

Competition in Virtual Worlds

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1. What entry barriers or obstacles to growth do you observe or expect to materialize in Virtual World markets? Do they differ based on the maturity of the various markets?

Entry barriers differ to the maturity of the market. In general, there are various barriers. The most important barrier seems to be the technology requirements. Developing and maintaining VWs requires cutting-edge technology (VR displays, High-End Graphics Cards, Hardware Controls, etc.), Frameworks, Servers. Developers need to learn new UI/UX concepts, need to be familiar with Frameworks and tools, and companies need to invest in licenses and training for their staff. VR products need to be differentiated in the market by innovative features or an innovative user experience to be successful. In mature markets, existing players may have a technological advantage, making it harder for newcomers to catch up. Furthermore, the compatibility with existing platforms and ecosystems is a challenge for new entrants. On an economic level, development is more expensive than non-VR-development. Furthermore, monetization in VWs and VW business cases, are not yet established. From the Gaming industry, monetization mostly reflects access licenses and game add-ons, but except for that, only few consumer business cases exist. However, in the area of industrial or professional applications, monetization seems to be solved quite well. Considering a worldwide market, coping with licensing, regulation, data protection and privacy in different regions is a huge challenge for newcomers and existing players. Finally, some general barriers for every business also apply to the VR businesses. Marketing cost and user acquisition, as well as community building are challenges both in the VR and non-VR world.

2. What are the main drivers of competition for VW platforms, enabling technologies of VWs and/or services based on VWs? Do you expect that to change and, if so, how?

From my perspective, User Engagement and User Experience are the most important drivers. Virtual Worlds – independent of being web-based, application-based, or VR-display-based) have to provide a unique immersive and enjoyable environment. This also involves the generation and presentation of content in a creative and innovative way utilizing cutting-edge technologies. Many established companies from almost any real-world business areas need to be present also in VWs from a brand and reputation building perspective - similar to the 90's, where each and every company needed to be present in the World Wide Web. Furthermore, in the industrial, medical, automotive, or educational area, advances in technology serve as a foundation for completely new business cases. For example, remote virtual surgery would not be possible without the technical foundation.

3. What are the current key players for VW platforms, enabling technologies with significant influence on the competitive dynamics of these markets?

The announcement and final delivery of Apple's Vision Pro paired with the much cheaper Meta Quest 3 hardware undoubtedly boosted the awareness of the public in terms of VR/AR/MR/Metaverses/Spatial Computing. This also had an effect on existing and well-established platforms like, e.g., Roblox, Minecraft, Fortnite, Second Life, Decentraland, Axie Infinity, and many more. Most of these worlds currently are accessible via browser, however there's a clear trend towards VR-devices (e.g., Recroom, Spatial, VR Chat, Red Fox, Horizon Worlds). A good source for statistics is Metaversed Consulting (<http://metaversed.webflow.io>), who provide an extensive and well-investigated market overview. In terms of enabling technologies, there are Unity and Unreal as major providers of VR/AR toolkits, however also Apple's Spatial Computing, and standard C++ development has to be mentioned. All major development tools provide toolkits and frameworks, which make it easier for the developers to build VR applications. Furthermore, Blockchain, AI, Cloud Computing and Content Delivery are core components for many applications.

4. Do you expect existing market power to be translated into market power in VW markets?

Yes. As mentioned, many established companies will have to be present in VWs. Therefore, more and more marketing budget will be spent on VR topics. Furthermore, successful companies in existing markets will have more power and budget to enter new markets instead of unknown newcomers.

5. Do you expect potential new entrants in any VW platforms, enabling technologies of VWs and/or services based on VWs in the next five to ten years and if yes, what products and services do you expect to be launched?

One of the best examples currently is Apple's Vision Pro. Such a device can be an enormous boost for the whole area of VR/AR and also be an enabling technology for many business cases. Considering the advances in this area in the last few years and the speed in which new and innovative products are released, there will be many different devices particularly in the area of Augmented Reality, which will bring AR to our normal life. Based on these technological advances, also new companies, players, platforms, and frameworks will arise. However, most of these new players will rely on a technological foundation built by the big and major players. From my perspective, this will be Apple, Google, Meta, and Samsung, as they seem to be the only few companies being able to build such technological foundations (both from an engineering and from an investment perspective).

6. Do you expect the technology incorporated into VW platforms, enabling technologies of VWs and services based on VWs to be based mostly on open standards and/or protocols agreed through standard-setting organizations, industry associations or groups of companies, or rather the use of proprietary technology?

Unfortunately, a small number of players will provide technology foundations (see question 5), each of them being in strong competition with the others. Currently, no standards exist, so each player in the market will have to use one or more of the technology foundations and discover interoperability or reusability by themselves. Furthermore, the regulatory conditions all over the world are difficult to understand and mostly left to the companies and the business cases they want to deliver. I expect

standards and open protocols in various business-related areas (e.g., seamless travelling between virtual worlds, authentication, avatar descriptions, etc.). However, these will be born out of necessity and not according to a joint initiative. Many of the features, the big platforms will provide, are proprietary. For example, Apple's option to record and playback spatial video, is only available in Apple's ecosystem and it is not likely that Apple will open this option to others. However, other vendors will see the urge to provide similar techniques on their devices. Currently, these vendors try to get as much market share as possible and won't agree to standards in short term. In 5-10 years this might be considered.

7. Which data monetization models do you expect to be most relevant for the development of VW markets in the next five to ten years?

A first initial monetization model is Advertising. VR/AR offers new ways to promote products, share messages, interactively and/or immersively make users try new products or discover product properties. These models mostly intend to use VR/AR to make users buy real-world products. However, also in VR worlds, brand marketing will be important, particularly in the fashion and luxury area. Except for marketing, new business-cases will enable monetization. Of course, content will be one key driver for monetization. Gaming and Gaming-add-ons will address the mass market, while professional applications will address business customers in industry, medical area, construction, automotive.

8. What potential competition issues are most likely to emerge in VW markets?

I think, we had some very good examples for competition issues in the past. From my perspective, similar issues will be faced in VW markets. Currently, there are a lot of players. Many of them will disappear, others will arise until the market consolidates. For companies this means, that they might need to re-develop applications, when the selected platform is no longer supported, which includes training, education, funding. If a product is based on the "wrong" platform, it might be impossible to migrate it if the platform discontinues. Vendors will try to force companies into their own ecosystem and make it hard for them to remain open and platform independent. Also from a contractual and/or legal perspective, vendors might look for lock-in concepts and exclusiveness.

9. Do you expect the emergence of new business models and technologies to trigger the need to adapt certain EU legal antitrust concepts?

Yes. New business models and technologies will trigger the need to adapt current legal concepts. A good example is the recording of real-world scenes and their playback (or streaming) in virtual worlds. As VR provides a whole new and immersive user experience, such videos will soon "feel" like being real. Capturing important moments sounds positive from a marketing perspective. However, in terms of data protection, uncovered scenarios may arise. Paired with the psychological effect, such recordings might have on people. If, e.g., a beloved person is no longer available (death, divorce, etc.) people might remain in the VR and continuously watch captured moments. Private collections of such captures might be shared without the agreement of the captured persons. This is going to be a whole new dimension for security and privacy protection. Furthermore, the new technologies are able to record and sensor billions of data records in every aspect or dimension. We're no longer talking just about recorded pictures or videos, also distances, measures, movements, accelerations, velocities, scene-graphs, raw VR-data, etc. will contribute to personal and protectable

data and will be subject to sharing, misuse, and everything we know from past experiences with pictures and videos. From a legal perspective, these new features must be aligned with existing or adapted regulations.

10. Do you expect the emergence of new business models and technologies to trigger the need to adapt EU antitrust investigation tools and practices?

Yes. This question goes hand-in-hand with question number 9. Of course, existing tools and practices need to reflect the new possibilities.