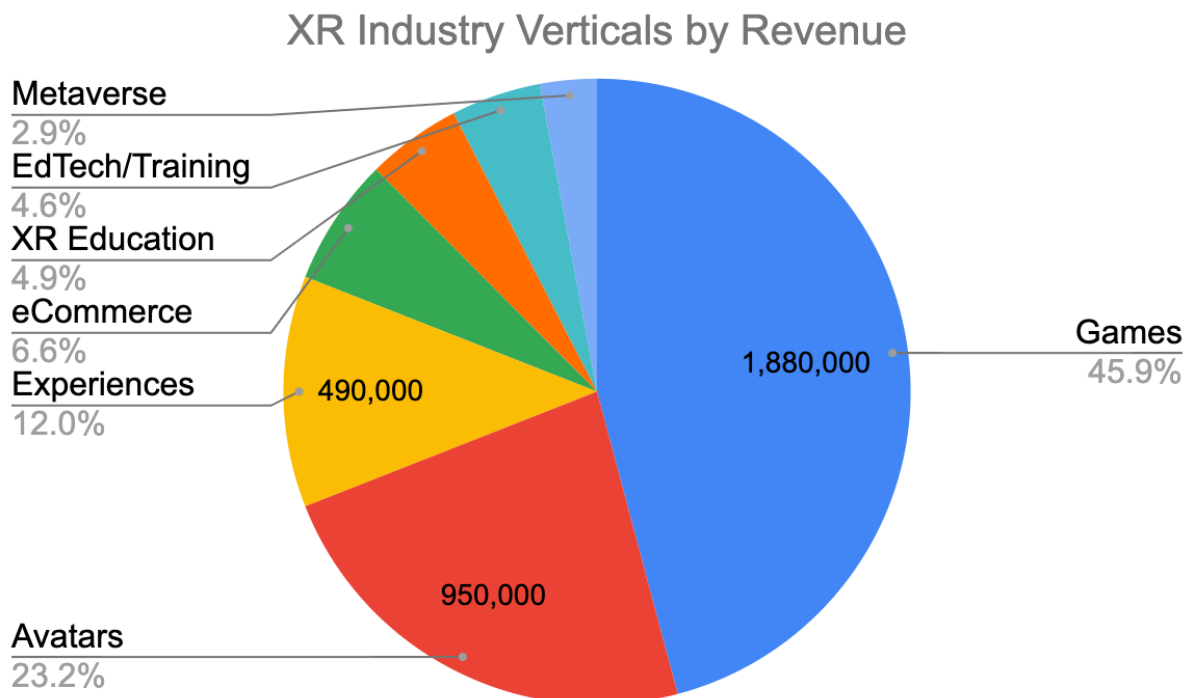
The total revenue of the Estonian VR and AR sector in 2021 has been calculated based on 17 responding companies and focuses on the **sales revenue related to the production of VR/AR/XR content**. The total revenue of the sector was **4.1 million euros**, which is 102% more than last year. Of this, **74.7% (3.063 million) is export revenue** and 25.3% (1.037 million) is domestic. The highest revenue was made by Creative Mobile and Wolf3D (1.6 million euros and 0.95 million euros, respectively) and the same companies will most likely be the drivers of growth in the coming years.

Renevue TOP 2021	
CM Games	1 600 000
Wolf 3D	950 000
Blueray	215 000
RootMotion	210 000
Maru VR Productions	165 000

VR/AR Sector-Specific Revenue Distribution

You can get an idea of sector-specific revenues by classifying each company into one sector and considering their average revenue range as belonging entirely to that sector. Thus, the games sector shows the highest revenue, followed by avatars, experiences, e-commerce and XR development.

XR Industry Verticals by Revenue 2021	
Games	1 880 000
Avatars	950 000
Experiences	490 000
eCommerce	270 000
XR Education	200 000



IV – Development Trends of the Sector in 2021 and 2022

Overview of VR-AR Development Trends in 2021

2021 was filled with several events in the field of XR. According to the survey respondents, the most important of them were:

1. Metaverse

Metaverse can be defined as a spatial Internet where we can enter through VR or AR glasses (this definition is preferred by Facebook/Meta) or as a blurring of the boundaries between real life and virtual life, where it no longer makes a difference in which reality or platform you live, work or own things (this definition is preferred by most others).

The term “Metaverse” became popular and overused in the second half of 2021. Every company whose product was even remotely related to VR/AR or user interaction over the internet declared itself to be a part of the metaverse to better sell itself to investors and customers. Suddenly, every company needed its own “metaverse strategy”.

At the same time, many of the world's companies, whose technology is necessary to build the metaverse, saw powerful growth opportunities. This includes technologies and platforms that enable the creation of NFTs such as RTFKT and Opensea (NFTs are digital items with a limited edition and unique functionality enabled by the blockchain); virtual worlds such as Decentraland and Sandbox, where the real estate boom took place, among other things, are

based on the Ethereum blockchain; gaming platforms such as Roblox, Fortnite and Minecraft; content creation in the metaverse is facilitated by companies such as Estonia's own Wolf3D and Alpha AR.



Image 7 "Metaverse Festival" in the online environment Decentraland.

2. Facebook -> Meta

It is unprecedented that a company in the world's top five by market value makes such large investments in technology that is so far from their current business. In 2021, Facebook renamed the entire company Meta Platforms, Inc., doing business as Meta, thus **betting on the realization of its entire future on metaverse** and unleashing a storm in the technology sector.

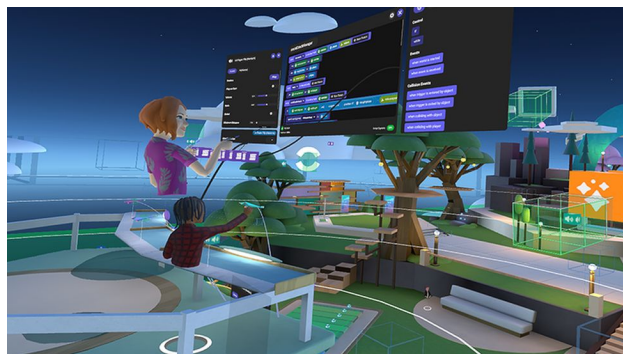


Image 8 Horizon Worlds, a closed "metaverse"

For Meta, metaverse is a place to go using VR headsets, which Meta currently is the world leader in building. At least every fifth Meta employee is currently working on the metaverse, making both virtual and augmented reality glasses more user-friendly and adding more and more functionality for entertainment and professional use cases. One of the biggest bets currently is the **Horizon Worlds platform, which is expected to be the first version of the so-called spatial internet** where people both create and consume content in 3D worlds.

3. The triumph of Quest 2 and the precipitous decline of PCVR

Launched in October 2020, the Quest 2 headset is still a top-seller and is believed to have reached 10-15 million units sold by now. The latest April 2022 survey of PCVR's leading platform, Steam, shows that there are about 1 to 1.5 million actively used PC-based major headsets, the number has rather fallen slightly over the past year. In other words, **wireless headsets are shooting for the stars**.

The Quest 2 platform is also constantly technologically updated. The headset can now be controlled only by hand (hand tracking), the real world can be seen through the cameras (passthrough), and every developer can now easily distribute their software to Quest users (App Lab platform).

4. New headsets

- **Sony PSVR2** headset release for the PlayStation 5 has been announced and is expected to hit stores at the end of 2022. Expectations are high because until Quest came along, PlayStation VR was the best-selling immersive VR headset in the world.
- **Pico Neo 3**, the first serious competitor to Quest wireless headsets, has now been launched in North America and Europe in addition to China. Since Pico was recently acquired by TikTok's parent company, ByteDance (for roughly \$775 million), the hope is that the competition will make future headsets even more user-friendly. We're also still waiting for other big-name hardware companies to launch their own wireless headsets.
- Varjo, the Finnish market leader in high-end VR and AR devices, launched the first consumer device, **Varjo Aero**, though the device is still fully wired to PC.

5. Developments in Augmented Reality

- Niantic, the creator of Pokémon Go, has launched **Niantic Lightship**, a “real-world metaverse” platform for developers.
- In cooperation with RayBan, Meta released the **RayBan Stories** glasses, which do not yet show an AR image, but with which you can record 30-second videos and listen to audio hands-free.
- Snap released **Spectacles 4**, one of the first consumer AR glasses, which are initially only available to content creators.
- WebXR went even further in developing its products and now allows phones (currently only Android phones) to consume AR experiences directly through the browser.



Image 9 Niantic's mission is to build a "real world metaverse"

6. Developments of the Estonian VR and AR industry

Compared to 2020, 7 companies have disappeared from the survey list. The most well-known of them is Levity Play, the reason for their disappearance is the termination of further development of their relatively successful VR shooting game "Skyfront" and focusing on other game platforms.

Due to the impact of COVID, the **Estonian out-of-home VR market has still not recovered**: the remaining companies that had to close their doors in 2021 were VR game rooms and VR equipment rental services.

Overview of Expected VR-AR Development Trends in 2022

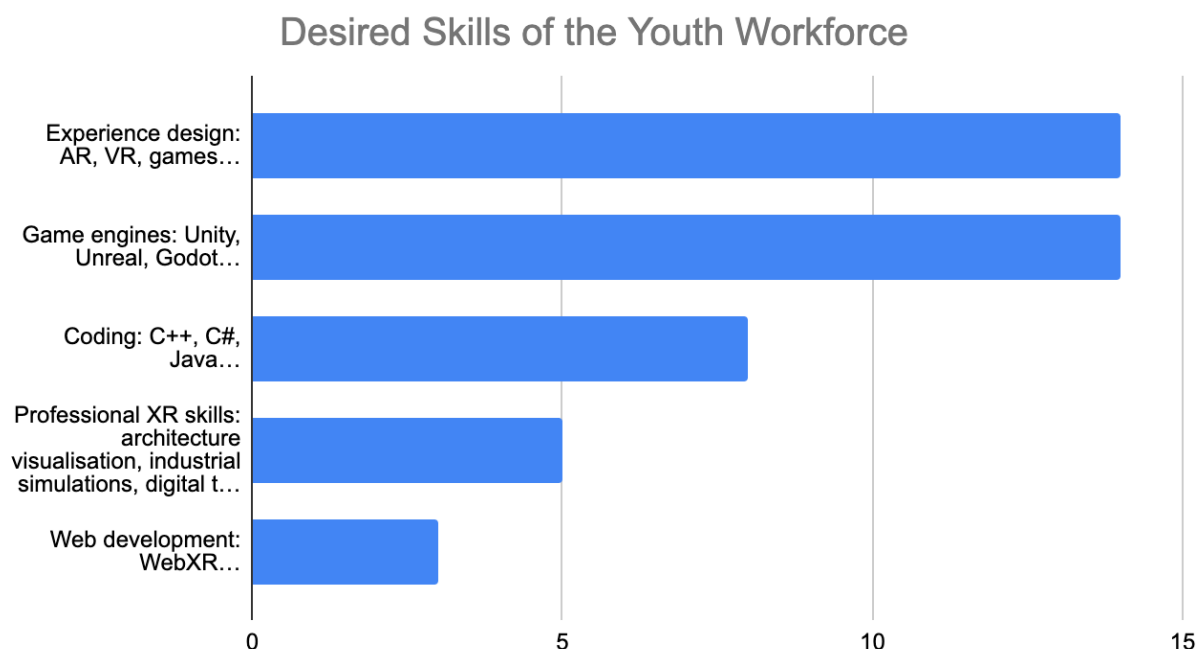
Among the **expected development trends in 2022**, the most popular among the respondents were:

1. Web3 and Metaverse developments
2. New VR headsets, notably Apple's long-awaited XR glasses and Steam Deckard
3. New developments by Meta
4. No more requirement of Facebook accounts to use Quest 2 devices
5. WebXR support on iOS phones
6. Brain interfaces for controlling machines

V – Promoting the Evolution of the VR-AR Ecosystem in Estonia

Skills of the Youth Workforce

Since it is believed that companies will mainly have to raise the needed workforce in the coming years, the survey specifically asked about the desired skills of the youth workforce. The most important of these were **the design of VR/AR experiences and knowledge of game engines such as Unreal and Unity**. EEVR contributes to the need for these skills to be increasingly taught in Estonian higher education institutions soon.



EEVR Joint Activities

In the survey, representatives of the Estonian XR industry were asked, among other things, about the contribution of EEVR as an organization both to the activities of the members themselves and to society at large. It was mostly pointed out that EEVR could assist members in **finding employees**. In 2022, EEVR plans to **represent its members at career fairs** and create joint **marketing campaigns** dedicated to finding personnel in virtual channels. There are also active job advertisements by EEVR members on the website eevr.ee/xr-jobs/

Another bottleneck, where EEVR could make its own contribution, was the lack of **funding opportunities**. One of the important activities of EEVR in 2022 will be keeping its members informed about various public funding programs and projects related to the field, as well as bringing them together with potential investors.

One of the important tasks of EEVR is to **raise awareness** of the topic of virtual and augmented reality both in the business and public sector as well as at the individual level. EEVR tries to be more represented in the most popular **social media channels**, such as giving updates in local news and mainstream media and creating more relevant and Estonian-language content for its website.

The scope of activities of the current leaders of the Estonian XR industry is quite wide in terms of products, technology, and size, but among the common development trends, the need for **additional knowledge** in the field of business strategy, development, marketing, personnel work, and sales was highlighted (12, 8, 8, 6 and 5 respondents, respectively). Based on the outlined topics, EEVR plans to organize **joint trainings** in 2022 or participate in a training organized by someone else with its members. It will certainly continue, like 2021, with the gathering of regular members to learn from each other's experiences and activities. When opportunities arise, at least one field trip outside of Estonia is organized or **foreign guests** are invited to perform at EEVR's Estonian events.

In 2022, major Estonian events are planned to include the **Latitude59 conference** (May 19-20 in Tallinn) and the **business festival sTARTUp Day** (August 24-26 in Tartu).

Appendix 1 - Companies/Organizations that Responded to the EEVR Questionnaire

	Companies	Business Area	Home Page	EEVR Member
1	Acode OÜ	Games	www.acode.ee	Yes
2	Alpha AR	eCommerce/Metaverse	www.alphaar.io	Yes
3	AVAR Agentuur	eCommerce		
3	Blueray OÜ	Experiences	www.blueray.ee	Yes
4	Creative Mobile OÜ	Games	https://cm.games	Yes
6	Cstudio/VR LAB OÜ	EdTech/Training	https://cstudio.co/about-us	No
7	ExteriorBox OÜ	Games	www.exteriorbox.com	Yes
8	Futuclass OÜ	EdTech/Training	www.futuclass.com	Yes
9	Gamefront OÜ	Games	https://www.exteriorbox.com	Yes
10	Greip Productions OÜ	EdTech/Training	https://greipproductions.eu	Yes
11	Maru VR Productions OÜ	Experiences	www.maruvr.ee	Yes
12	Metatellus OÜ	Metaverse/Augmented Reality	www.metatellus.com	No
13	Mobi Lab OÜ	Experiences/Augmented Reality	https://lab.mobi	Yes
14	Operose Labs OÜ	Experiences	www.operose.io	No
16	Realified OÜ	Games	www.rexr.io	No
17	RootMotion OÜ	Games	www.root-motion.com	Yes
18	Vriendly OÜ	Metaverse	www.vriendly.co	No
19	Wolf3D/Ready Player Me	Avatars/Metaverse	www.wolf3d.io	Yes
	Public sector organizations	Business Area	Home Page	EEVR Member

1	Eesti Loodusmuuseum	EdTech/Training	www.loodusmuuseum.ee	Yes
2	Päästeamet	EdTech/Training	https://www.rescue.ee/et	Yes
3	Tallinna Tehnikaülikool (TalTech), Mektory XR Keskus	XR Education Provider	https://taltech.ee/xr-keskus	Yes
4	Tallinna Tehnikaülikool (TalTech), Paindootmissüsteemide ja robotika demokeskus	XR Education Provider	https://ivar.ttu.ee	Yes
5	Tallinna Tehnikakõrgkooli Virtuaalreaalsuse labor	XR Education Provider	https://www.tktk.ee/ettevotjale/laborid/virtuaalreaalsuslabor	Yes
6	Tartu Ülikool, Arvutigraafika ja VR labor	XR Education Provider	https://cgvr.cs.ut.ee/wp	Yes

Appendix 2 – Examples of Estonian VR/AR/XR projects Completed in 2021

Company/ Organization	Projects and Links
Alpha AR	Most of the work is protected by NDAs, but content created with Alpha AR tools can be seen on the following websites: VivaTech, Renault, Farfetch, Browns Fashion, WANNA, Decentraland etc.
CM Games	VR game "Into the Radius" on Steam online store: https://store.steampowered.com/app/1012790/Into_the_Radius_VR/
CStudio	Various projects can be found on the website: https://cstudio.co/vr-ar-casestudies/
Futuclass	<ul style="list-style-type: none"> - Futuclass Chemistry VR Lessons for Schools in Meta Quest App Lab: https://www.oculus.com/experiences/quest/3900127736753019 - Teacher Portal: https://portal.futuclass.com/ - Futuclass VR lesson descriptions: https://futuclass.com/et-ee/lessons/
Greip Productions	<ul style="list-style-type: none"> - Tartu Rahu - Aktuaalne Kaamera 65 - Rahatarkus
Maru VR Productions	<ul style="list-style-type: none"> - Interactive 360° video "Shared Journeys" and interactive music board produced for Mondo NGO - Three VR experience applications developed for the Rescue Board - "Safety on the beach", "Safety by the pond" and "Preparations for emergency situations" - Four VR educational apps in the AltspaceVR environment for UT Narva College - VR game prototype
Metatellus	Social augmented reality app Plop for mobile platforms: https://plop.global
Mobi Lab	<ul style="list-style-type: none"> - Reality Maker for augmented reality platforms: https://lab.mobi/mars/realitymaker - Augmented reality project with Ericsson for the Estonian Maritime Museum - Augmented reality exhibition at Tallinn Song Festival Grounds visitor center - Visit Estonia AR campaign at EXPO2020 Dubai - https://ar.visitestonia.com/en/content/bear - State Forest Management Centre's augmented reality campaign: https://loodusegakoos.ee/where-to-go/national-parks/alutaguse-national-park/kauksi-visitor-centre - TalTech augmented reality campaign: http://teejuht.taltech.ee/ - Augmented reality platform of the Estonian Natural History Museum: https://www.youtube.com/watch?v=AFB7pyeE3F4 - Educational augmented reality game: https://www.youtube.com/watch?v=YQWqzkLNGGM

Operose Labs OÜ	Artemon - a platform for viewing art in augmented reality. Now closed.
Päästeamet	Three VR experience apps - "Safety on the beach", "Safety by the pond" and "Preparations for emergency situations" that can be experienced at public events.
Ready Player Me	Integrated over 2000 apps with the platform: https://readyplayer.me/apps
Tallinna Tehnikaülikool (IVAR, Mektory XR Keskus)	<ul style="list-style-type: none"> - List of projects: https://ivar.ttu.ee/research - 360° videos/VR/AR solutions of the mine are prepared in cooperation with project partners - https://mirebooks.com/materials
Tartu Ülikool (CGVR labor)	<ul style="list-style-type: none"> - University of Tartu students' projects and theses (some of them in XR): https://cgvr.cs.ut.ee/wp/index.php/defended-theses - By 2022, a virtual reality course will be created that can be taken by students who have previously completed the current game development and game engine courses: https://cgvr.cs.ut.ee/wp/index.php/vorgupohised-kursused/ - Annual showreel video: https://cgvr.cs.ut.ee/wp/index.php/cg-demo-reels/ - A wide range of projects CGVR projects (some of them in XR): https://cgvr.cs.ut.ee/