Fig. 1 Studio MILO for JCP Universe. (2020) Projections

# Future Realities : The Next Evolution in Interior Design
# Explorations of a new industry standard

Rebecca Kwang

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BA (Hons) Studio Practice (Interior Design) - Top-Up
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# Introduction

The evolution of design has consistently mirrored the changing times, adapting to the social climate and addressing the needs of society. Throughout history, it has served as a reflection of cultural, technological, and societal transformations.

For many years, interior design has always concerned itself to value highly on aesthetics and religious beliefs, as well as a reflection of one's economic status in society. It was not until the twentieth century that the world witnessed a major shift. Major events, such as industrialisation and the aftermath of the world wars profoundly influenced how people lived and worked. Rapid population growth and rising urban poverty introduced urgent new challenges. Designs that were once highly regarded in fine craftsmanship and artistry started to decline as the modern world started to prioritise on high production value in factories and less on handmade work. In the realms of art, architecture, and design, it became increasingly evident that the traditions of previous eras no longer suited the demands of the modern world (John Pile, 2005:323).

By the end of the twentieth century, technology and modern machinery became central as the world entered the Digital Age, transitioning from mechanical and analog systems to digital technologies. This era of digital revolution is closely linked to advancements in communication technologies (Haradhan Kumar Mohajan, 2021:239-251). The rise of computers, the internet, and IT solutions has not only transformed industrial sectors but also reshaped everyday human activities and routines.

The history of design has long been a rich tapestry woven from heavy cultural influences across specific timelines that have shaped our society (Gülşah Koç *et al.*, 2016:2-5). Today, we find ourselves on the brink of another transformative leap with a new era of technology, redefining the way we live, work, think and interact.  The Metaverse offers a unique opportunity to immerse users into virtual spaces that corresponds and overlaps with the real world, building an entirely different dimension altogether (Stylianos Mystakidis, 2022).

Looking ahead, the engagement of this new era of the virtual world could redefine the landscape of interior design. By integrating the Metaverse into design practices, users can immerse themselves in digitally designed spaces before physical construction, fostering an interactive and engaging experience (Sheida Shakeri *et al.*, 2023:5). As we dive deeper into the realm of the Metaverse and explore further on the potential it can bring, we may uncover the new future reality of interior design.

# The Metaverse world

The word 'Metaverse' comprises two meanings - 'Meta' as post, after and beyond in Greek prefix meaning and 'Verse' as universe in short. In other words, the Metaverse is a post-reality universe, combining the physical real world and the virtually digitalised world together. By implementing advanced technologies such as virtual reality (VR) and augmented reality (AR), the metaverse is able to provide a platform that enables multisensory functions to engage and interact with the environment, digital objects, and other users in the virtual realm. Essentially, the Metaverse is an interconnected network of immersive, social platforms that allows for real-time, embodied user communication and dynamic interaction with digital elements. In the earliest days of its invention, the metaverse is an interconnected web of virtual worlds allowing avatars to connect through teleporting to and fro. In the modern day context, it has evolved and expanded into immersive social VR platforms, expansive multiplayer online games, and AR-enabled collaborative environments, supporting diverse interactive experiences across digital landscapes (Stylianos Mystakidis, 2022:486).

Computer science and its innovations have been a constant key role in the way they have shaped and transformed daily human exchanges, communications and social interactions. The three main waves of technological innovation that have significantly enhanced end user experiences include personal computers, the Internet and mobile devices. With the current emerging fourth wave of computing innovation, virtual digitalisations such as Virtual Reality and Augmented Reality are making way for a new era of spatial immersive experiences in technology. This could potentially revolutionise modern day lifestyles in online businesses, entertainment remote work and study.

On a broader scale, Extended Reality, also known as Cross Reality (XR), is a collective term encompassing various immersive technologies that create interactive digital environments. These technologies include Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), all of which enable users to interact with fully or partially synthetic digital spaces through advanced technological means. Through this extensive range that is also known as the Virtual Continuum, they vary in terms of their relationship with reality (Stylianos Mystakidis, 2022:487).

VR constructs an entirely digital and artificial environment, immersing users in a world that feels separate from the physical one. VR constructs an environment that immerses users in a world that is fully digital and artificial, completely separate from the real physical world. By using devices like VR headsets, immersion helmets, and omnidirectional treadmills, the experience is enhanced through a series of sensory inputs such as sight, sound, touch, and motion. These tools allow users to interact with virtual surroundings as they would in real life.

AR, on the other hand, is able to create surroundings that enhance the real-world environment by overlaying digital elements, blending the physical and virtual seamlessly. This is achieved through devices like smartphones, tablets, and AR glasses. In some cases, the functions of AR can also be integrated into VR headsets using pass-through camera technology, creating a layer of digital elements that enrich the physical space.



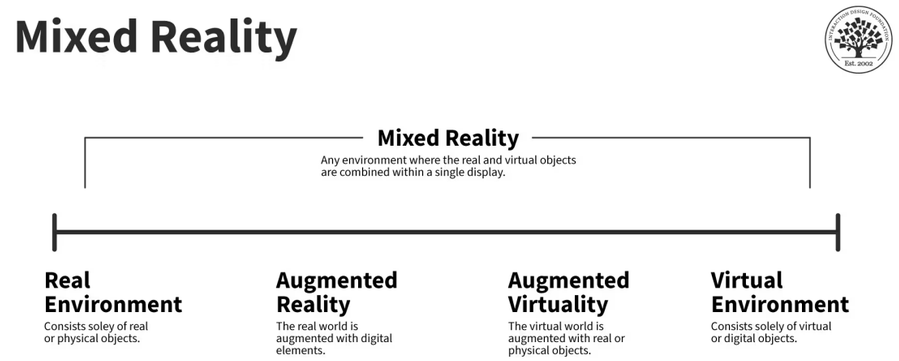


Fig. 2 *Illustration of the Virtuality Continuum mapping the spectrum of mixed reality environments that range between the natural, physical world and fully artificial virtual environment.* (s.d.)

Mixed Reality (MR) combines elements of both VR and AR, enabling real-time interaction between the physical world and digital projections. However, MR is sometimes interpreted as an extension of AR in terms of how the physical environment is able to interact with real time and data inputs. For instance, in an MR setting, a virtual character can recognize and respond to physical surroundings, such as hiding behind a couch. MR typically requires specialised glasses similar to VR and reflects advancements in how the physical and virtual worlds interact dynamically.

The Metaverse leverages advanced technologies to enable immersive and multisensory interactions with virtual environments, digital objects, and other users. Key features include displays that simulate ocular ambience to mimic physical sight. Extended Reality (XR) offers enhanced auditory experiences, utilising 3D, spatial, or binaural audio to create soundscapes. This enables a more holistic user experience with heightened immersion, which 2D platforms are unable to achieve. These soundscapes help users orient themselves within the virtual space by accurately pinpointing the direction of audio cues, aiding navigation and maintaining focus (Stylianos Mystakidis, 2022:487-488).

Fig. 3 The Modigliani VR : The Ochre Atelier. (s.d.)

Fig. 4 Digital Artwork of The VR Exhibition "Mona Lisa : Beyond the Glass". (2019)

Fig. 5 Digital illustration of public viewing of the actual Mona Lisa artwork at the Louvre museum. (2019)



XR experience offers an extensive range of tools and mediums in order to tell a story or educate on a subject matter. By projecting a user into a space, it offers a dynamic experience that also allows one to interact by walking and looking around in the virtual space. This often allows a more in-depth understanding if one is able to immerse in a space as if they are in it themselves, rather than looking at it from a static image. In the case of art and design exhibitions, The Modigliani VR : The Ochre Atelier (refer to Fig. 3) provides a reimagination of the artist's studio (through historical and technical research) to allow people to have a deeper insight of the subject's life, as there was no prior photographic documentations. The Mona Lisa VR (refer to Fig. 4) also offers a more exclusive and immersive experience of the famed artwork - including the renowned artist Leonardo Da Vinci's legacy. This provides a more up close and personal viewing experience compared to cramming with large crowds to see the actual portrait itself (refer to Fig. 5).

Through wearable technology, such as headsets and handheld controllers, users can toggle through different functions to interact with virtual objects as they move through a digital space. This provides a more active and participatory experience altogether.
Users engaging in XR environments are not confined to a stationary position. Through using their body interactions, physical movements are translated into the virtual space through positional and rotational tracking (Stylianos Mystakidis, 2022:488).

Fig. 6 *A user interacting with a VR experience by equipping a VR headset and handheld devices to control certain functions and digital interactions.* (2019)

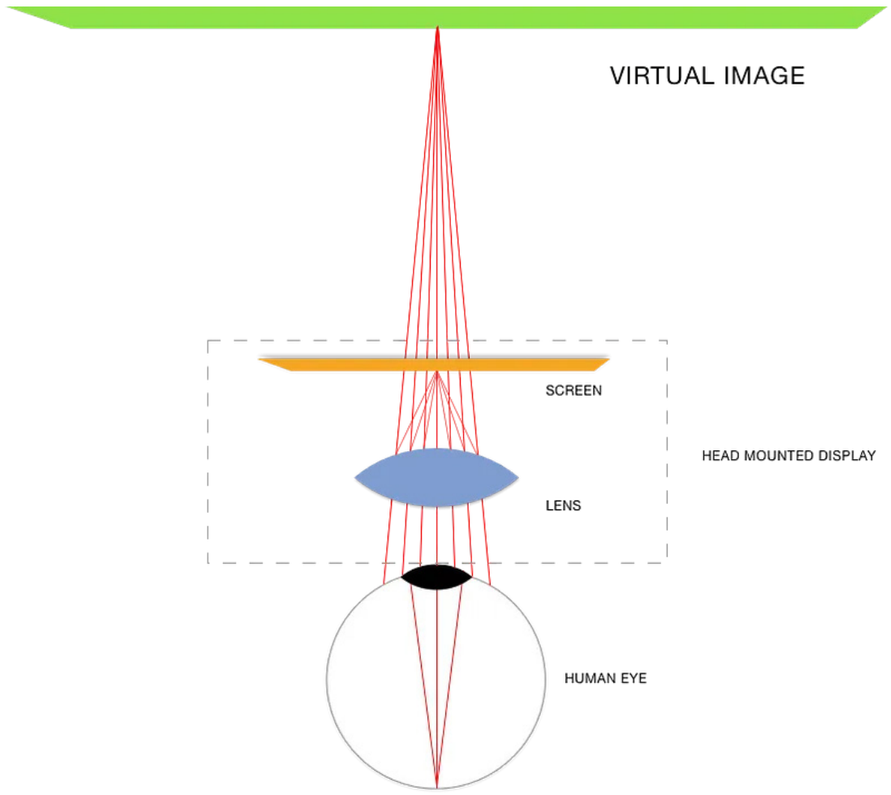


Fig. 7 *Head Mounted Display (HMD) lenses manipulate visuals by bending light rays and reducing the divergence of light from the screen, directing it to the human focal point. This process creates a "virtual image" illusion, enabling users to perceive digital content as if it exists in a three-dimensional space.* (2020)



Despite numerous developments being made to enhance the experience of interacting with VR headsets, there are still certain restrictions that could not fully replicate sight in physical environments as accurately as an actual human eye typically would. There are certain determining factors - field of view, field of regard, eye relief, and neck movement.

The field of view (FOV) represents the range of vision while looking straight ahead, encompassing what the eyes can perceive in both real and XR environments. The field of regard expands on this by including visible areas achievable through movements of the eyes, head, or neck. Eye relief refers to the distance between the viewer's pupil and the HMD's closest point where the full FOV is possible. A shorter eye relief reduces vision range, particularly impacting users with glasses who need a longer eye relief for optimal viewing.

The natural range of eye movement creates an FOV of about 60 degrees, extendable to 120 degrees with head or neck rotations to include peripheral vision. Some VR headsets may offer broader displays, but the user's actual FOV remains within these physical constraints. For seated users, the FOV is further limited to around 94 degrees horizontally and 32 degrees vertically, reflecting the natural limitations of their position. This understanding guides the placement of user interface elements for accessibility. (Siddarth Kengadaran, 2020).

Determining the most optimal settings universally may be challenging as the following factors need to be taken into consideration - users with varying head shapes and sizes, users with and without eyewear with different sight conditions - astigmatism, myopia, short/long sightednesss etc. VR headwears with adjustable functions could be a possible solution to tackle these issues. In order to achieve a comfortable visual experience for users in the XR environment, the settings must replicate as close to the human field of view as possible.

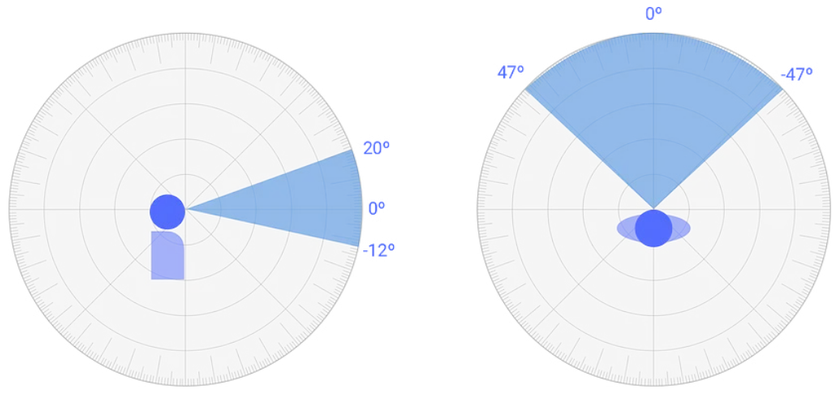


Fig. 8 *Illustration showing the average angle of direct vision for a person without having to tilt their head up and down or look left and right.* (2020)

# Plan to Perspective
## The world of interior rendering

The demand to expedite processes, be it day to day errands or work, has constantly been a challenge that many strive to improve on output and quality. We are often immersed in the digital world, and in the realm of interior design, 3D renders are essentially the staple of presentation materials to convey design ideas and construction information. The transition from a finalised 2D spatial plan to a 3D model has become a universal standard in the design development process. This approach allows spaces to be more effectively visualised, with architectural elements such as walls, ceilings, raised floors, and staircases extruded to bring the design to life.

There are currently many various ways of interpreting and presenting an interior space - 3D renderings of exterior and interior spaces, 3D floor plan (vertical and horizontal structure and objects - furniture, lighting - extruded onto 2D floor plans), Interactive floor plans (ability to toggle the 3D model to navigate both interior and exterior spaces), and 3D animation videos (which takes a user through the spaces from a fully rendered camera panning) (Authenticus, 2022).

Companies have also adopted various ways of allowing clients to access the interior spaces of design projects through online virtual tours. Using 360-degree interactive images, the feature also allows the user to navigate their way through different areas of the spaces. This method has been deemed very useful and efficient in conveying the full design idea to the client by allowing them to have a comprehensive visualisation of the interior spaces from every angle. In fact, several companies are currently adopting this platform - and is quite popular especially amongst the commercial developer sector in showcasing showrooms of residential and hospitality spaces (Christopher O'Grady, 2022).

Of course, there are still certain limitations in what the virtual tour is able to offer. To create the virtual tour, a 360-degree camera is set up at a certain point of each space to capture the full view of a room, which will then be stitched together to create the full interactive walkthrough. Although the photographer makes sure to determine the point at which the camera is able to fully capture a space as much as possible, there are still possibilities of having blind spots in the transitory spaces between one room to another.

Overall, the world of 3D renderings has no doubt evolved in various iterations, providing the versatility for end users to view an interior space in the comforts of their own home through a screen - without having to be in the actual space itself. Perspective renderings generally can provide an adequate representation of the design and style of a space at first glance and sets the tone of client expectations without diving into the more specific details of the interior elements.



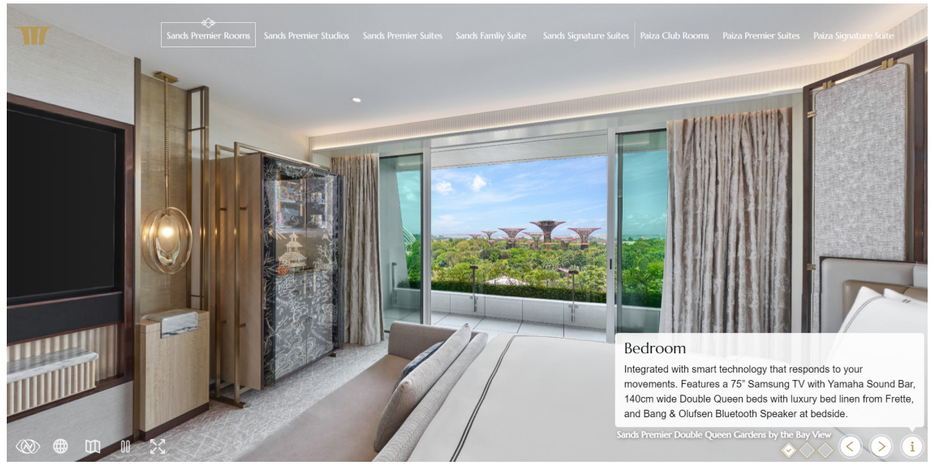


Fig. 9 *360-degree interactive virtual tour : A panoramic stimulation of the Marina Bay Sands hotel suite in Singapore. The function allows the user to access the bedrooms and bathrooms of various suite rooms of the hotel which can be a very useful way of providing helpful information to people before making a decision to book a room and visit its facilities.* (s.d.)


Fig. 10 *A 3D panoramic rendering with a key plan showing area indications of the apartment that can be navigated and viewed. Users can move around the space via clicking on location points set by a virtual camera function to create the perspective of a respective interior space.* (s.d.)

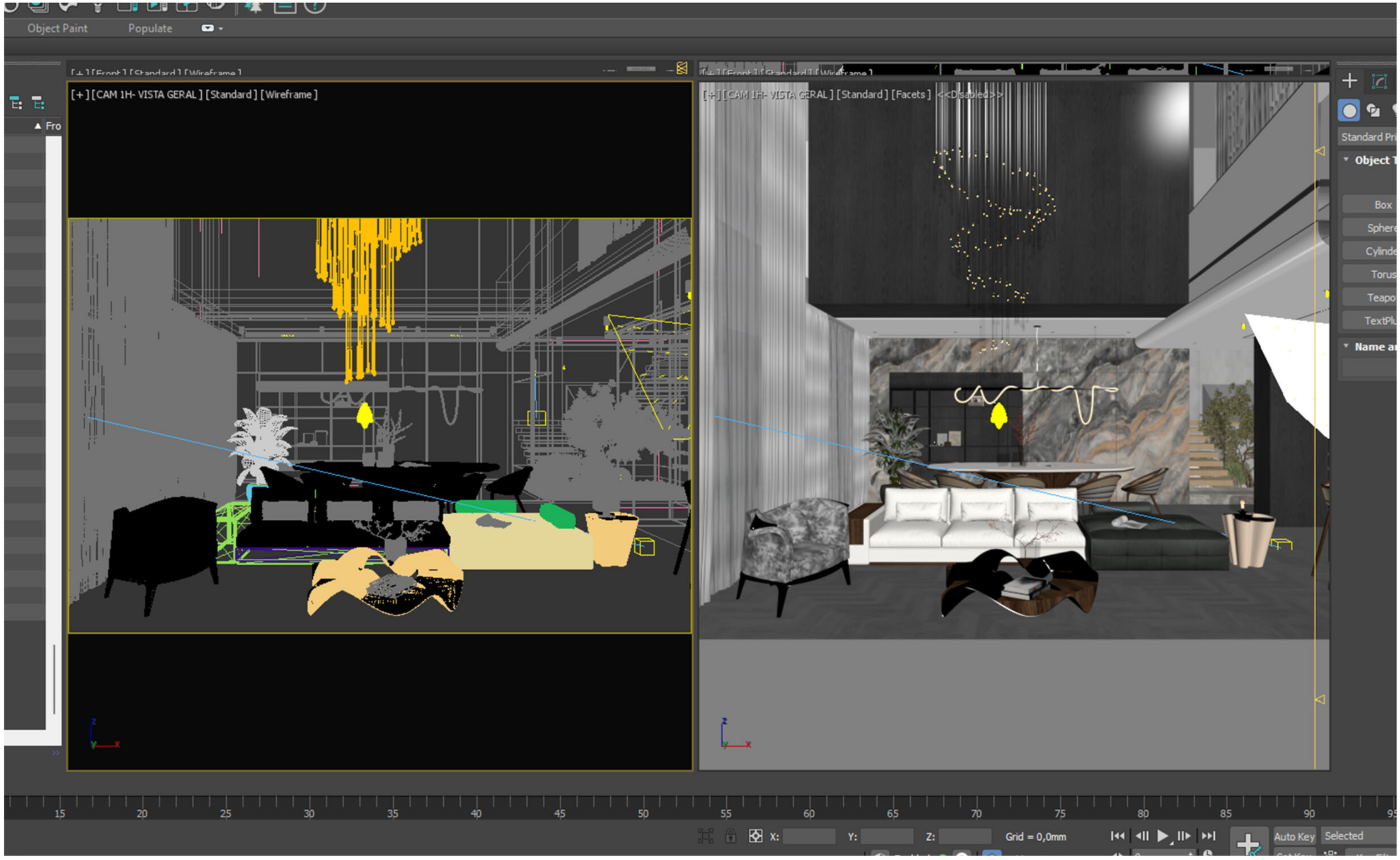


Fig. 11 *A typical perspective of an interior space in a 3D modelling software program. Through digital settings such as - material and texture mapping, structural extrusion, furniture customisation and interior and exterior lighting settings, 3D renders allow detailed visualisations of a space as closely similarly as a fully constructed and furnished version in real time.* (2023)

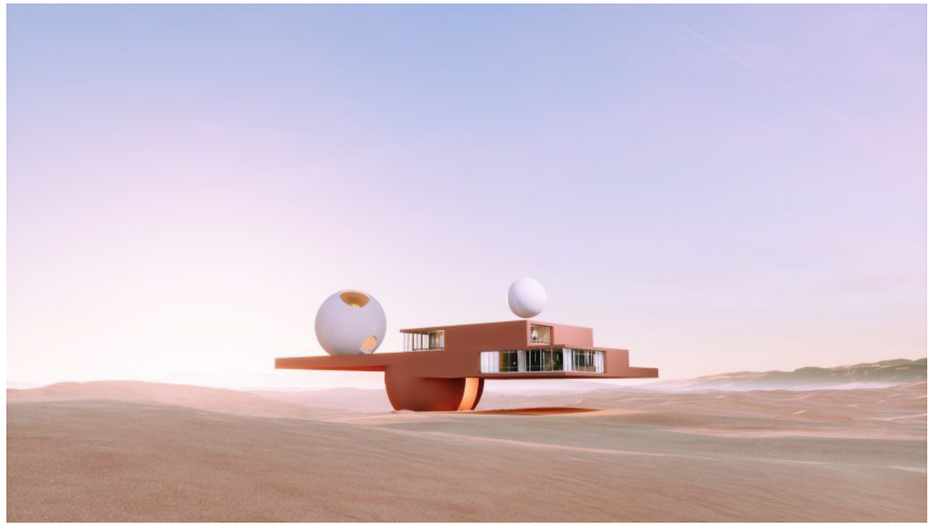

Fig. 12 Alexis Christodoulou. (2022) The Mirage

The Metaverse has rapidly expanded into the realms of design and architecture, leading to a surge of projects that explore the integration of the virtual and real worlds.

"The Metaverse has no physics, no weather, no limitations other than human ingenuity." (Janine Yorio, 2022)

In this virtual environment, designers can transcend real-world constraints—such as gravity, weather, and climate—while enhancing and extrapolating simulations. This freedom allows them to reimagine spaces that would otherwise involve significant structural challenges and explore materials that surpass traditional functionality. Many of these virtual architectural and interior spaces have given rise to otherworldly landscapes, often featuring soothing natural elements, yet unaffected by actual environmental conditions (Christina Yao, 2022).

Moreover, virtual design offers a new 'reality' where structures and materials are impervious to deterioration, allowing them to withstand the test of time. This concept parallels the use of AR to resurrect ancient ruins. By projecting parts of historical structures that have long since disappeared, it enables people to gain a deeper understanding of how buildings once appeared (James Wormald, 2023).



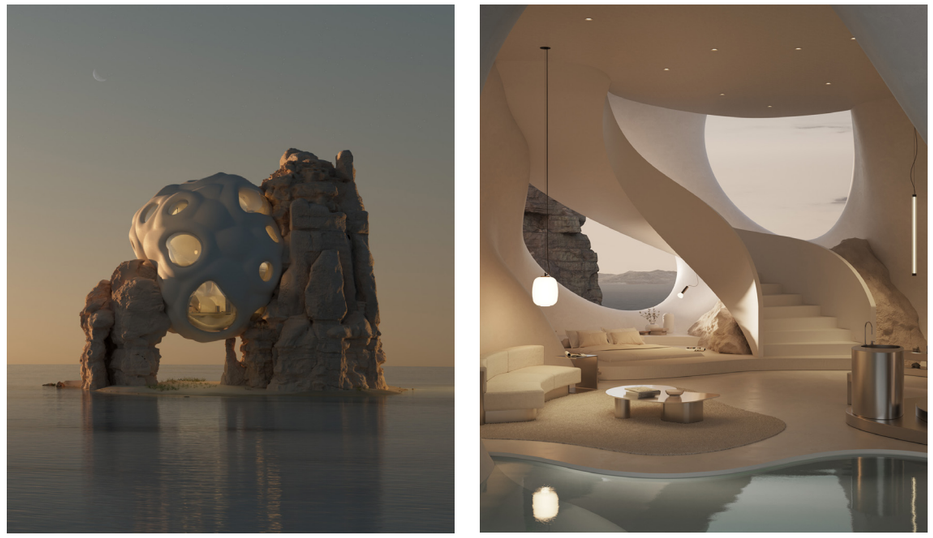

Fig. 13 (left) & 14 (right) Six N Five. (2022) Make Room For Us

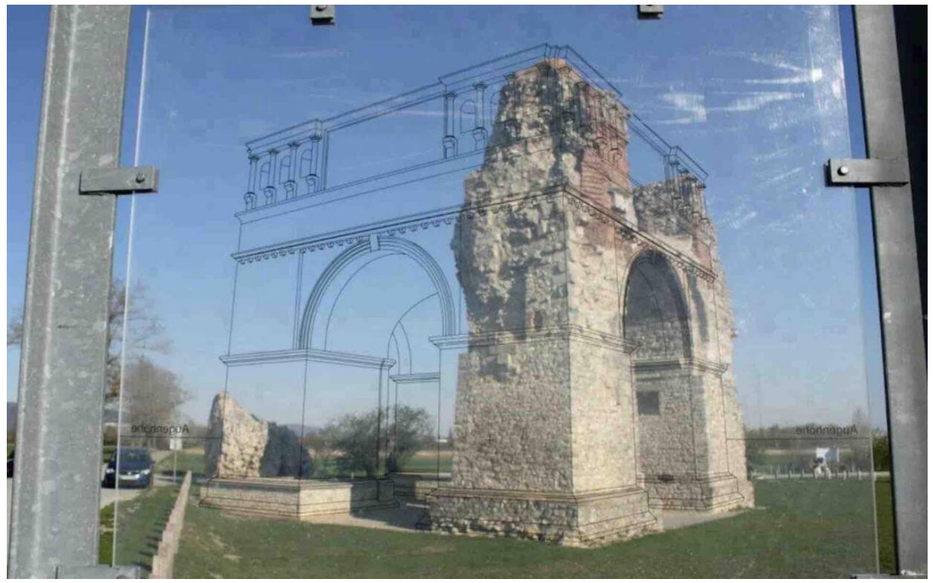

Fig. 15 *Illustration of an archaeological site showing the use of AR to remap the missing parts of the ruined structure to showcase how they were in original form.* (2016)

Fig. 16 (left) & 17 (right) Andrés Reisinger. (2021) Deep Space sofa and Complicated drawer

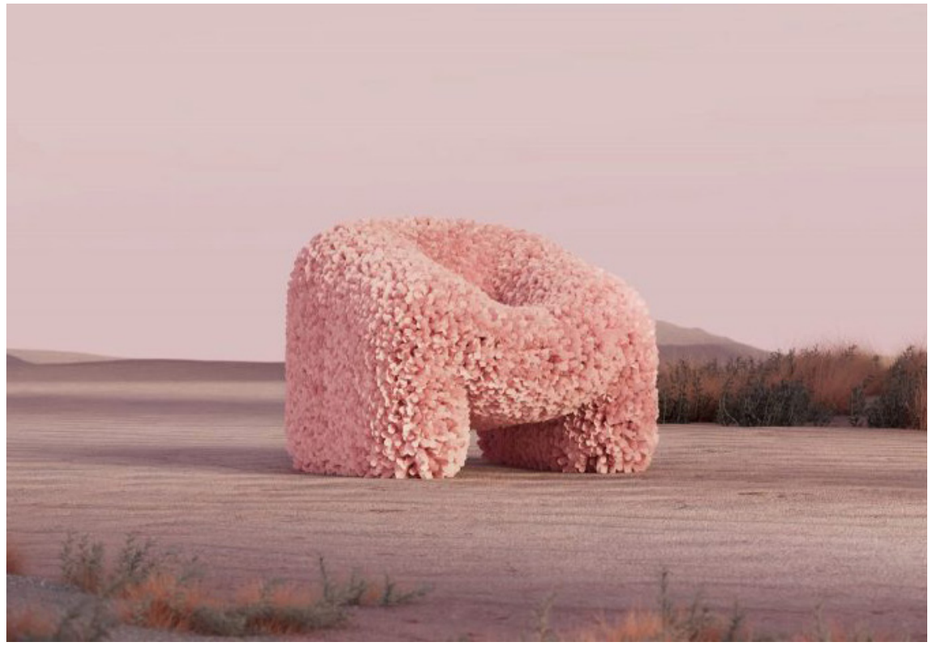

Fig. 18 Andrés Reisinger. (2021) The Hortensia Chair



The exploration of non-existence and surrealism in virtual architecture offers users a unique way to experience spatial functions, material performance, and imaginative site locations that are unfeasible in the real world (see Fig. 15 & 16).

Virtual furniture, which defies real-world constraints of material and construction, allows designers and users to reconsider traditional perceptions of furniture and materiality. The surreal qualities add a whimsical element, also enhancing product value (see Fig. 18 & 19). Some virtual furniture pieces, like Andrés Reisinger's digital Hortensia Chair (see Fig. 20), have been manufactured into physical products. Interestingly, the digital version sold for a higher price than the physical counterpart, prompting a reassessment of virtual furniture's value. Furthermore, each piece in Reisinger's collection includes a non-fungible token (NFT), certifying ownership and authenticity through blockchain, protecting the designer's creative rights (Jennifer Hahn, 2021).

"For artists, being able to sell artwork in digital form directly to a global audience of buyers without using an auction house or gallery allows them to keep a significantly greater portion of the profits they make from sales. Royalties can also be programmed into digital artwork so that the creator receives a percentage of sale profits each time their artwork is sold to a new owner." (Andrés Reisinger, 2021).

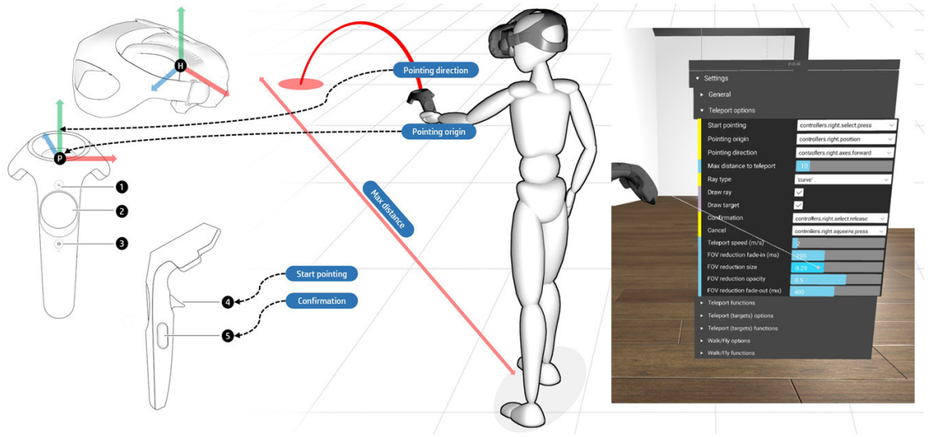


Fig. 19 *Illustration of navigation tools in VR using headset and controls.* (2022)

Although VR offers an interactive medium of spatial experience through simulated real world environments, it does not fully replicate nor replace the actual physical world. VR simulations currently still pose certain restrictions and constraints in experiencing a space exactly how one would perceive in actual context.

User interaction and action differ significantly in virtual reality (VR). Embodiment in VR is inherently limited, often resulting in a disembodied experience where physical movements are restricted or altered, and the virtual world moves relative to the user's stationary body. Virtual spaces do not fully replicate physical places. While VR models might represent real world environments at a 1:1 scale, the user's perception can differ due to inconsistencies in scale and optical distortions, especially when viewed on 2D screens.

Moreover, the concept of "real-time" in VR diverges from real-world time. Users interact with virtual environments at a pace that bypasses physical constraints, enabling actions like flying, zooming, or instantaneously moving between spaces. While the system processes inputs immediately, this "real-time" does not align with the temporal experience of performing similar tasks in the physical world. For example, traveling between two points in VR is far quicker than the actual physical effort required in reality (Jennifer Whyte, 2002:45).

Undoubtedly, VR offers a fresh and dynamic way to interact and experience spatial formations digitally - through visual and audio sensory functions. With the aided technology of laser scanning, documented photographs of actual buildings and objects can be easily converted and viewed in 3D models (Ahmed Kamal *et al.*, 2022:1). This technique offers a great opportunity for stakeholders in the field - architects, designers, engineers, to co-create and collaborate on large scale projects involving professional expertise from multiple disciplinaries.



Currently, VR technology faces several challenges in providing a seamless and comfortable user experience. One key issue is the mismatch between the visual perceptions in VR headsets and the way our eyes naturally process the real world. Navigating virtual environments can also be complex and overwhelming, particularly for inexperienced users or those with disabilities (Ahmed Kamal et al., 2022:67-68)

Additionally, the bulkiness of VR headsets and the prolonged use can lead to discomfort and simulation sickness (Nicholas Day, 2024). While VR offers a freeform way to interact with spaces, it often sacrifices realism and sensory engagement, leaving users disoriented and detached from the physical environment. In design and architecture, where user experience is crucial, VR navigation may not currently offer the most pleasant spatial experience.

However, VR can still be valuable in showcasing projects during the conceptual phase. It could be introduced at the early stages to present design styles to clients, using various mediums such as soundscapes and interactive material choices. By creating an immersive experience, VR could spark client interest, fostering more active collaboration and feedback as the design progresses.

# Environment and tools

Traditional 3D modeling software is highly effective for creating entirely digital designs, especially in presenting project concepts and ideas. However, its application in the construction sector remains limited, particularly when remodeling existing structures. Factors like hidden architectural elements (e.g., pipes in walls or floors) can significantly influence the progression of a design, even after the concept is finalized. These unforeseen constraints often require numerous design revisions, creating a labor-intensive process for all involved.

In physical construction, design choices have direct structural impacts, while the digital environment allows for safe experimentation and streamlined workflows. AR bridges these worlds by integrating 3D models with real world site contexts. This approach enhances decision making by providing an immersive experience where designers can visualise and manipulate architectural elements in real time. Tasks like moving walls, adding windows, or testing finishes become more intuitive, reducing the need for iterative back-and-forth adjustments.

While current AR applications rely on handheld devices, wearable technology such as smart glasses or helmets offers greater freedom and focus, making on-site projects more efficient and collaborative. AR thus redefines workflows, complementing traditional methods and enabling better alignment between digital designs and physical realities.

Real-time AR overlays, such as 3D schematics projected through glasses, can identify potential issues early, preventing costly errors. Structural, electrical, or plumbing systems can be visualised and adjusted before or after installation, streamlining on-site problem solving and simplifying training.

Several companies now offer walkthrough services by projecting 2D plans in 1:1 scale within showrooms, allowing clients to experience space proportions. These firms often operate in large warehouse spaces, enabling expansive floor plan projections. Users can walk through these real-scale projections to test circulation flow and spatial feasibility. Some also offer vertical projections, such as architectural facades, interior elevations, and animated video flythroughs, providing a fuller view of the project. However, planar projections have limitations in representing 3D spaces. To overcome this, some companies integrate augmented and virtual reality tools, using devices like smartphones, tablets, and VR headsets, creating an immersive experience that blends physical and virtual environments (Zawya, 2024).

Fig. 20 *Gamma AR allows 3D models to be superimposed as a digital layer over physical environments (using smart devices) to create a clearer interpretation of how a newly created space can be perceived in real time.* (s.d.)


Fig. 21 Lifesize Plans warehouse showroom. (2022)

Meta has recently developed prototype AR glasses that allow users to interact with both virtual and real environments. A significant advancement from their previous AI glasses with Ray-Ban, these new glasses enable users to experience enhanced digital settings integrated into real world surroundings. The glasses use Artificial Intelligence (AI) to detect contextual objects and project holographic displays, enabling interaction between 2D and 3D realities (Meta, 2024).

Designed to resemble typical eyewear, the Orion glasses provide comfort and ease of adaptation compared to the bulkier VR headsets. Combined with a wristband that tracks hand motions, this wearable technology allows users to incorporate AR into their daily lives. The Orion glasses offer access to digital content, such as large-screen entertainment, life-size holograms, and multitasking windows, while also allowing users to see others' facial expressions. This seamless blend of the digital and physical world lets users remain connected to their environment and people, unlike more immersive MR headsets (Pradeep Viswanathan, 2024).


Fig. 22 *Orion AR glass features by Meta.* (2024).




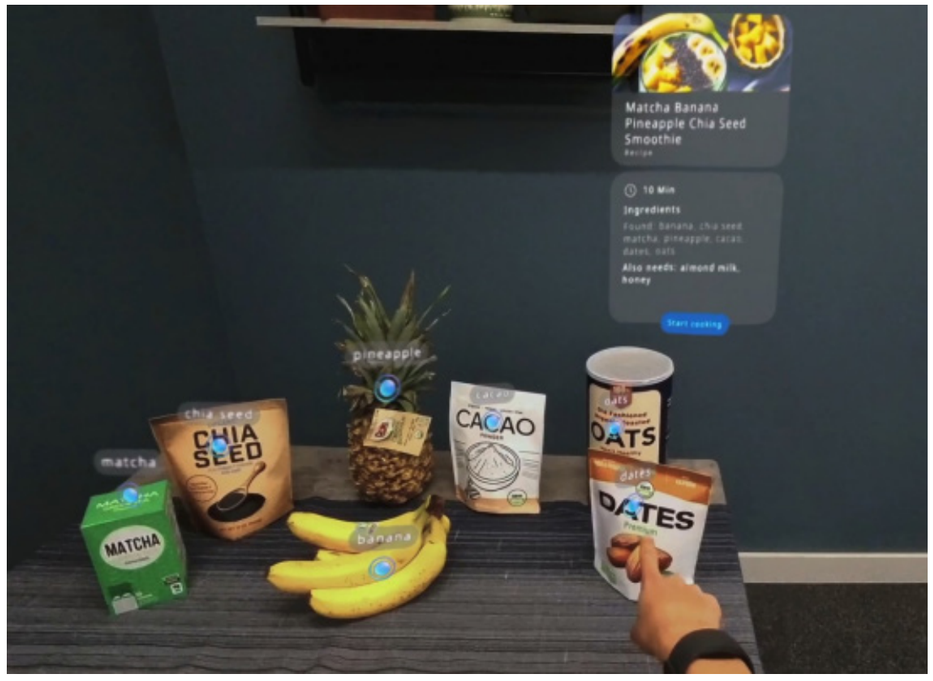


Fig. 23 (top) & 24 (bottom) *Orion AR glass features by Meta.* (2024).

Although the Orion glasses are not available to the market yet, the possibility of implementing AR into our daily lives has now become more conceivable. As the Metaverse continues to push and break new barriers of technological innovation, it has the potential to significantly reshape human and technology relationships through transforming traditional routines and spaces. The use of Meta AI functions also allow users to retrieve information instantaneously and conveniently. By enhancing daily routines into a more user-friendly manner - such as planning and scheduling events with a person on a call while performing other physical tasks with hands full, the purpose of the holographic AR glasses enables us the opportunity to elevate the human routine by implementing enhanced features into our daily activities, rather than having to adapt and adjust to a brand new environment altogether (Meta, 2024).

Through integration of the real and virtual, the prospects of pioneering MR in interior design prove to be rather promising. By integrating the multi-features of MR, the possibilities of revamping methodologies of interior design are extensive as designers can begin to dive into fresher perspectives of creative process and problem solving. Being able to design spaces, select materials and furniture by extrapolating out of the two-dimensional screen and view in real time on a physical environment could enable both designers and clients to make more precise decisions.

For example, global design and architecture firm Gensler has incorporated the use of MR through the Microsoft Hololens in one of their projects. By building architectural structures and designing interior spaces out of holographic designs, the design team as well as clients can virtually experience and inhabit the spaces on actual 1:1 scale. By doing so, this allows them to expand into many forms of experimentation - such as testing suitable materials based on how their physical performances, analysing sectional forms to have a better of internal structures, evaluating scale measurements of building structures to ensure they meet aesthetic and engineering requirements. Through experimenting and analysing the project from various perspectives out of the computer screen, the team is able to design and create the most optimal solutions for the project. Additionally, by projecting the entire project in holographic form on a smaller scale through the combined 3D modelling software and Microsoft's self-contained, holographic computer, the stakeholders are able to rescale, move and rotate the entire model around to their desired preference. This feature allows better comprehension of intricate structures and design, such as scale, size and depth of spaces that typical 2D renderings and foam models were unable to capture (Philip Stevens, 2017). This could also potentially be showcased to the public as a complete model which saves time and cost on having to create another model - either through 3D printing or traditional model making.

Additionally, with Microsoft Hololen's technology of holographic models, designs like furniture pieces can be manipulated literally in the palm of our hands to be reshaped and resized using the Hand Tracking feature, which could in turn respond just as real objects would. This is especially useful in dissecting and reviewing more complex ideas while customising design features (Microsoft, 2019) by providing dynamic learning and creating methods.



Fig. 25 *The team from Gensler using Sketchup Viewer on Microsoft Hololens to create a holographic projection of their project model for in-depth discussions.* (2017)

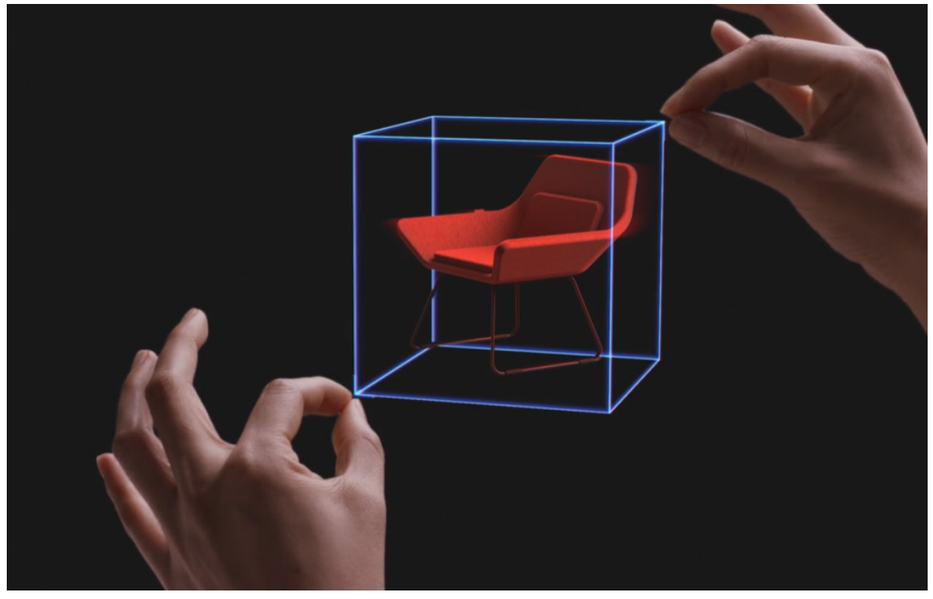

Fig. 26 Hand Tracking feature of Microsoft Hololens. (s.d.)

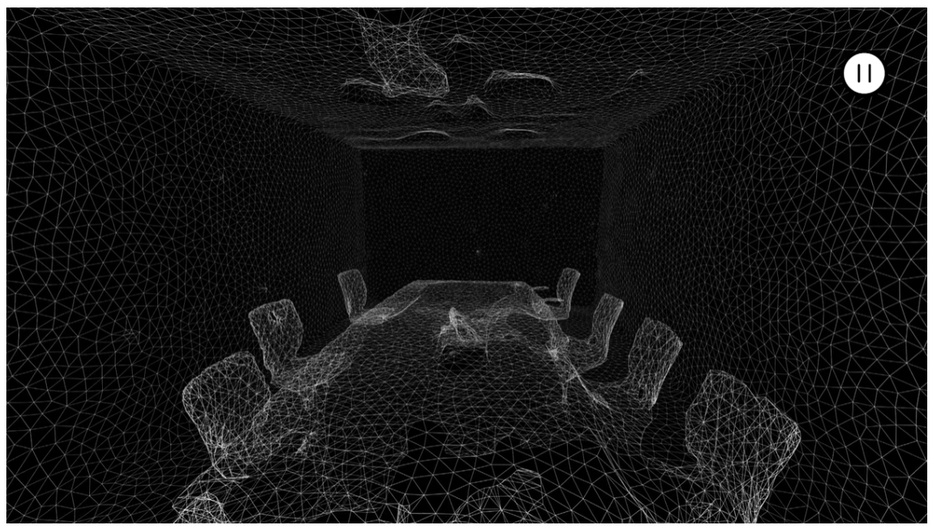

Fig. 27 Spatial mapping feature of Microsoft Hololens. (s.d.)

The Spatial Mapping function in the Microsoft Hololens offer the accessibility to incorporate modelled designs into real physical spaces. Ultimately, the versatility of toggling various scales of designs through holograms provides the added advantage of efficiency to navigate complex projects which may involve both large scale developments of multi-unit buildings and intricate styling of interior spaces (Microsoft, 2019).

Ultimately, the use of AR glasses to integrate the same technological features in interior spaces could enhance and expand the entire process of an interior design project - starting from conceptual, client presentation, design development and prototype to construction. The benefits of such wearable technology could allow stakeholders to share and develop their designs and ideas on the go, be it on construction sites to discuss with engineers and builders, or to select materials at showrooms with the client. Moreover, clients and designers could start their design discussions as early as visiting the project site itself before any demolitions take place, and using AI-enhanced spatial mapping, clients could have a first-hand insight and introduction of how the space could potentially be envisioned.

As much as MR devices have proven to be a rather multi-functional tool that could indefinitely transform the interior design industry, we cannot neglect the aspects of user experience and comfort in wearable technology as well. And in the case of AR devices like the Ray-Ban Meta glasses, whereby bespoke lenses for prescription and replacement are available for personalised fitting (Ray-Ban, 2023). This is equally as crucial to be taken into consideration especially for long-term usage in for lengthy work discussions and design development processes.



The products discussed are either already launched or currently in testing stages, yet they have demonstrated significant promise as valuable and effective tools. The exploration of the diverse availability of XR mediums - be it AR or VR, has its own specific functions and advantageous uses, which allows us to have a better understanding and take a step further to study their potential benefits in the future of interior design.

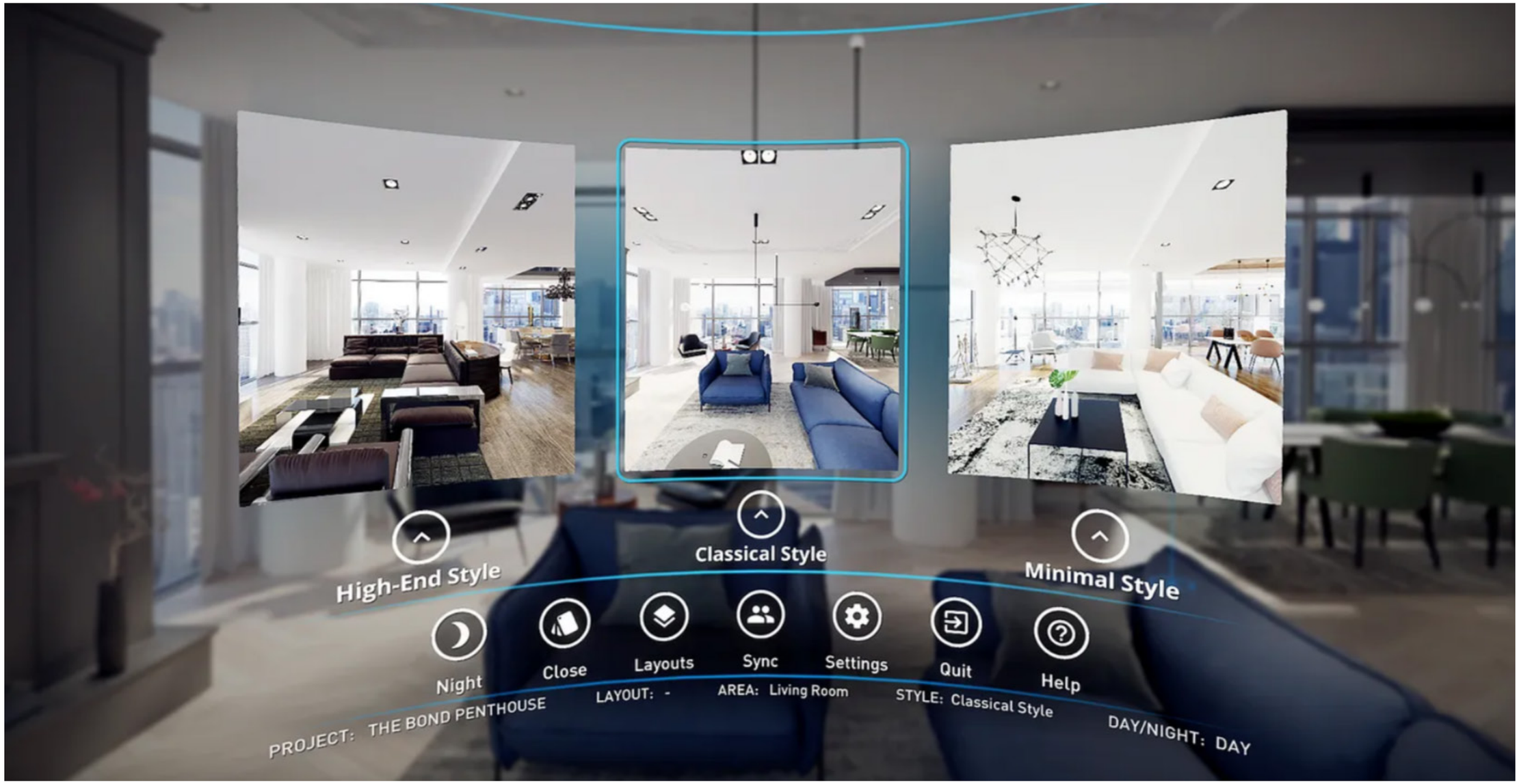


Fig. 28 *Using AR tools can allow clients to conveniently navigate through different types of design styles and apply it to the actual space, enabling them to visualise the interior space in both day and night time spontaneously.* (2019)

# Conversations with the industry

Taking this discussion further with Chew Kok Yong (KY), who himself is a co-founder of a Singaporean agency (The Afternaut) specialising in spatial and experience design, the narrative is driven in a slightly different route as to how VR could influence the field of interior design on a spatial experience level.

Starting the discussion about the roles of advanced technology in modern interior design, KY has mentioned the various forms of media he had experimented in his projects. Some examples include the use of Midjourney, an Artificial Intelligence (AI) platform to brainstorm various conceptual ideas of a design pitch into visual forms and developing an AI character for one of the design projects, as well as implementing VR across various experiential showrooms in overseas projects. In one of their projects in Chongqing, China (refer to Fig. 31 & 32), the Changshou sales gallery features hyper futuristic designs in the interior spaces that reinvents a newly defined way of showcasing a high-tech walkthrough. This illustrates the clientele's approach towards smart living, and the new prospects of spatial experience.

However, through the use of VR in several projects, KY remarked that it was not an overall pleasant client experience. As the depth of view in the VR environment is different from the real world surroundings, it takes a while to adjust and get used to the visual settings, with motion sickness and dizziness noted as such common causes of discomfort. Moreover, from a personal opinion, he added that the outlook of having a user wear a bulky headset in real time and navigating a space that is fully designed and furnished in the virtual world poses a sense of bizarreness and detachment from the overall design process.
Additionally, the use of a fully virtually curated environment takes away the sense of realism. The acute sense of touch and sight of actual materials are lost - feeling the softness of fabrics or ridges of textured wood grains, or the light rays bouncing off multi-faceted and iridescent textures - as such tangible sensations and observations could not yet be effectively replicated by VR.

Elaborating further on the limitations of VR, the use of VR headsets might not be comfortable and convenient for eyewear users. But that aside, as we dive deeper into the different experiential effects of design showrooms, KY challenges that physical mock-ups still have an added advantage of articulating realism in user experience that VR fails to recreate. In addition to the bulky and heavy weight of the headset, a virtual reality environment does not grant the same freedom to walk around and engage in spontaneous interaction with other users and the space itself. Through presentations of completed design projects to clients, he finds it quite lacking still in using VR to evoke the same sense of enjoyment and inspiration to present a walkthrough of a house as opposed to walking through the actual home itself.

Fig. 29 (top) & 30 (bottom) Chongqing Changshou Sales Gallery, China by The Afternaut. (s.d.)

Alternatively, KY countered that the use of mixed reality could instead provide a much more holistic platform to convey and illustrate design ideas and creations effectively to end users. By allowing the real world and digitally curated environments to enmesh together, KY suggests that MR can provide a more comfortable and cohesive experience, potentially through the use of Meta glasses (a collaboration with Rayban to create smart glasses) to create an augmented reality environment. By pairing the metaverse with AI-aided technology and comfort wear design (with the added advantage of having prescription features for eyewear users) could prove to be a very productive way of addressing the up and coming trends and challenges in the design industry.

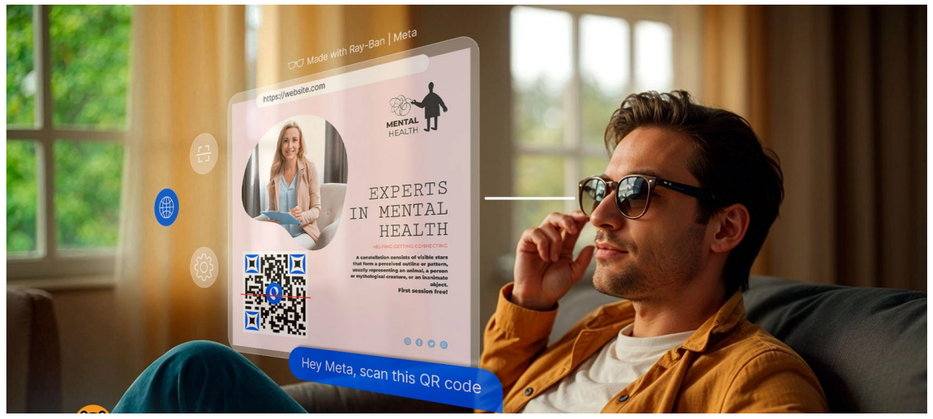



Fig. 31 (top) & 32 (bottom) *Features of the Ray-Ban Metal Smart Glasses.* (2024 & 2022)



By integrating MR into real world applications, KY highlights its ability to provide a tangible experience while leveraging AI and AR to enhance user interaction. MR bridges the gap between analog and digital realms, creating an ideal environment for users to experience spaces in real time. KY envisions utilising MR for client interactions, particularly as costs for adoption decrease. For instance, during design presentations in a physical mock-up showroom, designers and clients could use smart glasses to collaboratively make real-time adjustments to materials, colors, textures, or spatial elements. This approach significantly accelerates the traditional design process, eliminating the delays often caused by revisiting changes in the office. KY advocates for MR's potential to revolutionise customer experience and believes its applications in the design industry could be limitless.

I countered this narrative by suggesting the use of VR for technical stakeholders such as architects, lighting designers, engineers, builders, and developers. This approach could focus on navigating the complexities of a building's internal structure, fostering a collaborative environment among multidisciplinary teams. KY agrees VR could be effective for this purpose but emphasises that VR, like AR and MR, is primarily a visualisation tool. He suggests leveraging on Integrated Digital Delivery (IDD), a process widely used in Singapore's built environment sector, as a holistic framework for integrating stakeholders throughout a project's lifecycle. Utilising digital data in various forms of VR, AR, or MR to present precise material quantities could streamline procurement, reduce carbon footprints in large-scale construction, and enhance overall project efficiency.

In conclusion, in the interview I had with KY, we were able to dive into the different disciplinaries of the metaverse and discussed not only the benefits and disadvantages. We also covered diversely on the potential aspects and relevance of both VR and MR for different end users. It was an engaging dialogue that explores the complexities of each component and suggests that there may not be a 'one size fits all' platform for everyone but rather a potentially well-tailored tool for specific target audiences.


Fig. 33 Integrated Digital Delivery (IDD). (2024)

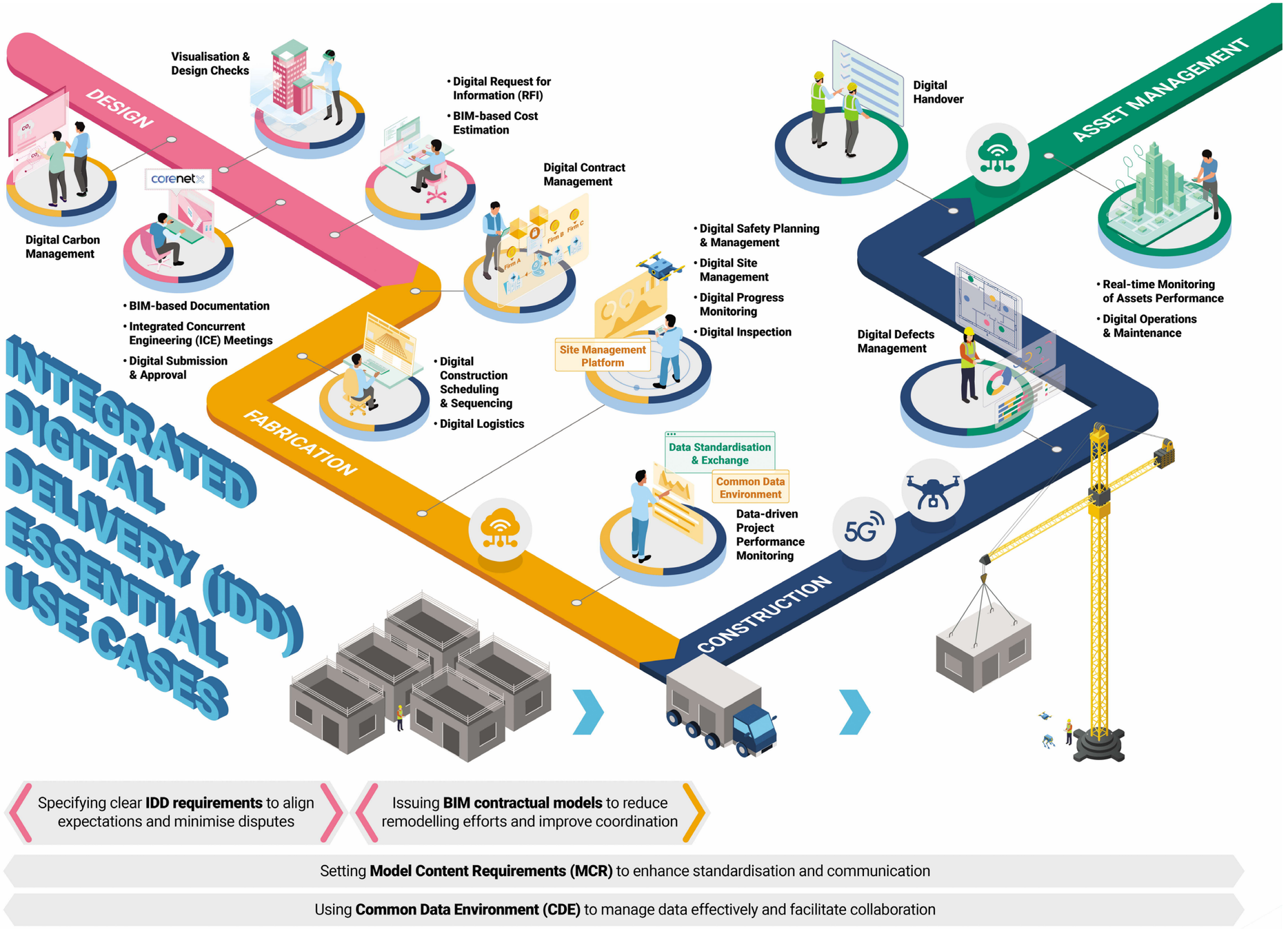


Fig. 34 *Diagram explaining the four main stages of IDD that aims to ensure a smooth flow to streamline the different work processes.* (2024)

# Conclusion
## Adaptation and integration

It is evident that technology plays a central role in our daily lives, and the rise of the Metaverse signals a transformative shift in technological development and societal norms. This emerging platform has the potential to redefine human rituals and reshape the fabric of society.

The rapid advancement of AR glasses, for instance, could soon revolutionise the fields of interior design and architecture. These tools not only promise to streamline design and construction processes but also offer a new approach to key stages such as ideation, prototyping, visualisation, user experience, troubleshooting, and execution.

However, such advancements should not be seen as a universal solution to all challenges. Instead, they should be embraced as powerful tools that enhance and facilitate existing practices. The Metaverse can encourage us to push creative boundaries and reconsider the traditional roles and functions of design and architecture, paving the way for a new industrial standard. While integrating real and virtual environments is vital, we must also preserve the value of traditional design and development methods. These approaches, though seemingly primitive compared to the capabilities of modern MR technologies, remain essential to maintaining a balanced and holistic design process.

Taking references from companies like Lifesize Plans, although already having established a well-optimised model of visualisation in design and construction, the multiple range of services offered are still available to suit every individual needs of a user that can each best relate to have the most realistic experience (Carl Williams, 2024).

“Our goal is to empower stakeholders with the tools they need to bring their vision to life with clarity and confidence. By immersing themselves in a Lifesize Plan, clients and project teams can make informed decisions and avoid costly changes down the line.” (Esther Walter, 2024)

While XR provides a platform for designers and architects to rethink how we perceive spaces and furniture, it cannot entirely replace physical site contexts or the intrinsic sensory experiences tied to real-world environments. Although VR and AR enable users to interact with and interpret virtual spaces, they fall short of fully replicating the tactile and sensory depth of real-world interactions. However, XR tools can serve as a complementary resource to: 1) accelerate traditional workflows and 2) expand design possibilities and strategies. By merging the real and virtual worlds, interior design can evolve through multi-platform approaches without severing the connection between these two realms.

The integration of the Metaverse into interior design holds immense potential but faces challenges. As a relatively new concept, the Metaverse requires time for professionals to \familiarise themselves with its applications. This learning curve could lead to hesitation or resistance, especially among those less confident in adopting new technologies. Additionally, widespread adoption demands addressing cost-related factors, including investments in training workshops and providing an adjustment period for designers to adapt to this transformative medium.



User adaptability and comfort are critical for successful adoption. MR tools, potentially integrated into wearable technologies like glasses or watches, offer a promising way to seamlessly incorporate the Metaverse into daily workflows without disrupting existing practices. Familiarity with these devices could encourage professionals to explore virtual environments while retaining their established processes. For instance, MR glasses with intuitive interfaces could allow designers to visualise virtual elements layered over physical environments, bridging the gap between real and digital worlds.

Ultimately, successful Metaverse integration in interior design depends on tools that complement existing methods while introducing advanced capabilities. By blending traditional practices with innovative technologies, the industry could foster a symbiotic relationship between reality and virtuality. This approach has the potential to redefine creativity and collaboration in interior design, marking a transformative step towards its future evolution.

# List of Illustrations

Fig. 26. Microsoft Hololens. (s.d.) *Hololens 2 - Hand Tracking.* [Digital image, screenshot] At: https://www.microsoft.com/en-us/hololens/hardware#document-experiences (Accessed on 8 Dec 2024)

Fig. 27. Microsoft Hololens. (s.d.) *Hololens 2 - Spatial Mapping.* [Digital image, screenshot] At: https://www.microsoft.com/en-us/hololens/hardware#document-experiences (Accessed on 8 Dec 2024)

Fig. 28. Photo excerpt from the article. (2019) *Multi-Modal Interactions for 3D UX Design.* [Digital image] At: https://www.codementor.io/@knightcube/multi-modal-interactions-for-3d-ux-design-swevens-medium-yamksb3gc (Accessed on 4 Nov 2024)

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Fig. 30. The Afternaut Group. (s.d.) *Chongqing Changshou Sales Gallery China.* [Digital render] At: https://theafternaut.com/changshou-high-tech-sales-gallery (Accessed on 9 Nov 2024)

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