

Why aren't there VR headsets in every home?

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1 Body of the Article

Things that make people's lives easier generally easily become widespread, especially if they are affordable. Let's take a quick detour to the late 1920s in the USA. A toaster could be found almost in every home that had electricity, while the introduction of the radio was a bumpier process. Especially rural regions had few radio stations, and the reception could be spotty, while the need to have an external antenna increased the complexity [6] of getting it to work there. Also, especially home-made, radios in the past were the opposite of sleek. Who would want boxes with exposed cables sitting around their living room? It was when they not only offered valuable content to the contemporary families, but also when they met the aesthetic standards of the times they became sought after - that meant hiding them in furniture and streamlining their design, shedding excess dials and buttons and increasing appeal and usability. Let's also not forget: lowering the price, as some families could not afford them until the 1950s [4].

VR headsets, especially the early ones, were also very expensive and quite clunky. They had their debut in research laboratories in 1960s, but for a long time they could only do basic things, such as draw wireframe shapes. In 1995 more affordable consumer VR headsets were released, but due to their hardware requirements, limited capabilities and lack of content they did not catch on. We had to wait until the Oculus headsets and their 2012 Kickstarter campaign to get a more viable home alternative.

It has been over 60 years since lab VR prototypes, and over ten for the Oculus campaign, still VR is not a staple device in every home; more a curiosity than a necessity. Sure, unlike a radio, or a TV set a VR head-mounted display (HMD) can be used by one person at a time, which may limit its appeal.¹ However, this is not the whole story.

The mainstream user needs to clearly see a use for their purchases, and aside from gaming and some educational applications, this use is not made very clear. Perhaps this limitation is related to the groups VR headsets are developed for and marketed to, predominantly young white males. Some studies from 2021 point to limited inclusion of diverse populations in the R&D cycles and VR

¹ Games like "Keep Talking and Nobody Explodes" which you can play as a group, with one person in VR are a honorable exception here.

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Fig. 1. Ad in "Radio Broadcast Advertiser" May 1923 source: <https://www.radiomuseum.org/>



Fig. 2. A more aesthetically pleasing radio design from 1941 by Canadian General Electric, enclosed in a wooden case.



Fig. 3. VR Goggles developed by NASA's Ames Research Center in 1985, and wired gloves.



Fig. 4. The design of a modern early commercial headset HTC Vive from 2016

studies [5] resulting in little variety in design, affecting ergonomics and comfort and not accounting for individual user differences [3].

There are also the usual barriers of high price, the need for a fast home network, or a good computer if the headset is not a standalone device. But an often overlooked limitation is related to the medium's heavy reliance on movement, and, hence, the required obstacle-free space at home. While the HMD price may drop, this may not be enough for VR to become a widespread commodity [7]. A large group of people may still be living in small spaces with the average area per capita of 5-10 square meters, especially in developing countries. It is possible to use VR in a stationary mode, but the recommended minimum play space for some experiences is 2x2 meters, with 3x3 meters being the golden standard.

Despite these, there is progress on some frontiers, including education. Stanford's students can sign up for a "Virtual People" course in VR since 2021, an upgrade to a course that has been running since 2003. VR is also used to train professionals in simulators, to protect other more expensive equipment, and themselves. It has also been studied for professional applications. In Poland, the Laboratory of Interactive Technologies of the National Processing Institute spent over a month organizing regular meetings in Virtual Reality, via Horizon Workrooms using Meta Quests 2 [1]. Apart from discomfort related to the headset weight and the eye-strain of lower resolution, an interesting finding was what is dubbed as "the VR turn-on ritual". Before entering VR, the user has to prepare themselves, the headset and the surrounding space to enter the virtual world. This is shown to be a barrier, as some participants commented it is only worth it for them if they stay in VR for an extended period of time.

Although virtual reality, as depicted in sci-fi, with a promise of full-body immersion and a perfect real-life-replicating experience is still far off, we are slowly getting there. Heavy headsets are getting lighter each year. Controllers are set aside in favor of hand-tracking and using VR at home is becoming safer with better boundary tracking and higher quality pass-through mode. But other relevant questions remain. First, what unique content, besides educational experiences and games can virtual reality offer to the general public? How to design the VR user experience, to take into account the needs of diverse groups? And finally, should we worry that, when we learn how to do it right, it may eventually have more appeal than reality [2]?

References

1. Abramczuk, K., Bohdanowicz, Z., Muczyński, B., Skorupska, K.H., Cnotkowski, D.: Meet me in vr! can vr space help remote teams connect: A seven-week study with horizon workrooms. *International Journal of Human-Computer Studies* **179**, 103104 (2023). <https://doi.org/https://doi.org/10.1016/j.ijhcs.2023.103104>, <https://www.sciencedirect.com/science/article/pii/S1071581923001131>
2. Bojic, L.: Metaverse through the prism of power and addiction: what will happen when the virtual world becomes more attractive than reality? *European Journal of Futures Research* **10**(1), 22 (Oct 2022). <https://doi.org/10.1186/s40309-022-00208-4>, <https://doi.org/10.1186/s40309-022-00208-4>

3. Ciccone, B., Bailey, S., Lewis, J.: The next generation of virtual reality: Recommendations for accessible and ergonomic design. *Ergonomics in Design: The Quarterly of Human Factors Applications* **31**, 106480462110025 (03 2021). <https://doi.org/10.1177/10648046211002578>
4. Craig, S.: How america adopted radio: Demographic differences in set ownership reported in the 1930-1950 u.s. censuses. *Journal of Broadcasting & Electronic Media* **48**, 179–195 (06 2004). https://doi.org/10.1207/s15506878jobem4802_2
5. Peck, T., McMullen, K., Quarles, J.: Diversify: Break the cycle and develop vr for everyone (09 2021)
6. Rogers, E.M.: *Diffusion of Innovations: Modifications of a Model for Telecommunications*, pp. 25–38. Springer Berlin Heidelberg, Berlin, Heidelberg (1995). https://doi.org/10.1007/978-3-642-79868-9_2, https://doi.org/10.1007/978-3-642-79868-9_2
7. Schrage, M.: The myth of commoditization. *Engineering Management Review, IEEE* **48**, 104 – 104 (09 2007). <https://doi.org/10.1109/EMR.2007.4296433>