AUDIENCE FUTURE OF THE

The creative immersive content lifecycle: from distribution to restoration

Research for commissioners, producers and collectors who work with immersive technologies

In collaboration with

UK Research and Innovation

CATAPULT Digital

This report is a result of research conducted by Digital Catapult on behalf of UK Research and Innovation (UKRI), in collaboration with the Audience of the Future Demonstrator programme.

UKRI's Audience of the Future programme is funding industry-led consortia in the creative sector to create new immersive experiences.

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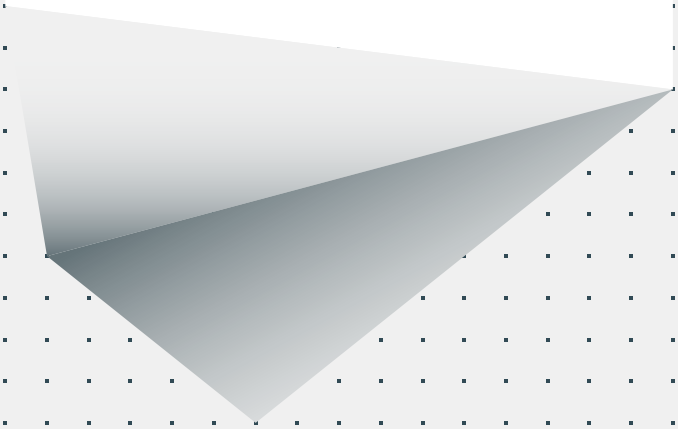

AUDIENCE OF THE FUTURE

CATAPULT Digital

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UKRI UK Research and Innovation

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Foreword

This report is part of the output from UK Research and Innovation's Audience of the Future Demonstrator Programme. It will be of particular interest to those involved in commissioning and publishing creative immersive content, and those who are interested in developing methods to preserve such content for future audiences and historians. It also addresses aspects of commercialising content and the factors that contribute to its longevity.

The technologies typically placed under the umbrella terms 'immersive technologies' or XR include virtual reality (VR), augmented reality (AR), haptics, spatial audio, projection mapping and any others that enable creators to break out of the confines of rectangular two-dimensional screens.

The technologies have several utilitarian application areas, but they also attract content creators within the creative industries. Creative immersive content aims to evoke aesthetic sensations, deliberation and enjoyment in the context of an entertaining or intellectual activity, often leisure-related: a night out; a visit to a gallery, museum or heritage site; or an at-home experience. The Audience of the Future programme has supported the development of creative content across a range of sub-sectors, including several immersive demonstrators.

This report is the third in the series of reports from the programme. It provides an understanding of the various stages of the immersive content lifecycle, as well as thoughts on the types of strategy that can be employed for wider distribution and impact.

The findings explain some of the growing pains that the market is experiencing. For example, the combination of production costs and an under-developed distribution landscape makes completing a project and managing to distribute it to a single audience an achievement in itself. Most creators tend to move on shortly after the content goes public, because the market rarely supports engaging in continuous development or scaling to additional locations. This is a symptom of both the size of the market and its segmentation: VR at-home content other than games has a niche audience and out-of-home experiences require the scale of an urban metropolis to be sustainable on a scale that guarantees longevity.

By mapping the immersive content lifecycle we have demonstrated that to achieve longevity, creators need to think of their work as a fluid entity: intellectual property that can shape-shift into various distribution opportunities.

Creators cannot succeed in this alone. For many pieces of creative immersive content, the twilight begins halfway through the lifecycle, regardless of its future potential, largely due to the lack of distribution companies able to support creators. To become sustainable, the immersive content market needs to become more accessible and consequently individual pieces of content will have longer lifecycles that might even lead up to the work being restored in the future.

This research provides an understanding of the various stages of the immersive content lifecycle, as well as thoughts on the types of strategy that can be employed for wider distribution and impact.

Introduction

Introduction

Immersive content for galleries, museums, public spaces and online platforms is often ethereal: it is available for a limited time and it can only be experienced with technologies that are not highly accessible. To become sustainable, the immersive content market needs to become more accessible, and consequently, individual pieces of content will have longer lifecycles. By reading this report, you will gain an understanding of the various stages of the lifecycle, as well as food for thought about the types of strategy that can be employed for wider distribution and impact.

This report will be of particular interest to those involved in commissioning and publishing creative immersive content and those who are interested in developing methods to preserve such content for future audiences and historians. It also addresses aspects of commercialising content and the factors that contribute to its longevity and we hope that content creators will find those sections stimulating.

RESEARCH CONTEXT

Part of a series, this report forms part of the output from UK Research and Innovation's Audience of the Future Demonstrator Programme. On behalf of UKRI, Digital Catapult has previously studied audience journeys and business models in the context of creative (cultural, arts or entertainment-focussed) immersive content.[1]

Throughout the programme, we have interacted with producers who work with emerging technologies. Typically in the UK, they have sought funding grants and - if they have been successful - creative energy tends to be invested into production. While challenging, developing the project for physical exhibition or online launch is often easier than distributing it to audiences and operating a sustainable business model, as the grant only goes so far and is intended for research and development. We have also noticed that highly technology-dependent applications or pieces of content in the immersive space are in danger of becoming obsolete and forgotten.

The research documented in this report stems from such observations and maps the lifecycle of immersive content: from development, through publication to archiving - something that content producers seldom have the time to think about.

FOCUS: CREATIVE IMMERSIVE CONTENT

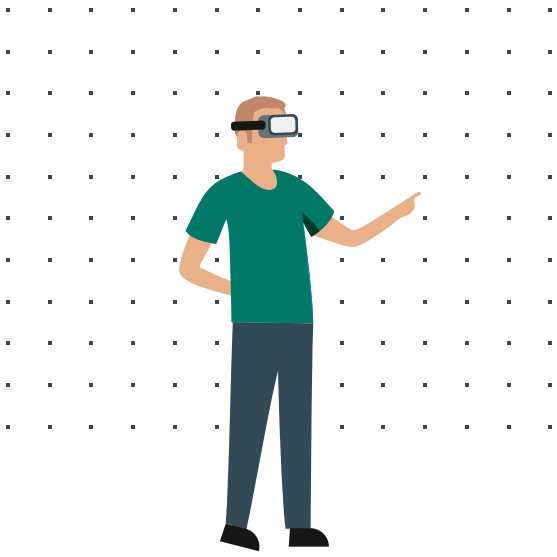
The technologies typically placed under the umbrella terms 'immersive technologies' or XR include virtual reality (VR), augmented reality (AR), haptics, spatial audio, projection mapping and any others that enable creators to break out of the confines of rectangular two-dimensional screens. In terms of user experience, these technologies emphasise the embodied and spatial aspects of interaction, which is why users perceive engaging with them - and the content being delivered - as an immersive experience.

When creators with artistic, cultural or entertainment aspirations use immersive technologies, they place audiences within spaces that will respond to an individual's activity in a more tangible, physical fashion than is typical for traditional forms of creative output. For example, playing the hit VR game Beat Saber works as an exercise and location-based immersive installations (such as Marshmallow Laser Feast's work) are not consumed seated gazing at a screen, but actively experienced by exploring virtual environments that feel real.

Utilitarian immersive content, such as training scenarios built for VR, has similar powers of presence and immersion. It will also have a defined purpose, such as reinforcing a scenario within a trainee's mental script of a situation or instilling muscle memory for completing a certain task. This type of research does not fall within the remit of this report.

Creative content, on the other hand, is open to audience interpretation and aims to evoke aesthetic sensations, deliberation and enjoyment in the context of an entertaining or intellectual activity, often leisure-related: a night out; a visit to a gallery, museum or heritage site; or an at-home experience. This report focuses on content that strives to deliver such aesthetic experiences, which is why we use the term 'creative immersive content' throughout.

Audience of the Future programme, which has supported the development of creative content across a range of sub-sectors, including four immersive demonstrators: Performance, Moving Image, Sports, and Visitor Experience.



RESEARCH QUESTIONS AND METHODOLOGY

Our research sought to identify the available opportunities for creative immersive content, so that both existing and future creators could gain a more holistic view of the distribution landscape.

In 2021, Digital Catapult commissioned Immersive Arcade, a retrospective of British VR content.[2] Licensing considerations and practices became a vital component of this production, and following that experience, we decided to produce a clear picture of what content creators can look for when negotiating licences for their intellectual property.

Once immersive content is available to audiences, it is in the creator's interest to make it sustainable by prolonging its lifecycle. This raises questions such as: how could it be possible to guarantee a multi-year or even a decade-long lifecycle for a piece of immersive content? Would a part of that lifecycle be due to re-licensing it or franchising it? How could an impactful immersive work be preserved? Could it be restored or reimagined years after its initial launch?

This report maps the different paths that an immersive content lifecycle can take, and the activities that are relevant to its various stages.

For the final stage of the lifecycle - preservation and archiving - our goal has been to identify the key challenges in a technology-intensive field and draw on existing work to address some of those challenges, such as understanding the best approach to preserving a contemporary location-based immersive installation. We also hope that this report can inform national efforts in setting up systematic processes and infrastructures around impactful immersive projects produced in the UK.

We carried out our research using literature reviews, analysis of VR app store data and discussions with creators and distributors. We have also drawn from our previous research for Audience of the Future; from the Immersive Arcade VR showcase production process; and from our learnings in attending a number of immersive festivals where content relevant to the study was showcased. To conclude the study, we ran two online events in January 2022 that would kick start discussions around distribution, licensing and archiving. All of these sources and findings have fed into the synthesis of information the report presents.

This report maps the different paths that an immersive content lifecycle can take and the activities that are relevant to its various stages.

DISTRIBUTION AND LICENSING AS COMMERCIALISATION ACTIVITIES

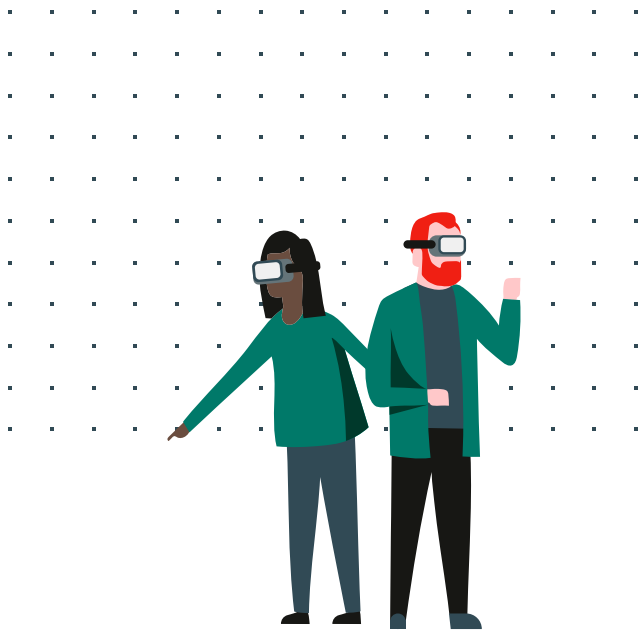
Our interest in researching the content lifecycle originated from practical licensing questions. Licensing (giving permission to use a piece of content in a specific context), tends to involve the payment of licence fees, which makes it a commercial activity. It is also a form of distribution.[3]

While undertaking the research, we found that respondents had different perspectives on the relationship between licensing, distribution and commercialisation, according to their role within the supply chain.

Distributors see licensing as just one part of their work, as they partner with a wide range of creative outlets (from festivals to digital platforms), while a producer working on an individual project sees negotiating licensing deals as a significant part of their non-technical work.

Both distributors and producers are minority roles within the creative immersive space: there are few specialised distributors and equally few instances where licences for immersive content are sought after its initial release. This means that licensing work falls mostly to creators who, in our experience, tend to invest their energy into production rather than commercialisation. Unless they have secured a distribution channel from the beginning, consideration may not be given to licensing until late in the project process. These research findings also show that creators' readiness to engage with licensing processes can vary greatly.

Overall, we found that discussions on licensing lead to broader questions about distribution, which is why this report looks at commercial licensing as part of the distribution landscape. Distribution can be broken down into a set of activities that can indicate the success of commercialisation. When such activities continue beyond launch, they can contribute to the longevity of the content's lifecycle, if continuously pursued. However, this requires a product strategy built on collecting and analysing data about the audience, then acting on the insight derived from it.



Creative immersive content lifecycle: an overview

Creative immersive content lifecycle: an overview

The illustration below (Figure 1) presents an overview of the series of changes in the life of a piece of immersive creative content. A piece of content goes through a series of phases that fluctuate between visibility to a broader audience and targeted demonstrations that are less public - such as to funders, commissioners, audience test cohorts and other stakeholders.

The progression of the content lifecycle is reflected in the structure of this report. We begin by discussing distribution opportunities and sharing observations on the types of content that different distribution channels favour and the practices that creators can engage with at this stage. We look at measures for longevity with examples from the immersive and related markets (such as mobile app distribution).

The second half of the report focuses on the twilight phase of the content lifecycle: we review the archiving landscape with the aim of summarising the challenges in restoring immersive content for future audiences.

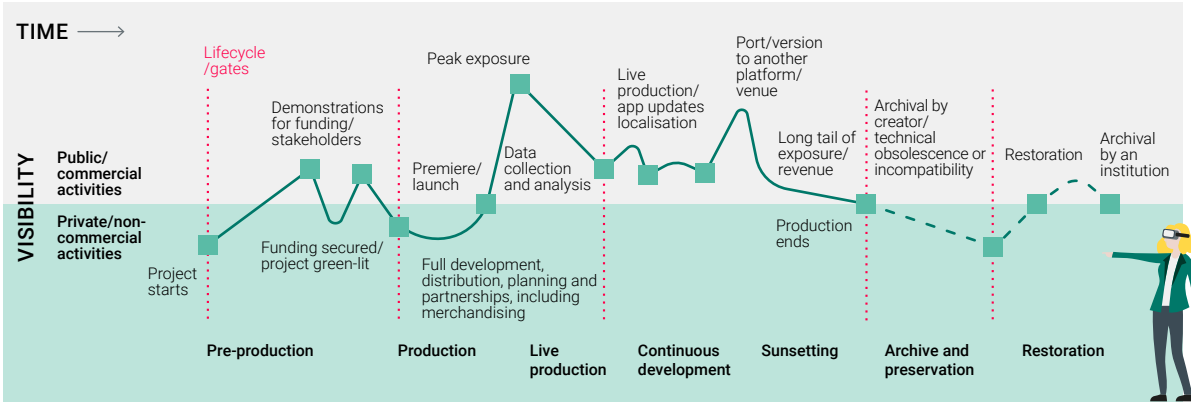


Figure 1: The lifecycle of creative immersive content

PRE-PRODUCTION PHASE

The lifecycle has several gates: points that are crucial to whether or not the project can continue. The first gate is typically after the pre-production or prototyping phase, when creators have produced something to show and seek funding for the full production, either internally within a studio organisation or from external funding sources. Research and development activities often precede or are included in this stage.

Budgets for immersive projects tend to run from anywhere around £40,000 to £700,000, depending on the scope and nature of the production.[4] If the external funding or internal development resources are given the green light, production begins.

PRODUCTION PHASE

One of the key reasons for conducting our research into the immersive audience journey was the recognition that too few content creators were thinking about audience development at this stage, and instead were investing all their resources into fulfilling their creative vision. Similarly, we suggest that creators should also start thinking about the content lifecycle - including its various distribution and licensing opportunities - early, not as an afterthought once the project is available to the public.

The lifecycle illustration in Figure 1 encourages such holistic and long-term thinking, in a similar approach to that of audience engagement.[1]

If they have not done so already, creators will at least start exploring distribution opportunities once they begin full production towards launch. In an uncertain and volatile distribution landscape, this means trying to secure as many opportunities as possible.

> "With a rough number of around a dozen existing platforms that specialise in immersive content distribution, developers and studios are forced to plan their release strategies in a detailed and meticulous way, trying to find as many homes for their projects as possible."
>
> **French Immersion and Kaleidoscope: A handbook for immersive producers, 2021[4]**

LIVE PRODUCTION

Post-launch or premiere, the immersive content lifecycle becomes about longevity, to maximise opportunities for exposure or monetisation. A location-based production inherently requires a service approach, as staff are needed to deliver the immersive content as an experience and this can be expensive. In such a production, commercial viability will be determined largely by how many audience members can be led through the experience per hour, and by ticket pricing, similar to theme park attraction revenue models. If the primary indication of success is not direct revenue, production teams still need to have quantifiable metrics to evaluate whether the production can be continued or even expanded.

Live production can take multiple forms and involve various different roles, from programmers to actors to duty of care staff. In the report documenting the lifecycle of East City Films' immersive work, Common Ground, the authors sketch out an ideal four-stage lifecycle for an out-of-home production.

- First, the launch that targets the best festival platform
- Secondly, recoupment efforts (such as showcasing in a venue for a longer ticketed run) follow
- The third phase concerns reach and securing a place on a tour, nationally or internationally
- Finally, once the content has proven traction through the previous stages, it can be offered for syndication via a distributor[5]

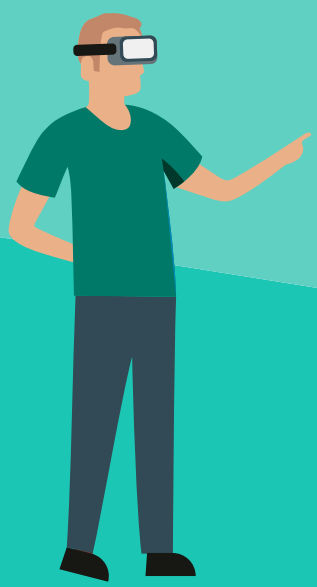
CONTINUOUS DEVELOPMENT

Creators targeting digital platforms and the at-home consumption of immersive content stand to benefit from a similar mindset to those delivering through out-of-home locations: planning the structure of the content to allow updates, episodes or similar features that increase the longevity of the content across all possible distribution platforms.

> "Episodic is great for narrative experiences. If you can drop regular episodes, you can extend the lifetime of the experience. With each episode you can go to a festival and win awards."
>
> **Maria Rakusanova, Viveport**
> **From French Immersion and Kaleidoscope:**
> **A handbook for immersive producers, 2021**

A piece of immersive content might reach another peak exposure moment when it is launched on a different platform, updated or taken into another venue. Different versions of the content can be targeted at different audiences: for example, a piece of expressive content can be transformed into a piece of educational content. Similar to the syndication of location-based content, digital distribution presents opportunity for long tail revenue, providing the content is maintained to be compatible with the technology used to access it. For example, in the case of an AR smartphone app, the production team needs to keep the application updated in line with new releases of the phone manufacturer's operating system.

The distribution landscape for immersive creative content



Part 1: The distribution landscape for immersive creative content

What does the landscape for immersive creative content look like across its digital, physical and hybrid forms?

Creative producers have described the immersive distribution landscape as having minimal standardisation, being full of vague jargon, difficult to benchmark and "like the Wild West." [4, 6]

Figure 2[7] presents the twofold nature of immersive content distribution:

- digital publishing channels, such as mobile and VR app stores, plus avenues for physical exhibitions
- out-of-home experiences (OOH), including festivals, galleries, museums and other public spaces such as shopping malls, libraries and bars.[4]

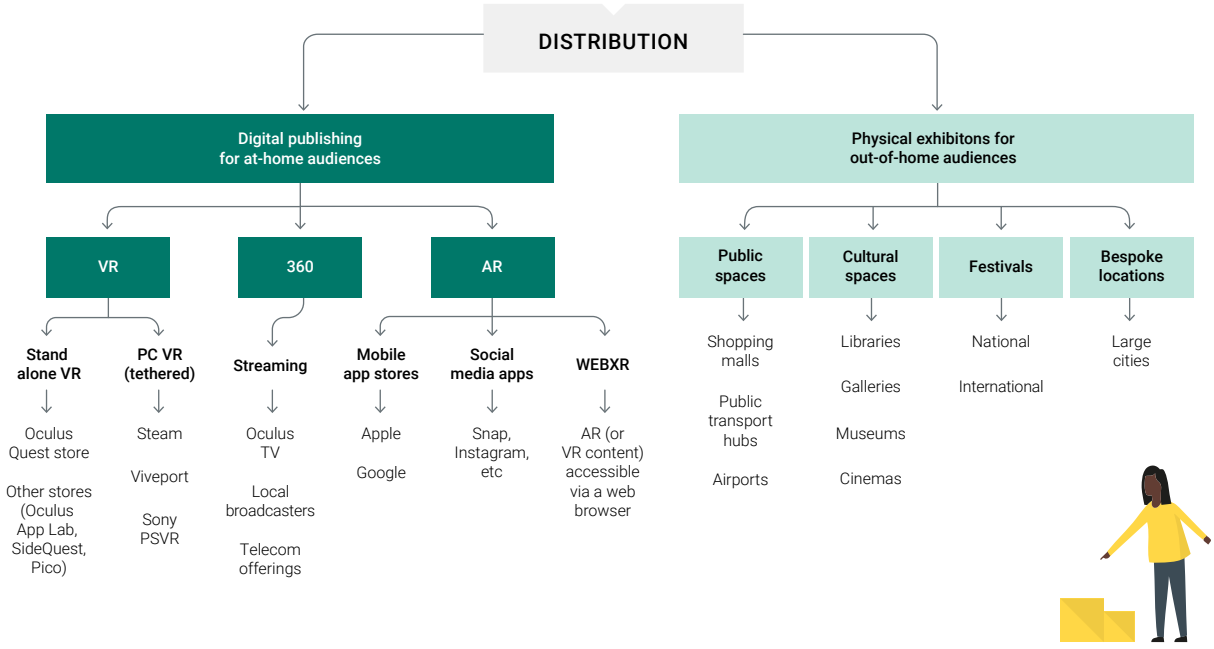


Figure 2: Distribution streams available to content creators and those commissioning content[7]

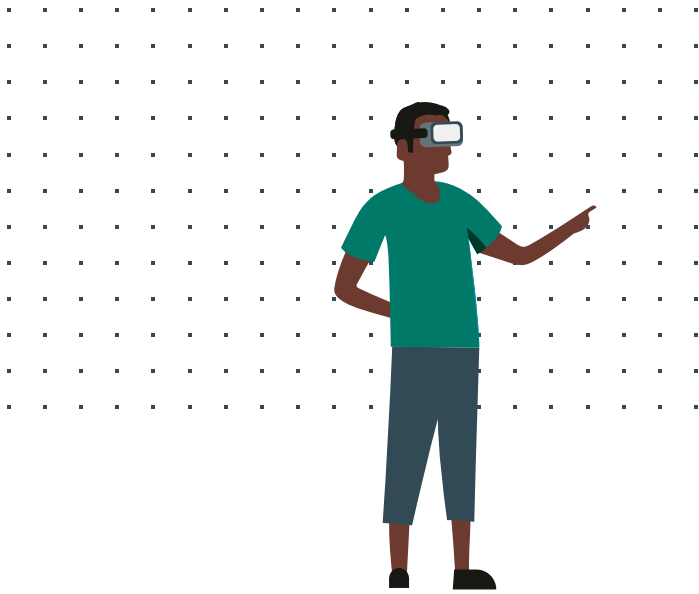
Since the launch of consumer-facing VR headsets in 2016, we have seen distribution channels (digital and physical) come and go, especially in the market for 360-degree video content. Due to such volatility, this report does not list every digital distribution platform or festival and instead concentrates on channel types.

OOH DISTRIBUTION: FESTIVALS, ARCADES, CULTURAL AND PUBLIC SPACES

While headset and smartphone manufacturer app stores have become a permanent part of the distribution landscape, location-based distribution has been more volatile - partially due to the COVID-19 pandemic.

For non-gaming immersive content, various international festivals have provided a channel through which to premiere and raise awareness with potential publishers and festival audiences. Venice Film Festival, Raindance, CannesXR, BFI London Film Festival's Expanded in Europe, Sundance, Tribeca, South by Southwest (SXSW) in the USA, Vancouver International Film Festival in Canada and Adelaide Fringe in Australia are among the festivals that have premiered immersive content since the latter half of the 2010, and they continue to be an attractive venue for immersive content creators. As the origin of most of these festivals is in showcasing film productions, their selection of immersive content skews towards comparable genres, such as expressive/artistic projects or documentaries.

Location-based VR arcades with proprietary technology, such as The Void, were shuttered during the pandemic. While it is estimated that 20% of arcades closed due to Covid-19[4], some have weathered the storm (Wonderspaces in the USA) and are opening new locations (Sandbox VR in London) or launching across USA and UK locations (Outernet). Wild Immersion was expanding its footprint in the out-of-home space but has since pivoted towards at-home distribution via AR[4] with a particular focus on content that creates awareness around environmental issues. Some companies, such as SynthesisVR, facilitate content management for VR arcades and enterprise solutions.



A related, commercially-driven distribution option for individual productions is to tailor a bespoke experience space, similar to an escape room. Before the pandemic, this was a trending direction for location-based immersive distribution, with productions such as The War of the Worlds: The Immersive Experience (by Layered Reality) successfully occupying a central London location from 2019 onwards (the production had some closures due to Covid-19 but re-opened in May 2021). While this gives the creators the highest degree of control over how the content is presented and the production is orchestrated, it is also the most costly option.

The other type of VR arcade model resembles the internet café, and operates on licensing a selection of content from publishing platforms, such as Steam and their PC Café service. Content creators do not have much control over whether their content gets chosen - it is up to the arcade business owners to select and license the content, which means that creators are likely to only influence their choices indirectly. If the content gains traction on a platform that offers a service for VR arcades (predominantly Steam or Viveport), then it is more likely to be selected. However, if there are publisher exclusivity deals in place (as we have seen with Oculus), this may not be the case.

We have seen VR arcades (Otherworld in London, for example[8]) packaging their offering into different selections with distinct audience groups in mind and this approach would offer an opportunity for non-gaming immersive content to find its place in selections targeted at first-time VR customers. International companies like VeeR have also provided content curation services to help set up VR arcades.[9]

Out-of-home distribution opportunities also include cultural spaces, such as museums and galleries that commission immersive content. For example, the Science Museum Group has showcased several projects that use immersive technologies to enable visitors to experience complex natural phenomena, while libraries and public spaces such as airports, shopping centres and commercial districts, provide opportunities for pop-up installations, often when the content is touring or part of a larger event.

Finally, there are specialised distribution solutions that operate somewhere between arcades and other public spaces. Netherlands-based Sensiks distribute ‘sensory reality’ pods with a selection of licensed and proprietary content (mostly VR). Their solution also enables sensory extensions using biometric sensors and they provide a content creation tool tailored to the pods’ capabilities. We have not seen UK-based creators target Sensiks’ platform, but similar options may have relevance for the long tail of the content lifecycle.

While attendance at out-of-home distribution locations suffered from due to the pandemic, there were positive impacts for online content, including engagement with VR and AR, which now seems more than just a temporary trend.

Online events, especially concerts in virtual environments such as Fortnite and Roblox, achieved unprecedented audience numbers. This trend presented opportunities for content creators to pivot from physical distribution to online channels. In the Audience of the Future programme, the Performance Demonstrator (led by the Royal Shakespeare Company) accomplished this with their production of Dream.

However, a change in direction is not easy and the ambition to deliver uniquely immersive content may involve some kind of trade-off. Finding ways to reuse content on platforms with less friction or larger reach can be challenging in terms of maintaining the original essence of the immersive production, but can also extend longevity and reach. Experts surmise that "accessible mobile AR experiences and web-based AR will become more popular,"[4] and while this trend still has some drawbacks with performance and creator accessibility, it has the potential to provide immersive content creators with a distribution stream that transcends the out-of-home and at-home divisions by embracing both.

AT-HOME DISTRIBUTION: APP STORES AND STREAMING

As well as mapping the distribution landscape, our research interest has been to identify the different strategies publishers have in terms of the content they prefer. Analysing which genres or types of content immersive publishers prefer is difficult because the field is fragmented and aggregated data is sparse.

We include AR smartphone applications under our definition of creative immersive content. However, mobile AR apps are rarely featured in stores, and therefore their reach relies heavily on paid user acquisition. Even if an AR content creator has the budget or partnerships to reach audiences, retaining them in the mobile space is challenging. For the general smartphone consumer, besides a few games with recognisable brands, such as Pokémon Go, AR is associated with face filters in social applications and branded promotional content.[10]

Going forward, we expect to see more AR content distributed using WebXR technology, which means that the user does not need to download an app to access it.

Going forward, we expect to see more AR content distributed using WebXR technology, which means that the user does not need to download an app to access it. However, while WebXR improves accessibility, it currently comes with trade-offs, including inferior technical fidelity and more friction with payment processes, compared to app stores.

The Oculus store for VR applications is predominantly games-focused, which is reflected in the types of content being surfaced (for example, being featured on the store's landing page). In comparison, fitness or productivity apps get only occasional exposure.[11] Oculus TV is a streaming platform that offers mostly 360-degree video content around travel, music and sports, but also animated, non-interactive immersive work.

In discussions on VR publishing, its often stated that most app stores are filled with VR games, with everything else forming only a minor percentage of the content. We analysed the Top 50 best-selling charts of Steam and Oculus stores in January 2022 and found this to be mostly true. However, it is difficult to conduct such analysis with absolute accuracy, as the content is tagged in multiple categories, often to gain more visibility rather than to represent the content accurately. In addition, sales charts do not directly translate to levels of user engagement. Duration spent with a piece of content, frequency of engaging with it and other similar metrics are usually only visible to the curators and content creators.

In the Oculus store, 48 out of the top 50 titles were games, with one travel and one utility application being the exception. On Steam, three utility apps were found in the top 50, the rest were games. On Viveport, analysis is more difficult to carry out as the store lists separate charts for games and other applications.

By leveraging existing market data, we can provide a sense of how the games and apps categories relate to each other. In general, the breakdown of store content offerings aligns with previous research on at-home audience preferences. In a Digital Catapult study of the AR and VR at-home market in the UK, it was found that VR users tend to interact with an average of 3.1 types of content on a regular basis: typically games, 360 video and travel.[10]

The positive news for immersive content producers is that non-gaming content has a place in the collections of at-home VR consumers. In January 2022, Viveport's non-games chart consisted of 360-degree video content, wellbeing and fitness applications, educational content and business tools such as social collaboration environments. In our sample, half a dozen titles among the Top 50 represented the type of creative immersive content we have been focusing on (among them UK-produced work, such as History of a Painting, and Berlin Blitz 1943).

So, what is the size of the market share that non-gaming content for? The same dataset shows for 80% of consumers, VR is predominantly being used for gaming.

Conclusion 1

NON-GAMING, CREATIVE IMMERSIVE CONTENT HAS FEWER USERS THAN GAMING CONTENT.

Another data point from the same study tells us that over half (54%) of UK VR users reported regularly buying games and a further 36% purchase additional in-game content. In contrast to the 54%, reported regularly paying for content such as VR films or animations.

Conclusion 2

FEWER USERS PAY FOR CONTENT OTHER THAN GAMES.

Therefore, the bad news for immersive content producers is that, in terms of consumption and revenue, non-gaming content has at least 50% less impact within at-home audiences. This result is also a reflection of what is featured on store landing pages and in promotional activities. We can assume that, from a store curation point of view, that games sell best, making it difficult for other types of creative immersive content to reach the limelight.

DISTRIBUTORS AS FUNDERS AND CONTENT GATEKEEPERS

When distributors fund content, they also shape how the offering in stores evolves. Oculus has contributed funding to projects created by UK-based immersive content creators such as No Ghost's Madrid Noir (2021) and Goliath (2021) by Anagram. Typically, these deals have included exclusivity throughout their store for a period of time, ranging from three months to a year.

Oculus has practised tight curation in their Quest store, unlike other services such as Steam. Before 2021, it was third-party services like SideQuestVR that functioned as an outlet for more experimental content and only since Oculus launched their App Lab in 2021 has there been an early access distribution channel for similar content.

Viveport's Infinity service is subscription-based service requiring diverse content to maintain its relevance to consumers. This is supported by our findings regarding the Top 50 content: Viveport's representatives are on record as saying that they strive for an 80:20 ratio between games and other content categories. They don't often demand exclusivity and even then, only for a month at most. They are more concerned about content longevity, in terms of content updates, for example.[4]

The exclusivity question is relevant for VR content creators to maximise reach when planning their releases across the different stores (predominantly Oculus, Viveport, and Steam). The profile of the publishing platform and its audience - for example, mostly gamers versus a more diverse customer base - can be important to negotiations. Platform exclusivity may erode if creators adopt a more deliberate multiplatform and versioning strategy to maximise reach, such as releasing different versions with different content to different distribution channels, either simultaneously or in phases.[4]

An understanding of the target audience is important in terms of content development, and also can be used to influence how the content is presented within its promotional assets. This is where support from publishers can be crucial to positioning the content so that it stands out.[4] Communicating the elusive yet unique nature of immersive content remains the challenge.

Communicating the elusive yet unique nature of immersive content remains the challenge.

ALL-IN-ONE DISTRIBUTORS

There are publishing companies in the immersive market that strive to accommodate both at-home and out-of-home content in their portfolio and publishing pipeline. Atlas V is among the few such actors in the market, having the goal of establishing a distribution pipeline across the out-of-home and at-home divide. It is also one of the rare examples of a publisher that finances content and aims to diversify and develop its own IP (Madrid Noir was co-produced with Atlas V).[4]

Distributors have an interest in the improved longevity of content, which makes them useful partners for creators. For example, Atlas V addresses longevity by localising content to meet different needs within an international market. This can improve accessibility and reach, especially when accompanied by price flexibility (adjusting for different markets, seasonal events and so on). In the digital distribution context, localising typically means adding multiple languages (spoken or with subtitles), and may also involve other aspects, such as adapting to meet different cultural norms.

Through distributors, creators can find more opportunities to extend the reach of their work. These include VR to go services that transform the VR arcade model into a rental model, where customers can take headsets home with a selection of pre-installed content. This has been enabled by the advent of more accessible standalone headsets. In the past, pop-up VR theatres always needed to facilitate the experience from start to finish (for example, Limina Immersive's pop-up solution in Bristol in 2019).

In planning roadmaps for individual pieces of creative immersive content, distributors like Atlas V are seeking to understand and adopt practices from the video game and mobile game industries (more of this later when we discuss distribution strategies).[7]

Distributors like Atlas V are seeking to understand and adopt practices from the video game and mobile game industries. This is discussed later in distribution strategies.[7]

DISTRIBUTION PARTNERSHIPS: TELECOMS COMPANIES AND BROADCASTERS

In the telecoms space, creative immersive content creators have some success with local operators. For example, Deutsche Telekom has invested in immersive content, and Orange in France has invested in multiple projects. Some broadcasters have funded projects that have potential mass appeal and fit with their channel content. Telecoms companies predominantly pay flat one-time fees to content creators.[4]

It is challenging for an individual content creator to forge relationships with potential partners in the telecommunications and media sector. As a result, distributors - with their international networks and contacts - are desperately needed to strategise and facilitate the business development process, including licensing.

In the UK, broadcasters Sky and BBC have shuttered their VR divisions and publications such as Guardian have ceased their journalism-themed VR content production. According to reports, in Asia, 360-degree video has some footprint, while North American operators are not investing in distribution.

In terms of production funding, the technology companies that manufacture immersive devices or develop content creation software have stepped into the space instead, with the aim of boosting adoption rates. Headset manufacturers like HTC have run programmes like Vive Arts with similar goals.

DISTRIBUTION MODELS AND STRATEGIES

Establishing a clear strategy determines the streams and channels through which a piece of content should be distributed and in what order. When the strategy is put into practice, it becomes the distribution model and the lifecycle of a piece of immersive content can include multiple different distribution models.

From a content creator point of view, lifecycle thinking requires planning and allocation of resources both before and after the initial launch or premiere. This thinking presents opportunities to build distribution advantages into the piece, for example, structuring the content episodically to make it easier to localise or repurpose assets for other media formats in the future.

The lifecycle of an individual piece of content can involve both out-of-home and at-home distribution. For example, Fly (by Picture This Productions) began its public life at the Saatchi Gallery in London in 2019 and has since toured physically in the UK. It was part of the Immersive Arcade VR showcase in 2021 and continues to be available through the Viveport store for at-home audiences. So far, its lifecycle has extended to three years, which is unusual, the use of different distribution streams being one factor in its success.

With their international networks and contacts, distributors are desperately needed to strategise and facilitate the business development process, including licensing.

In reflecting on their experiences, the producers of the critically acclaimed Common Ground (East City Films) identified four types of distribution models for creative immersive content:[5]

1. **Alongside a film on a cinema tour**
   Notes On Blindness (Archer's Mark, 2016) and Unrest VR (Shella Films, Ex Nihilo, Little By Little Films, Novelab, 2017) are both examples of VR experiences which have secured small tours alongside their parent film.
2. **Within an existing exhibition**
   Examples of exhibitions with immersive creative content include The Tate's Modigliani (2017) and The Louvre's Mona Lisa (2019).
3. **Within a touring exhibition or festival**
   Common Ground (East City Films, 2019) was featured in the Alternate Realities exhibition during Sheffield DocFest, and on a national tour.
4. **Through a bespoke experience or installation in a cultural space**
   Fly (Picture This Productions, 2019), We Live in an Ocean of Air (Marshmallow Laser Feast, 2018), and Atlas V's Ayahuasca Kosmik Journey at the Eye Film Museum (during IDFA) are all examples of one-off installations of VR experiences. Lost Origin (Factory 42, 2021), one of the Audience of the Future Demonstrators, ran in London late 2021 as an out-of-home experience at an events venue, a combination of immersive technologies, including mixed reality headsets and projection mapping.

Libraries, airports and shopping centres all present additional locations for consideration.[4] What presents a challenge in scouting venues and pursuing outreach towards potential partners, is that creators tend not to have the resources for such distribution considerations and may not have the necessary business development skill sets. Another stretch of resources for content producers considering merchandising as a way to diversify revenue streams.

> "There are no available funds to support distribution of location-based immersive content. These costs need to be covered by the museum or a sponsor. In many cases it means that producers must not only take care of the creation and delivery but also need to become entrepreneurs and develop sustainable distribution models for their portfolio."[4]
>
> **French Immersion and Kaleidoscope: A handbook for immersive producers, 2021**

The creative immersive space has too few impact producers who can create awareness and map the scale of distribution.

Location-based installations require documentation in the form of a concept bible (a document with intricate specifications of the production, similar to a brand bible) and, or a tech rider that provides all the technical information needed to enable staging by a local partner instead of the original production team.

Outreach for local production partnerships is important, yet it can often be difficult to prioritise during production. This is where publishers can provide much-needed support. With smaller productions, we have come across teams that have a touring precedent (such as dance companies that have added an immersive element to their performances) and can run the immersive content piece alongside their performance bookings, instead of organising separate logistics for it.

When the lifecycle is considered through the distribution model strategy, it becomes a sequence of releases through various channels, with a number of resource-intensive preparation activities (ranging from technology development to contracting) taking place in the lead-up to each one. Figure 3 aims to encourage creators and commissioners to design their longer-term strategies with consideration for the resources and partnerships required for their execution.

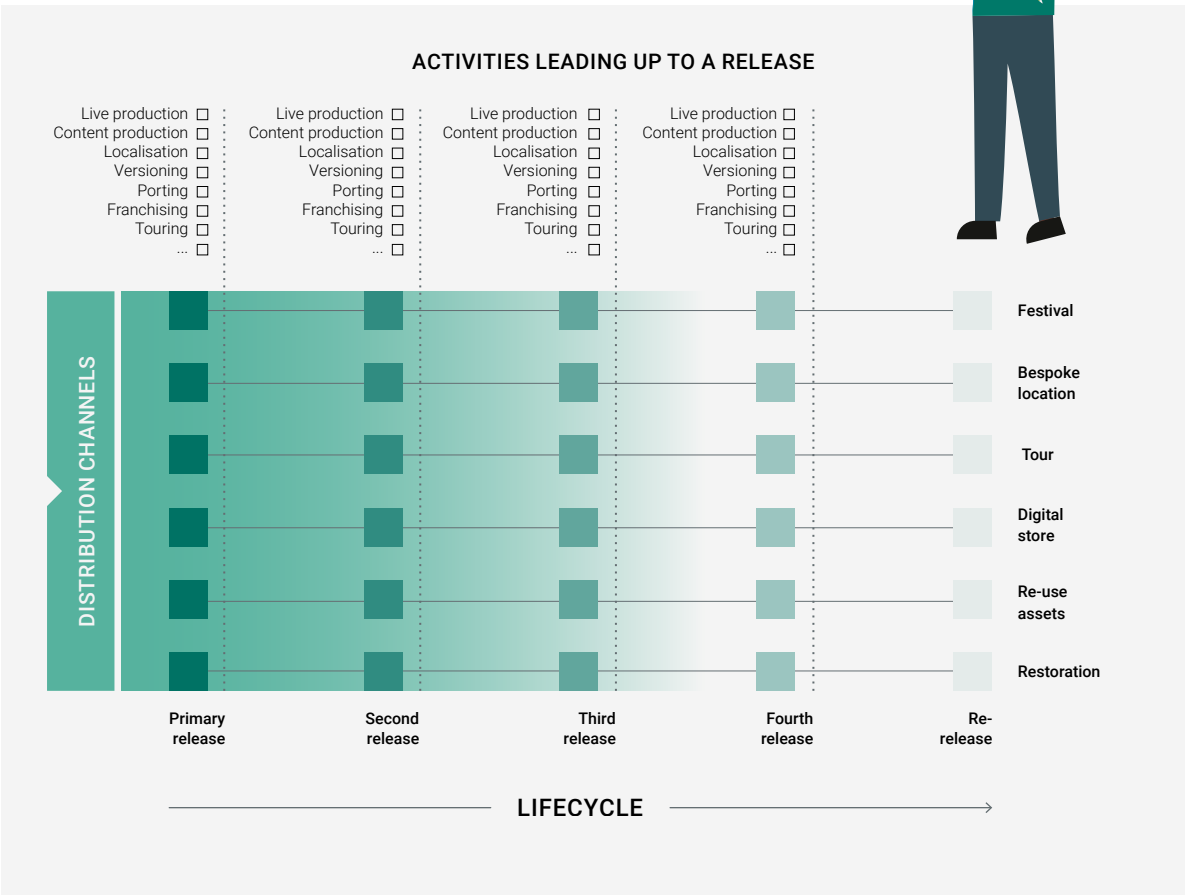


Figure 3: The distribution model

This model presents various channels available for consideration as the distribution model for a piece of creative immersive content. The lead-up activities that the production team needs to complete for each release might involve scoping the production up or down, reconfiguring it from one technical platform to another, producing a new episode of content and/or localising it to a particular context.

The model can be used in planning the roadmap of a project. Figure 4 shows the routes of two different pieces of creative immersive content, where each premieres through one channel or platform (festival for the green, bespoke location for the yellow) and subsequently traverses a different path towards digital distribution and beyond. Many of the examples mentioned in this report (such as Fly and Common Ground) have navigated the creative immersive landscape in a similar way to the example paths in figure 4.

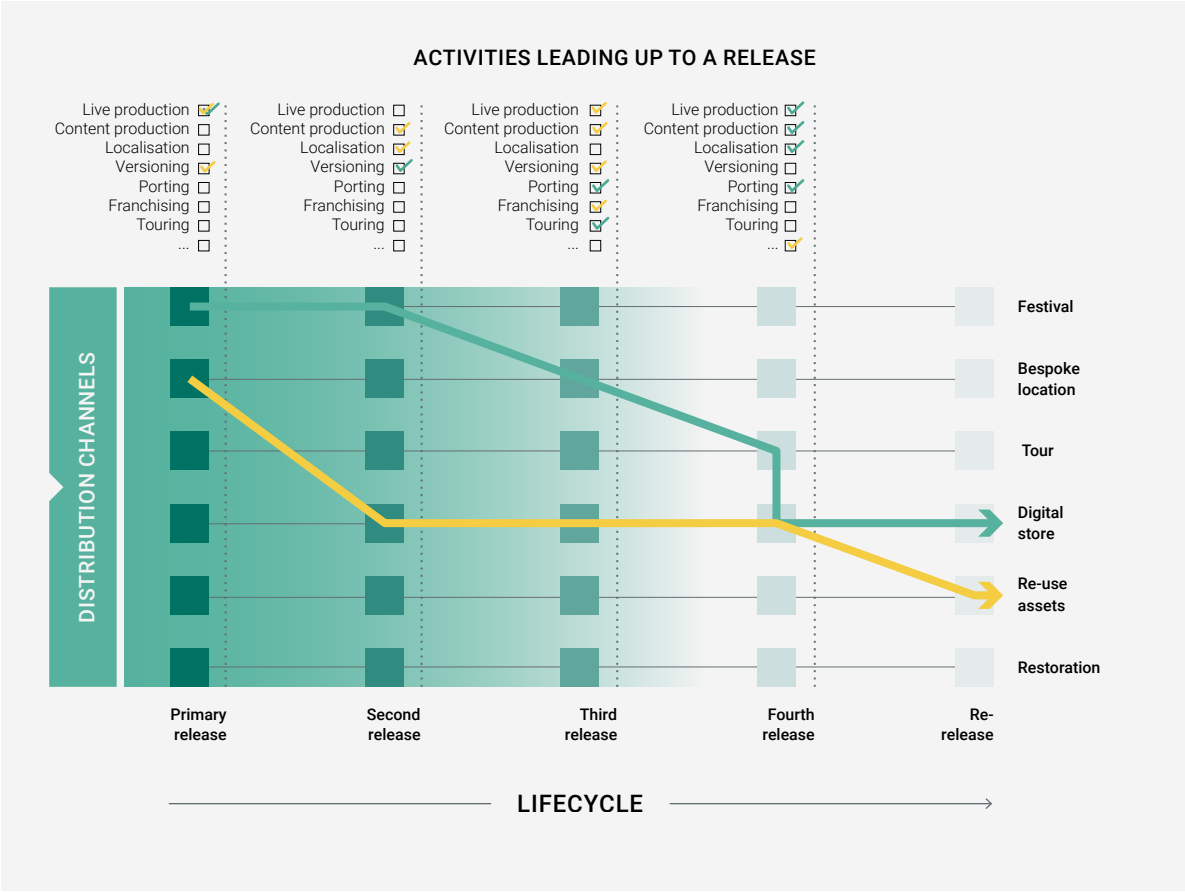


Figure 4: Examples of content distribution routes across multiple releases

USING AUDIENCE DATA FOR DECISION-MAKING

When it comes to adding or updating content to improve audience reach or retention, the value of making changes needs to be weighed up against the resources needed to deliver it. There is a risk of being caught on a content treadmill that becomes unsustainable, given that each iteration will require the production team to stay intact. Furthermore, the original content structure or application architecture might not accommodate the straightforward addition of content.

This is where quantitative data regarding audience behaviour becomes crucial for decision-making: is there a business case for delivering additional content? We have observed that immersive content creators tend not to operate with a data-driven mindset - and even when they do, they may not have the skills or resources needed to collect the audience data they need. As we found in our previous research, often content creators do not have expertise in this area, so data collection becomes an afterthought.[1]

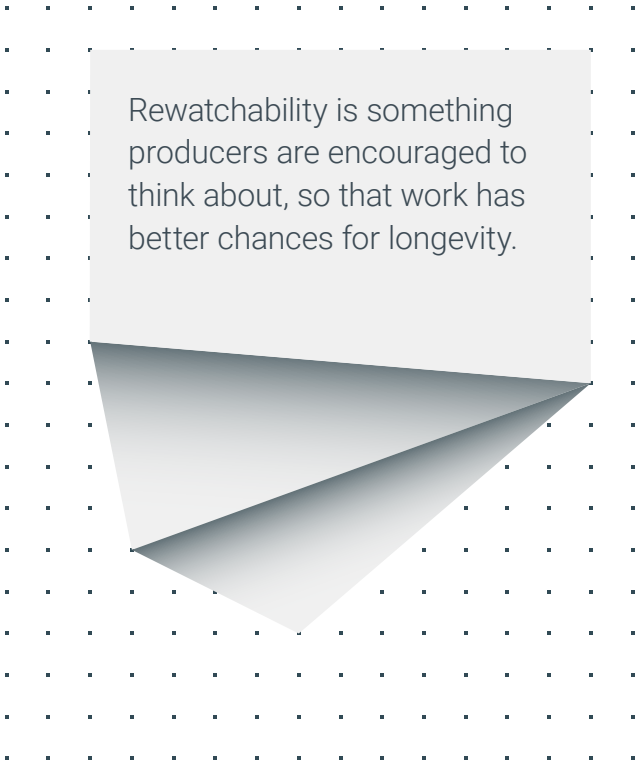
Creators have also reported additional considerations in extending reach. How much visibility and control will the creator have in each new context the work is put into?[5] What genre or other work is the content affiliated with? Do creators have direct visibility of customer data on the platform? Is the data granular or specific enough to yield insights about how audiences are engaging with their particular content?

Another challenge is that the costs of versioning are not trivial. If a project begins as fully interactive content using six degrees of freedom (6DOF), but there are distribution opportunities in the non-interactive 360 video domain, does the team have access to the tens of thousands of pounds of additional funding needed to cover all relevant platforms, as well as the know-how how to make the content work for audiences in its new format?[5] In such cases, co-production partnerships, such as the telecoms partnerships mentioned earlier, can be crucial in providing the support necessary for taking the content from one domain to another and to leverage the subsequent distribution opportunities.

Yet, the content creation process itself can yield valuable assets. We have seen how the various tools and methods of content creation and the management and study of audience impact can be used to grow products. It's useful to note that it is not always the content, but sometimes the workflows around it that may become the most viable commercial outputs. For example, from the Audience of the Future Demonstrators, The Fictioneers are pursuing the commercialisation of their transmedia content management tool, and i2 Media Research has developed their Audience Impact Metric service through work in the Performance Demonstrator and beyond.

Another approach to extending the content lifecycle is to find ways to reuse and repurpose the assets, for example, so that they can also be used beyond the headset, possibly even via a web browser on desktop or mobile, taking advantage of WebXR technologies.

Data collection, analysis and rigorous documentation are important in communicating internally (to inform creative decisions within the production team) and externally (to pitch and report to stakeholders). This documentation can include details of how the project is scalable in a sustainable manner and can help evaluate how the content can be released in seperate versions for different markets and contexts. As the second part of this report shows, documentation is crucial for any potential archiving and restoration efforts.



MEASURES FOR LONGEVITY: RE-ENGAGEMENT

Distributors like Astrea and Vive recommend taking a lead from practices in the video game industry, where consumption is strongly dependent on replayability and the consumer's long-term engagement with the content. Even with non-interactive immersive content, such as animated storytelling or 360-degree video content, the notion of rewatchability is something producers are encouraged to think about, so that work has better chances for longevity. We are starting to see this approach being adopted by UK producers (for example, History of a Painting by Fat Red Bird, 2021), although an episodic approach does require a team to commit to the project for an extended time.

The event-based approach to the content life cycle is also possible in the immersive space. Unsurprisingly, there are numerous examples in the multiplayer gaming space, where time-limited content drops and events have produced spikes in player numbers and revenues.[12]

Just as product strategies such as these have relevance for mobile AR content, they can also be adopted more broadly in the immersive space and with VR content in particular. In 2020, US-based studio Tender Claws demonstrated how live shows, adapted from Shakespeare's Tempest, could extend the life of the original content (The Under Presents) and how ticket sales for live performances can provide another revenue stream in addition to the app purchase.

These are examples of where creators have added a social and live dimension to their content and extend its reach via online interactions and create longer term forms of community engagement. From a production perspective, both require a service mindset and organisation.

LICENSING PRACTICES

To promote success, the distributors we consulted as part of the research encouraged thinking about licensing from the very beginning of a project. Our research into the distribution landscape looked at what kinds of processes and standards already exist for licensing immersive content and if any of these are broadly established. We discovered that, although licensing activities have varied considerably across different projects, there are signs that the field is starting to mature.

It is in the interest of both publishers and content creators to establish standards and best practices for dealing with immersive intellectual property. Based on our experiences in producing the Immersive Arcade VR showcase, we uncovered no standards or guidelines for a temporary publisher seeking to restore content to the public eye.

We also learned that licensing arrangements and IP ownership vary by country. For example, in Canada, the National Film Board has been active in financing immersive content and typically owns the rights to distributing the work. While this can be helpful for retrospectives similar to Immersive Arcade, it puts the onus on the institution to foster the content's longevity, not on the creator. The question of who is in control of the lifecycle is not always straightforward, and can impact licensing arrangements.

It is in the interest of both publishers and content creators to establish standards and best practices for dealing with immersive intellectual property.

Our learnings from Immersive Arcade benefit both content creators and those licensing content. From the very start, contract templates, clear IP ownership structures, roadmaps for the licensing process, relationship-building between licensor and licensee, and agreeing what the licence applies to (such as which version of a piece of content that has multiple versions) all need to be addressed.[6]

In most cases, there comes a point when the creators want to sunset the project so they can move on to the next. What happens then, in terms of archival by those immersive content creators, is critical for any future effort by an external body, such as a museum or a research organisation, to be able to study, archive or even restore the work.

2

The archiving landscape

Part 2: The archiving landscape

The twilight phase of the creative immersive content lifecycle is riddled with questions about technical complexity and the risk of obsolescence. Through this study, we have documented an overview of the current state of practices that relate to archiving in the creative immersive domain. We questioned the extent to which archiving is carried out and about the particular challenges that immersive content presents compared to other media, such as art or video games.

> "The necessity to redefine the concept of archiving is clear, when it comes to ensuring the continued accessibility of media art, as well as its conservation."[13]
>
> **Cosetta G. Saba, Media Art and the Digital Archive (2013)**

ARCHIVAL, CONSERVATION AND AUTHENTICITY

We begin by looking at some of the key concepts in this field, such as how the notion of archiving needs to change in response to content that is created for an eclectic mix of technologies and media formats.

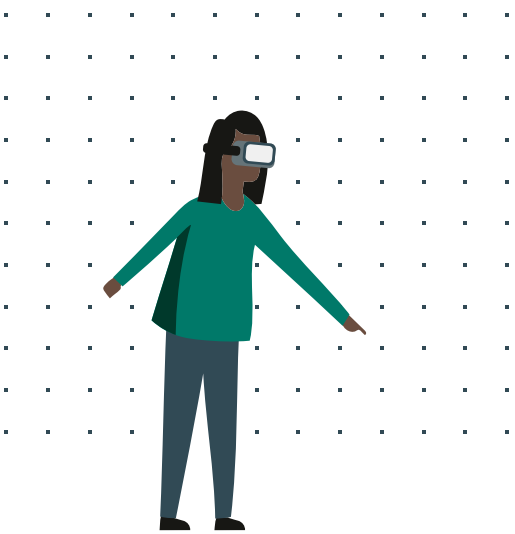
Archiving a piece of creative work is carried out to preserve it for future access. While archiving can be understood as referring to collecting and indexing assets and making them accessible through a centralised repository, we are more interested in conservation practices: how a creative project employing advanced digital technologies (ranging from AR to VR or haptics to projection mapping) is stored after its initial exhibition or publication, so that it is possible for audiences to experience it in the future as authentically as possible. This practice can extend the longevity of the work, short and long term.

Documentation is a key conservation practice, but when preserving a work involving multiple media and technologies, it becomes increasingly complex. This might mean that for future archivists, today's immersive work can only be reimagined using future technologies with the help of conservation practices that have aimed to capture the creative essence of the original work. It is therefore increasingly likely that preserving immersive content will mean discounting the concept of authenticity, at least in the way that it is attributed to more traditional pieces of creative output, such as paintings or sculptures.

What information needs to be documented about the identity of creative immersive content and how it is delivered? When addressing the challenge of digital art back in 2005, Pip Laurenson from Tate, identified the following properties: [14, 27]

- the artist's instructions
- approved installations intended to act as models
- an understanding of the context in which the art was made
- the degree to which the artist's specifications reflect their practice at the time the art was created

The key question is how to document all of the above to produce a notation or *score* for those restoring the work and orchestrating its revival in the future. The music metaphor applies well to a work that could be performed long after it is originated, by different people and in different locations and may be useful as a reference for creators or archivists re-engaging with immersive work from the past.



PRESERVING IMMERSIVE WORK AS TIME-BASED MEDIA

Today's archiving and preservation landscape in the immersive space is led by world-renowned institutions, including Tate and The Victoria and Albert Museum in the UK and the Guggenheim and the Smithsonian in the USA. As experts in acquiring and exhibiting art and installations, these institutions have had to consider how to preserve time-based media, namely work that employs combinations of moving images and computational media.

Preservation efforts for computer games is a related field, especially due to their interactive nature and reliance on particular generations of microprocessors, displays, controllers and operating systems. Archiving immersive content presents similar challenges, especially as display technologies, graphics processing units and computer vision technologies are evolving year by year. For example, a particular head-mounted display of today or the augmented reality glasses of the near future, may be a feasible and affordable way of delivering the content at the time of its premiere, yet could be obsolete less than a decade later. Moreover, immersive technologies may have been installed in a particular space or location tailored for the project. Documentation regarding how the space was configured, let alone about the space itself, might not be available for future restorations. Some technologies might need to be substituted.

> "Whereas the conservation, restoration and exhibition of classical artworks like painting and sculpture generally primarily raises material problems (investigating the types of materials used, determining the best lighting conditions, etc.), the preservation and exhibition of contemporary time-based media artworks also raises the more fundamental question of exactly where to locate the work."[13]
>
> **Julia Noordegraaf, Preserving and exhibiting media art. Challenges and Perspectives, 2013**

Writing about time-based media artworks, Julia Noordegraaf observes the challenge when aspects of the work go beyond the material considerations:

When producing the Immersive Arcade VR showcase, the importance of *where* became apparent. To restore a relatively recent work, less than five years after its premiere, our first challenge had been to locate the original production team and whoever had the project files and executables saved on a computer.

If original materials are lost or deprecated, technical preservation can present problematic reverse-engineering challenges.[15] For example, the operating systems on our smartphones evolve each year; a smartphone AR application that was a part of an immersive installation may not function in future unless it is continuously updated, along with its possible dependencies to online services.

Preservation considerations aren't limited to the issues of software emulation, whether to stockpile playback devices or headsets or ensuring media file availability and compatibility. A set of new creative or technical decisions need to be made. To further complicate matters, as William Real said in 2001, "the 'heart' of a work might lie primarily in its less tangible qualities."[16]

DOCUMENTING TIME-BASED MEDIA PROJECTS

Looking at what conservators of immersive content can draw from practices established in conserving media art, Annet Dekker studied UK-based art collective Uncle Roy All Around You, created by Blast Theory - a mixed reality game played in city streets. She compared contemporary media art documentation strategies and how they fitted the types of ephemeral trans-media experiences, typical of Blast Theory's work.

Dekker identified multiple functions for documenting practices in this context:

"I discerned three different phases in which documentation played an important role. I define these, often parallel, stages as follows: **documentation as a process**, in which documentation is seen as a tool in decision-making processes during the development of the work; **documentation as presentation**, or the creation of audiovisual material about the work; and **documentation for re-creation in the future**."[17]

While it is the last role - documenting for future re-creation - that strikes as the most important for conservation, the two are integrally linked. Traditionally, interviewing the artist for documentation purposes has been a key part of archiving a piece of work and with more fluid works or events, documenting the creative process and decisions made becomes essential to informing practitioners about how to restore the work.

To date, this kind of approach has not been part of the toolbox of conservationists based in museums and cultural institutions.[18] However, initiatives such as the Variable Media Questionnaire, Capturing Unstable Media Conceptual Model and The Media Art Notation System have tried to fill this gap in the media art space.[13] For example, the Variable Media Questionnaire was created in part to "help by recording opinions on how to preserve creative works when their current medium becomes obsolete."[19]

These approaches would warrant re-evaluation in the light of more recent immersive projects. For example, do they help capture an immersive theatre production that mixes virtual spaces in VR with motion-captured live actors? Does their methodology encompass augmented reality applications on a smartphone? Discussion of these models was outside the scope of our research, but we have surfaced a number of considerations specific to creative immersive content in this report.

TECHNICAL PRESERVATION

As scholars of media art have observed in the past, technical challenges contribute to the complexity of documentation practices and types of assets that need to be archived and maintained.

> "The documentation and dissemination of our media-based artistic heritage requires a clear methodology. As with physical conservation, the work's complex installation configuration requires, at an archiving level, that the technological platform must be documented too."[13]
>
> **Cosetta G. Saba, Media Art and the Digital Archive (2013)**

Preserving software-based immersive projects can benefit from the tools and approaches established with time-based media projects, as they present "a well-established precedent for documenting technically complex, installation-based artworks in time-based media conservation".[20]

Technical preservation of immersive content aligns with what Rechert et al identify as the three layers of preservation requirements:[21]

- **The digital artefact description and its configuration**
  Configuration documents can include equipment schematics, such as how projectors, sensors, audio and devices etc., were laid out in the space and how they were connected to each other.[22] This was referred to as the concept bible or tech rider earlier.
- **The software runtime environment and its configuration**
  This can be presented as schemas for the runtime environment and software architecture.
- **The hardware environment**
  This would include descriptions of the hardware which include a 'machine' with built-in hardware (e.g. a computer, phone, tablet etc.), and external hardware components connected to this machine.

Preservation requirements for these three layers can be assessed separately and risks can be identified through interdependencies between the layers.

Unlike traditional artwork, the devices used to deliver content using digital technology can quietly break without anyone noticing. Initiatives like Conserving Computer-Based Art at the Guggenheim in the USA have been set up to address issues such as hardware failure, rapid obsolescence and the lack of established best practices.

This project introduces three steps.

First, the work is analysed for vulnerabilities and dependence on specific operation systems and software and hardware. This helps with securing necessary resources, such as hardware, peripherals, source code, executable programs and media assets like video or audio files.

Then the data is copied from physical storage media before it becomes inaccessible and moved to preservation storage. Multiple copies need to be kept and monitored for data integrity.

Finally, migration to newer hardware or software emulation are considered as optional conservation treatments; undertaking either will change the artwork. How much change is acceptable needs to be determined while still maintaining the work's integrity. This presents a problem for museums, collectors, curators and creators, something which had already been identified more than two decades ago, as "an installation rarely has a text or score that can be safely regarded as the objective starting point for any subsequent re-creation."[16]

In summary, time-based media documentation practices, such as employing document templates for recording properties of the work and the creator's intent, can capture and measure unwanted change. Yet, these practices tend to be resource-intensive and so far they have not been extended comprehensively to all the other characteristics of immersive content.

TECHNICAL DOCUMENTATION PRACTICES

Francis Marchese has suggested that "software engineering processes will aid digital art scholarship by augmenting and organising an artwork's components in such a way as to enhance accessibility by art historians."[23] Marchese argues that methodologies from software engineering can help in creating and maintaining documentation and make it possible to audit systems when they are considered for restoration.

> "Software engineering as a process may engage all stakeholders who comprise an art museum's business practice, including artists, curators, conservators, installers, maintainers, museum directors, art historians and viewers; and can reflect and integrate this process into a museum's current best practices."[23]
>
> **Marchese, Francis T. (2011) Conserving Digital Art for the Ages**

However, Marchese's point is largely theoretical, given the uncertain financial environment in which immersive content creators work today. In our experience from running immersive content accelerators, content creators do not have the luxury to factor in time and funds for rigorous documentation practices for future installations of platform releases that may or may not happen. As a result, the sets of documentation across immersive content projects are inconsistent.

Marchese's case studies highlight this inconsistency. He cites a multi-sensory installation from 2005 that was documented by collecting original video materials, walkthroughs, still images and a technical paper - a useful set of materials for future use. His second example from 2008 is a more complex installation that leveraged various online resources, included a specific touch-screen interface and was implemented with multiple computing platforms and programming languages - yet no discernible documentation seems to exist.[23]

In conclusion, we have found that rigorous documentation of the creative process, or the creation of technical specifications, is carried out as an exception rather than as a rule. The process is characterised by ad-hoc decisions, similar to how William Real has described installation artists' practice:

"Almost every installation involves making innumerable small decisions as the work evolves in the space. It may be that the artist has arrived at a site with only a sketchy idea of what the final product will be, or that the artist is recreating a previous work in a new location."[16]

For robust documentation of creative immersive work to take place, creators would need to be supported with tools that facilitate documentation throughout production with minimal effort. Ideally, this would take place according to a standardised and accessible syntax that serves the production team and the archivists and conservationists.

There are examples of ambitious research projects that have aimed to document the audience experience of 'variable media' artworks, as part of capturing the live experience of a work that might be challenging to restore.[24] Roeck et al argue that sensor and screen recordings are needed for the documentation and comparison of significant but otherwise elusive properties.[20] Therefore, the challenge is to create live documentation tools that can handle output from various technologies, alongside relevant ways to present what has been captured.

PRESERVING 360-DEGREE VIDEO

While 360-degree video content is typically viewed with VR headsets, it is not interactive in the same sense as software-based VR applications. The creative processes also differ, as producing 360 video builds on film-making workflows rather than software development ones.

To mitigate future issues with incompatibility, 360 video file formats would ideally have embedded technical metadata (such as display dimensions, scale and provenance), but not all formats support this, so these details need to be stored separately.

Without standardisation of file formats, 360-degree video will either require a time-based media conservation approach using a case-by-case evaluation or a staged preservation strategy: storing files as they are received and exploring transfers to preservable formats later.[25]

PRESERVING VIRTUAL REALITY PROJECTS

Researchers at Tate have grouped preservation strategies for software-based creative projects into four categories:

- **stockpiling:** acquiring and preserving the necessary hardware
- **hardware migration:** replacing old hardware with current hardware with similar capabilities
- **emulation:** using contemporary software to emulate the functionality of past software
- **code migration:** keeping the software up to date with new versions, for example, of game engine software[22]

We recommend taking a detailed look at Tate's work to anyone particularly interested in the specific technical challenges relating to preserving VR content.

In restoring Char Davies' pioneering VR work from the 1990s, Glen Fraser and John Harrison have discussed how, through a number of iterations over the years, they migrated individual hardware components (tracking, spatial audio, mainframe Silicon Graphics computer) to a single Windows-operated PC in 2017. Davies' projects Osmose (1995) and Ephèmére (1998) also include a vest that monitors the breathing of the immersant experiencing the work. The vest has evolved from a 1994 prototype to the original exhibition version for the late 1990s, and onward to the 2007 and 2017 iterations. This would not have been possible without documentation and the fact that - quite unusually - the same people were working on the project throughout the whole time.[26]

In practice today, technical documentation of VR should include thorough software and hardware architecture specifications, good programming practices and storing software projects created with game engines, such as Unity3D or Unreal Engine.

> "Encouraging the preservation of the source projects of real-time 3D applications seems a logical approach to their long-term preservation, as these are analogous to source code. Retaining these opens up options of modification and migration in order to keep the software running in future technical environments."
>
> **Tom Ensom and Jack McConchie (2021) Preserving Virtual Reality Artworks, Tate Gallery: London**

In addition, software components such as drivers that communicate between devices are central to VR headset operation. Ideally, from the preservation perspective, all VR-related software would all support open standards instead of proprietary solutions, to make writing compatible software more practical. However, levels of adoption of open standard file formats (such as for 3D models) and frameworks (OpenXR) have been mixed.

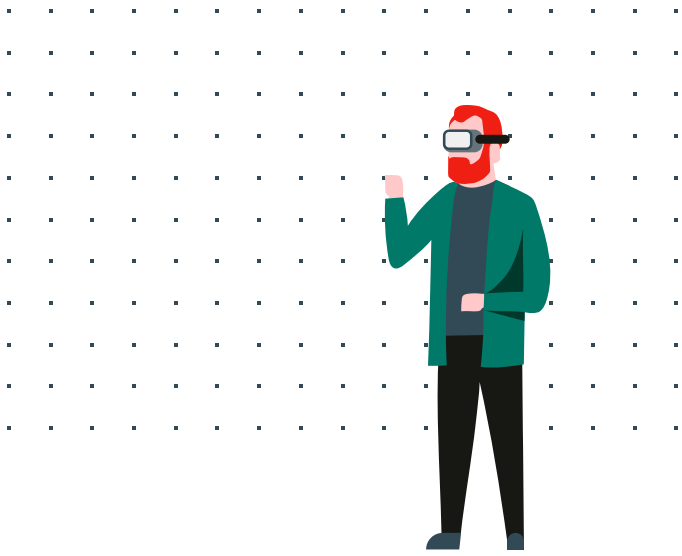
The large gaming developer communities can help in sustaining projects that have been built using game engine software, but development often involves dependencies on other software development kits (SDKs). For example, mobile AR development requires either Android or iOS tools to build the project onto a distributable format.

PRESERVING AUGMENTED REALITY PROJECTS

Our observation is that the preservation of AR applications is an under-studied area. Throughout the late 2010s and early 2020s, AR has gained traction - largely due to current smartphones and their cameras and the AR software development tools that manufacturers now provide. By augmenting the physical world with a virtual counterpart, AR applications offer all kinds of opportunities, such as conserving heritage artefacts in their original location. But how can the AR application itself, used to access such augmented heritage, be conserved?

The issue of software obsolescence has become more acute for mobile platforms, due to the rapid development of mobile applications and services. This is a recent phenomenon, and one that few will have paid attention to in relation to the challenge of archiving and restoring smartphone applications. Software emulators can be found for mobile operating systems from the feature phone era in the early 2000s, but the same cannot be said about the earliest versions of smartphone operating systems (Apple iOS and Google Android).

From the Audience of the Future Demonstrator programme, one augmented reality project in particular can evidence this preservation challenge. Looking at the challenges with Blast Theory's Can you see me now? (2001) and Uncle Roy All Around You (2003), will anyone be able to access and play - or research - the once widely available location-based AR game The Big Fix-Up from The Fictioneers in two or three years or beyond? What documentation of it is left for conservation?



PRESERVING LOCATION-BASED INSTALLATIONS

Creative immersive projects that have been based at a specific venue or location, often with a mix of immersive technologies, such as projection mapping and head-mounted displays, present more complex preservation challenges, due to the technologies involved. When out-of-home experiences involve physical props as well as digital technology, conservation will include both material and immaterial (digital) consequences.

This makes documentation of the original set-up crucial and the more complete it is, the better it serves preservation. The practical requirement, as described in Dekker's work with Blast Theory, is to treat this as a live document that would include ad-hoc decisions to problems that may only arise when setting up the installation.

The commercial motivation for content creators to maintain such a live document as a communication tool is that franchising the work to generate revenue elsewhere will require a concept bible tech rider or similar set of specifications. Immersive creators like Darkfield have been able to franchise their ambisonic theme parks (containers tailored for immersive audio experiences) with the help of such documents, as have others. Marshmallow Laser Feast is another immersive UK company that has been touring its work, such as We Live in the Ocean of Air, both globally and in collaboration with local companies to run the production.

Despite the eclectic mix of technologies that immersive producers use, it's important not to overlook the value of material archiving and preservation. The location-based context and physical props are an important part of the creative experience.

Because restoring installation-based pieces of content involves setting up a service that audiences can engage with and journey through, service design methodologies are a potential reference point to draw from for creating documentation. For example, service design blueprints are used to specify the different components and actors, within a complex network that needs to be orchestrated for the service to run smoothly.

The service design context highlights the need for institutions undertaking collection and archiving to rethink the skills sets required and take a multidisciplinary approach. Twenty years ago, when addressing similar questions relating to installation art, William Real emphasised the importance of multidisciplinary communication in building a sound basis for conservation efforts:

> "Conservators who are responsible for the preservation of installation art, and in particular technology-based installations, must communicate effectively with audiovisual technicians, commercial video engineers, equipment service personnel - and others ongoing services will be required to maintain electronic components and media, who are not in the habit of thinking in terms of long-range preservation mandates or conservation ethics."[16]
>
> **William Real, 2001**

End matter

Conclusions

The research we have undertaken with the Audience of the Future programme and our immersive content accelerators has already shown that few producers of creative immersive content have the luxury or the mindset required to think about the longevity of their work.

The combination of production costs and an under-developed distribution landscape makes completing a project and managing to distribute a piece of creative immersive content to a single audience an achievement in itself.

Most creators tend to move on shortly after the content goes public, because the market rarely supports engaging in continuous development or scaling to additional locations. This is a symptom of both the size of the market and the segmentation of the market: VR at-home content other than games has a niche audience and out-of-home experiences require the scale of an urban metropolis to be sustainable on a scale that guarantees longevity.

For many pieces of creative immersive content, the twilight begins halfway through the lifecycle, regardless of its future potential, largely due to the lack of distribution companies able to support creators.

Documentation practices during immersive productions often end up being ad-hoc rather than systematic. In a pure software development project for a digital publishing platform, such as developing a VR application for an app store, the documentation has a better chance of being consistent and sufficiently detailed, simply because software developers require highly specific documentation to implement features. The more complex in terms of the variety of technologies and skillsets a production becomes, the more fragmented the documentation becomes. This does not bode well for longevity either in the commercial sense (such as when approaching distributors for franchising support) or for archival and preservation efforts.

Consequently, when archivists and researchers make recommendations to creators, they tend not to be very realistic, which means that few creators carry them out. What might be more realistic is a renewed perspective on what conserving a work means. By mapping the immersive content lifecycle we have demonstrated that to achieve longevity creators need to think of their work as a fluid entity: intellectual property that can shape-shift into various distribution opportunities. Even if the work remains in one specific location or distribution platform, it can benefit from evolution. The challenge is to reallocate resources to such continuous development and work in a continually changing distribution landscape.

This is echoed in what Annet Dekker has proposed about the nature of institutions that archive and exhibit such fluid work:

> "A museum could move from being a custodian of dead objects to a living space, where presentation, preservation, discussion and active exploration go hand in hand."[17]

If the earlier stages of the creative immersive content lifecycle are already a constant negotiation of the work's identity, it's likely that later efforts to archive, preserve and restore it will need to deal with similar fluid identity as well.

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About the authors

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Audience of the Future invested £39.3 million in the development of new immersive technologies such as virtual, augmented and mixed reality. The Challenge also commissioned research to better understand audiences for immersive productions in the fields of art, culture, heritage and entertainment. The Audience of the Future Challenges opened in May 2018 and May 2018 and completed in March 2022. For more information please visit www.audienceofthefuture.live

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