University of Glasgow

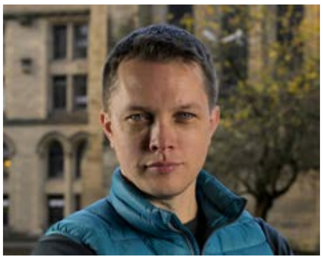
Museums in the Metaverse

Audiences and Impact Report

WORLD CHANGING GLASGOW

Photo credit: Martin Shields.

Authors:



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1.1 Introduction – Museums in the Metaverse

Museums in the Metaverse ('MiM') is a University of Glasgow ('UofG') led, UKRI-funded Research and Innovation project, based at UofG's Advanced Research Centre in Glasgow. The project's primary outputs will be an Extended Reality ('XR') software platform, alongside a body of supporting museological and economic research. The project aims to dramatically scale access to 3D digitised Museums and Cultural Heritage ('M&CH') collections - taken to encompass institutions and organisations broadly captured by the 'GLAM' acronym, or any institution or individual that holds culturally significant collections to which enhanced access could be enabled via XR technologies.

The project is expected to generate substantial public benefit and societal impact, a central element of which will be the economic activity that its outputs create. As such, the economic work package for MiM involves direct market and audience research to quantify and characterise opportunities for generating said economic activity, which is a key requirement of UKRI funded projects.

A primary undertaking for this research activity is to test, evaluate, and model M&CH audience awareness, understanding, confidence, and preferences relating to several key data points consequential to the MiM project.

1.2 Principal Data Points / Research Questions

In view of the primary focus of the economic work-package into which this activity falls, our research sought to address the following questions:

- To what extent are M&CH audiences aware that a limited percentage of cultural collections that are typically exhibited (c.10%), and that, consequently a very high percentage (c.90%) are in storage, and thus normally inaccessible to visitors (except by arrangement or appointment).
  - The potential for expanding the range of material accessible to the public in new ways is colossal: the Smithsonian has 155 million objects in its collections (Smithsonian History, Smithsonian Institution Archives); the British Museum has 8 million; the Hunterian, University of Glasgow has 1.4 million, of which fewer than 1% can be on display at any one time. Glasgow Museums has a Resources Centre where its stored collections can be accessed: typically, visitors to this are only 0.3% of those visiting on show collections in any given year.
- How do M&CH audiences perceive the use of digital technologies for accessing cultural content and experiences and which digital formats do they use?
- Amongst M&CH audiences, what are the levels of familiarity and engagement with XR technologies - in particular Virtual Reality (VR) technology?
- How do M&CH audiences view the potential of XR technologies - and particularly VR - for expanding access to collections and addressing the exhibited-to-stored ratio?

- What is the current level of Willingness to Pay (WTP) for virtual museum and cultural heritage experiences?
  - How does WTP differ between a monthly subscription model and one-off payment / pay-as-you-go (PAYG) models for virtual cultural heritage experiences?
- How does WTP for remote virtual experiences compare to WTP for on-site virtual experiences amongst M&CH audiences?
- To what extent are audiences interested in being paid for creating user-generated digital cultural heritage content?

Our initial audience survey also collected general visitation, engagement, and demographic data from a broad M&CH audience drawn from both the general public and respondents identifying as M&CH professionals.

1.3 General Context

Since the early 1990s, audience appetite for visitor experiences, particularly cultural heritage (hereafter 'CH') visitor experiences, has grown immensely. Museums have doubled in number since 1993 and visitor numbers have roughly done the same or better, despite the increase in the overall number of attractions available. In 2023, the Hofburg in Vienna was the most visited CH site in Europe, with 25 million visitors, including 6 million to its museums, while the British Museum and the Louvre each saw some 7-8 million through the doors. In Scotland, the National Museum has 2.2 million visitors and Glasgow Museums have 4 million, as does the National Trust for Scotland, while Historic Environment Scotland welcomes some 2 million a year to Edinburgh and Stirling castles alone.

Virtual Reality and other related digital additions or complementary exhibits are still in their infancy in comparison, despite Nicholas Thomas' 2016 prediction of 'creative technologies that people can use to create new things' (*Return of Curiosity* (2016), p.17). Nonetheless, Sisi's VR Journey and Time Travel Vienna have had 1.4m aggregate visitors in the last few years and the 2024 VR Impressionist experience at the Museé d'Orsay has achieved c.18,000 visitors in the 5 months to August 2024.

In 2018, it was declared that Immersive Media was 'poised to cross…the notorious chasm on the technology adoption curve' (*Immersive Content* (2018), p.3, henceforward *IC*). In pursuit of demonstrating this, focus groups were set up by Digital Catapult in 11 areas of culture, activity and gaming in order to identify the leading trends in format and genre. Self-curation and activity secured the strongest response from audiences. Stories conveyed by VR were judged more intensely realised and effective in the *IC* report. Both of these findings provided clear direction for the realisation of both a core activity of MiM (self-curation) and the kind of product which might be offered under a curated heading (exhibitions with their strong narrative). One of the interesting findings of the *IC* report (p.84) was that VR narratives could emerge from the strength of experience of the content itself, without being formally curated. The report also found that Art and History gained some of the highest audience scores, at 4.3/5 (IC (2018), pp.34, 84). Some of the early outcomes of that crossed chasm include the Hunterian's Veracunda project, led by Maria Economou (*Immersive Experiences in Museums, Galleries and Heritage Sites,* (Cardiff: Creative Industries Policy and Evidence Centre, 2019), p.6-henceforward *IEMG*).

Reporting on 'The Lost Palace' experience at Historic Royal Palaces, the *IC* report (p.50), noted that 50% of attendees heard about the experience through word of mouth, providing clear evidence that (in this case) AR linked experiences which expand understanding of a particular site can draw additional on-site visitation. In addition, 37% of all HRP 'Lost Palace' visitors were aged 25-34, making it clear that AR/VR has the capacity to expand the museum demographic substantially (*IC* (2018), p.54). As we will see from the questionnaire which follows, a mixture of onsite and remote access to Mixed Reality is preferred across demographics.

The *Evaluating Immersive User Experience and Audience Impact* (Nesta/i2 Media for Digital Catapult, 2018, henceforward *ExperienceImpact*) stressed engagement with CH attractions as a foundational element of its audience selection, and therefore provided a strong direction for our operational findings, particularly because of the adoption of a Van Westendorp Willingness to Pay contingent valuation model in evaluating its findings. It engaged with a Quality Metrics approach to cultural value together with the 2015 Bakshi contingent valuation model (pp. 10, 13, 19-20). Using focus groups and interviews, the *ExperienceImpact* participant pool of under 100 people included over 60% with VR experience; 92% had visited a museum or gallery in the past 12 months (pp.23-24). Findings suggested that depending on content, WTP was a rental value of £7-£12 for home use depending on content, and a 'day out' value of £11.50-£17.50 for VR arcade use (p.29). These are 2018 prices, but interestingly VR arcades in operation today are in general in the range suggested by these price points. The Retail Price Index has risen by 34% from summer 2018 to summer 2024, indicative of prices of £15.50-£23.50 being suggested in money at the time of writing from the findings of the *ExperienceImpact* report. These are clearly in line with the expectations of the report, despite the smallish size of the sample; one of MiM's key target audiences is the home rental market, which-unlike VR arcade experiences-has not taken off in the same way since 2018. Adjusted for inflation, its WTP range would be £9.50-£16 if the *ExperienceImpact* report were to be borne out today. How far it was we will explore in the following pages.

Actual WTP at existing ASVA paying CH visitor attractions is £12.78 (the average adult price in 2023). 48% of such visitors are from Scotland, 26% from RUK and 26% from overseas which in general terms matches the international distribution of the responses we received in the study that follows. In a slightly different context, the 2018 *Economic Value of Heritage (EVH)* study estimated visitor use values of £6.65 on average for the Natural History Museum and £10.83 for Tate Liverpool (£9 and £14 roughly at 2024 prices).

Photo credit Martin Shields.

Average visitor non-use value to support the research and conservation work of the NHM was elicited as a voluntary top up donation (average £2.78), while visitor non-use value of the work of TL in the wider community, elicited as a donation, averaged £8.00 (EVH (2018), p.10). In 2019, the *Public Value: how can it be measured, managed and grown?* study assessed the use value of a range of regional museums at £6.42 (*Public Value* (2019), p.22).

The Scottish Heritage Partnership: Immersive Experiences Policy Report (Glasgow, 2018, henceforward *SHP*) also cites commercially important findings from the Event Marketing Institute and experiential agency Mosaic which suggested that experiential exposure to marketing led to 98% reported increased inclination to purchase, 74% positive responses and 70% conversion to regular customers among user groups (SHP (2018), p.17). As MiM CI Pittock noted in that report (subsequently adopted by the National Trust for Scotland in the area of visitor strategy and provision)]

> **Retail strategy should and could be integrated into the design of a VR/AR narrative designed to support a distinctive and personalised visitor experience. Given the importance of merchandising in visitor experiences, this offers a number of future opportunities. (SHP, p.17)**

SHP also noted the strong environmental and sustainable dimensions of immersive experiences in the context of enhancing automation and remote access to museum and gallery holdings. XR is part of technology's exciting redefinition of professional expertise towards transparency and sustainability, outlined in Susskind & Susskind, *The Future of the Professions* (2nd ed., 2021).

In the study that follows, it is worth noting that aspects of our findings strongly bear out the audience research carried out for the Scottish Heritage Partnership in the 2018-19 EPSRC/AHRC Audiences of the Future project (PI: Pittock; Cis: Economou, Hughes).These include the need for stronger narratives than is the case in normal curation, either provided by the audience, the provider or the content holder. In the report that follows, 51% of our sample would definitely or probably favour self-curation.

The SPICE model of citizen curation supported by Horizon 2020 already recognises this demand in the context of the creation of new digital experiences based on the extensive and largely unseen holdings of museums and galleries (*Digital Learning and Education in Museums* (2023), p.9, henceforward *DLEM*). Furnishing open data from Danish Museum holdings, the German open cultural data hackathon and others are all good examples, though internal cultural boundaries can hold back peak adoption (*DLEM*, pp.14, 15, 18). There have even been some initial Metaverse developments, as with the Finnish National Gallery (*DLEM*, p.33) though dwell time has proven a challenge: one of the challenges that WTP is well placed to address. One of the things recent research has shown is that image licensing is only a very small net earner and more usually a loss maker for the cultural institutions who utilise it, and creating a WTP model which combines open access with sustainably commercial content availability will be central.

The audience research undertaken in the following report is on a different scale to any undertaken before. Our >2000 online responses and 100 face to face interviews provide a large, demographically various and international sample on which to build a second round of focus groups to drill down further into WTP data. From the initial findings - following earlier much smaller studies - it is clear that WTP appetite operates at a price point which is advantageous and inclusive with regard to the entry charges for major exhibitions and the possibility of visiting them. UK museums are not always free at the point of use and their exhibition offers embed additional costs such as transport and time which MiM has the capacity to relieve while expanding the heritage offer. And this is without the wider commercial linkages which leverage museum and gallery brand values into associational and sponsorship deals: Abu Dhabi paid $520M a decade ago ‘merely for association with the Louvre brand’ while the British Museum’s global deals have been assessed at many millions a year (*Return of Curiosity,* pp. 25-26).

2. Survey Recruitment, Structure and Data

2.1 Recruitment

Data was collected via a 26-question primary market research survey over a 4-month period (March-June 2024). This survey was completed anonymously and in-line with University of Glasgow research ethics guidelines for the collection of anonymised survey data. Participants were recruited via voluntary opt-in, responding to either social media posts advertising the research or in-person canvassing at selected MiM CH partner sites. University ethics protocols also required that participants were not compelled to answer every question, that they could skip questions, and that they could end their participation at any time (this is also general good survey design practice – particularly for studies involving voluntary opt-in participants who were not directly engaged or facilitated by the research team).[1]

Given these guidelines, and to ensure a high degree of statistical confidence, a substantial volume of overall responses was targeted (>1,000 completed responses), across a broad demographic range (13-66+), and with participants drawn from Scotland, the UK, Europe and the rest of the world. This necessitated a recruitment campaign focussed primarily on online outreach to ensure both sufficient geographical reach and fine-grained targeting of personal traits and interests. As such, the survey was published and heavily promoted by UofG social media channels and via selected internal and external mailing lists. This digital outreach campaign received significant amplification from paid advertising on Meta social platforms (Facebook, Instagram), alongside additional paid placement on LinkedIn over the same period. The survey was also shared by the project's CH partners.

Photo credit Martin Shields.

[1] Forcing responses risks both foreshortening overall engagement (thus reducing sample sizes) and undermining the verity and related usefulness of responses participants feel they were forced to provide (See Dillman, 2000, p.394; Albaum et al., 2010).

Online targeting of respondents on all social media channels - whilst driven by proprietary platform mechanisms in each case - focussed on audiences with a stated or demonstrated interest in M&CH / M&CH attractions, and who were present within selected major population centres within the UK and Europe during the survey period. On-site canvassing targeted a broad demographic range of respondents and a blend of solo visitors, small groups, and families.

In both online and in-person settings, participants were advised that they did not need to answer every question and could therefore skip questions they opted not to answer.

2.2 Survey Structure

The survey questionnaire structure captured responses within the following broad data themes:

- General sentiments, preferences, and habits relating to CH visitation and engagement
- General digital technology awareness & sentiment (including in CH settings)
- Specific sentiments and preferences relating to the potential value-add offered by VR technology in CH settings
- Willingness to Pay (WTP) and Willingness to be paid (WTBP) for virtual CH experiences and content, including price expectations
- Demographic information

2.3 Data

The results and interpretation below are drawn from a substantial dataset of over 2,100 recorded responses. Of these recorded responses, c.50% (1047) of respondents completed the survey.[2] The data was collected both online and in-person. c.95% of survey responses were collected online, and c.5% collected in-person at The Hunterian Museum and Art Gallery, Culloden Battlefield Visitor Centre, Edinburgh Castle, and Stirling Castle.

It should be noted that the c.50% completion rate observed in recorded respondents means that these individuals reached the end of the survey, not that this cohort answered every question. This is due to both the avoidance of forced response conditions and additional conditional logic within the survey, which meant that certain supplemental questions were only asked of respondents who answered previous questions in a specific manner (where the analysis below relates to supplemental questions not presented to all participants, this has been noted). Despite the inconsistency in response volumes on a question-by-question basis created by the above conditions, each question nonetheless garnered response rates well above statistical confidence thresholds, and ensuring trends observed for any one question can be considered representative of the broader sample.

This dataset and the sentiments identified through this study should be considered broadly representative of a global M&CH-engaged audience, with a diverse mixture of geographic origins and featuring both professional and non-professional respondents. A clear majority of all responses (73%) did not identify as M&CH professionals, and conversely (27%) did identify as such. A little under half (49%) of respondents identified as coming from Scotland, with 51% from elsewhere (including 29% from outwith the UK).

[2] A completion rate of 50% is generally considered excellent. (That our survey targeted participants with - and enjoined them to support - research very well correlated with their interests may help to account for this high level of engagement).

This is consistent with observed trends suggesting that visitors to Scotland's CH attractions are international and diverse: for example, over 55% of Glasgow Museums visitors come from outside the UK, and Culloden and Edinburgh and Stirling Castles are major international tourist attractions.

Significance: To-date, the research team has identified no contemporary or publicly available research, testing, or reportage on the specific combination of M&CH audiences and their willingness to pay for entirely virtual museums experiences noted above. Whilst it is possible private research has been conducted to these ends - both by M&CH institutions and organisations, and elsewhere in the private sector - this study is likely to constitute the first public research-led test of sentiments relating specifically to the commercialisation of XR technology in M&CH and, we believe, the first such drawing from a dataset of this size.

There is, however, an existing evidence base for WTP for XR experiences *per se* - both derived in research settings (e.g. NESTA/I2 Media 2018) and as evidenced in real market settings by a proliferation of VR/XR 'arcade' style location based experiences and installations (themselves reliant on a substantial VR gaming market, which is expected to exceed $22bn in 2025, per Statista). Moreover, paid M&CH experiences – often in the format of special on-site exhibitions and/or offsite content – are increasingly common, experientially rich, narrative-led, and well received by audiences (e.g. Musee d'Orsay's 'An Evening With the Impressionists (2024),[3] Schönbrunn Palace's VR experience (2024), Bristol Museum's 'Cave Art of Lascaux' (2023), The V&A's 'Curious Alice' (2021), and the multi-partner 'Eternelle du Notre Dame' (2023)). Experiences such as these often see visitors/users pay £15-£30 for a standalone experience - the 'Beyond Van Gogh' experience at Scottish Exhibition Centre (2024) retailed at £26.95 for an adult ticket.

[3] For example, recently published audience statistics from Excurio suggest 6-month revenues from this specific exhibit of over €1 million.

Photo credit Martin Shields.

3. Summary Results

The study found several significant results, including:

- Respondents demonstrated high levels of interest in using digital technology to access CH artefacts that are not normally accessible to them
  - *A combined* **79%** *would either 'definitely' or 'probably' be interested in the above.*
- Respondents demonstrated high levels of awareness that a substantial percentage of M&CH collections are not normally accessible to visitors, though there was a tendency to underestimate just how great the volume of material in storage is:
  - **32%** *of respondents thought that 70% of collections were normally inaccessible.*
  - **18%** *of respondents thought that 90% were of collections were normally inaccessible*.
- **90%** of respondents indicated prior experience of using digital technology to access cultural content.
- Notably elevated levels of both awareness of and engagement with VR technology
  - **55%** *reported being both aware of and having tried VR technology*
  - **96%** *reported being at least aware of VR technology*
- Positive sentiment regarding the added value offered by XR technology (specifically VR) in CH settings
  - **A combined 72% of respondents** *indicated that VR would either 'probably' or 'definitely' be valuable for visitors to CH attractions*
- Positive WTP - and willingness to be paid - sentiment relating to virtual CH content
  - **A combined 38%** *of respondents reported being 'probably' or 'definitely' willing to pay for virtual CH experiences*
  - **A combined 51%** *reported being either 'probably' or 'definitely' willing to be paid for virtual CH experiences they create*
  - **The precise figures for WTP** *are commercially sensitive, but they corroborate - for CH specific content - the above referenced NESTA (2018) findings relating to general WTP for VR experiences of any kind.*

Several of the key data points from the survey are now discussed in more detail below.

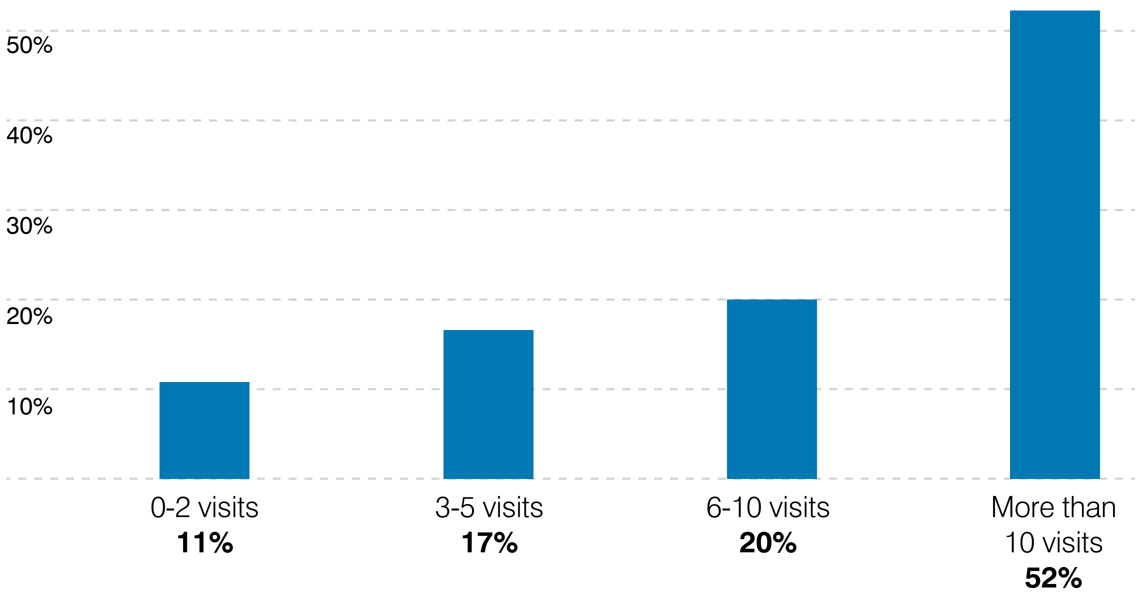
3.1 Data Theme 1

General sentiments, preferences, and habits regarding M&CH

Respondents were first asked a sequence of questions capturing a broad set of characteristics relating to their engagement with M&CH. The first of these queried if respondents identified as M&CH 'professionals' (no specific definition of was offered here, accommodating anyone who would describe themselves as such). As noted above, around three-quarters of respondents (73%) identified as not being M&CH professionals, with 27% reporting that they were.

In order to measure general M&CH visitation habits in the survey group, participants were also asked to estimate how many CH attractions they had visited in the last 3 years, with respondents again given some latitude to determine what constituted such an attraction. A majority (52%) had visited 'more than ten' such attractions within a 3-year period, with a substantial proportion of the remainder (21%) having visited such attractions at least six times.

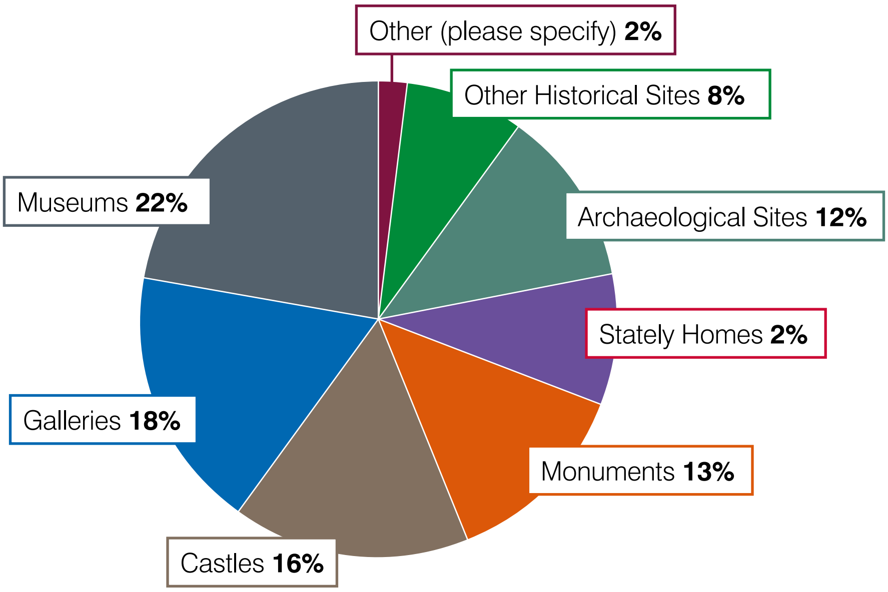
Q2 – Approximately how many times have you visited a Cultural Heritage attraction in the past 3 years?



The above results are perhaps unsurprising given the recruitment campaign targeting individuals with a stated interest in CH (and/or patterns of behaviour suggesting such an interest).

To add additional nuance to this data-point, the survey then queried what types of attractions respondents usually visited, with museums seeing the highest percentage of responses (22%), and museums, galleries, castles, and monuments combined featuring in 70% of all responses *(see overleaf).*

Q3 – Thinking about your visits to Cultural Heritage attraction, what kinds of sites and attractions do you normally visit? [Select all that apply]



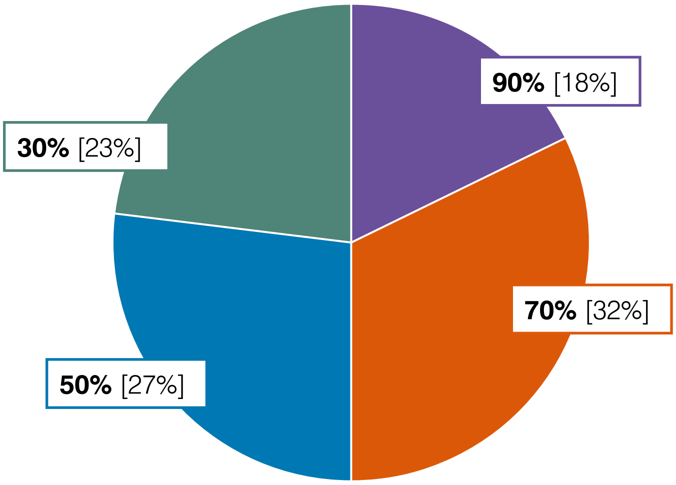
Free text responses were also collected for the 'Other (please specify)' option, above, and 'natural heritage', 'churches', 'libraries', 'battlefields', 'industrial heritage', and 'archives' occurred most frequently.

Finally, the research team sought to test audience awareness relating to the central added value that both VR and the planned MiM platform will deliver – i.e. virtual access to 3D digitised artefacts drawn from the 90% (or greater) of most M&CH collections which are held in storage, standardly off-site, and are therefore normally practically inaccessible to everyday visitors.

In terms of access and inclusion - and as further context for the challenge it is anticipated that VR can help overcome - as noted above the Glasgow Museums Resources Centre typically welcomes under 20 000 visitors a year from a museums visitor total of c.4 million. Hence, even with the provision of a dedicated Resources Centre and facilities tours, 98% of Glasgow Museums holdings are visible to less than 0.5% of visitors. Many museums do not even have this level of access to collections as they do not have the dedicated facilities available in GMRC and Kelvin Hall. Others levy direct costs to recoup staff time: tours of the NMS Collections Centre in Granton cost £12 plus transport and time costs.

To assess awareness of the experiential deficit these circumstances create, participants in this study were asked what percentage of collections 'might normally be inaccessible to visitors' and offered four options: 30%, 50%, 70%, and 90%. A pluarity of respondents (32%) thought that 70% of collections were normally inaccessible, and 18% correctly indicated that this proportion was around 90%. Notable, here, is that a combined 77% thought that the answer was 50% or higher, demonstrating that respondents in this sample had a good general awareness that a high percentage of most CH collections are not normally on display, though with broad tendency to underestimate the true ratio *(see overleaf)*.

Q6 – What percentage of Cultural Heritage collections do you think might normally be inaccessible to visitors?



Given the characteristics and proclivities targeted during the recruitment campaign for the survey – i.e. individuals with a stated or demonstrated interest in CH and CH attractions – it is perhaps unsurprising that our respondents demonstrated good general awareness that the of the overall exhibited-to-stored ratio is heavily skewed towards storage, though without a control drawn from a sample without these characteristics we cannot have the same levels of confidence that the sample reported on herein is representative of the general population's awareness of this ratio.

3.2 Data Theme 2

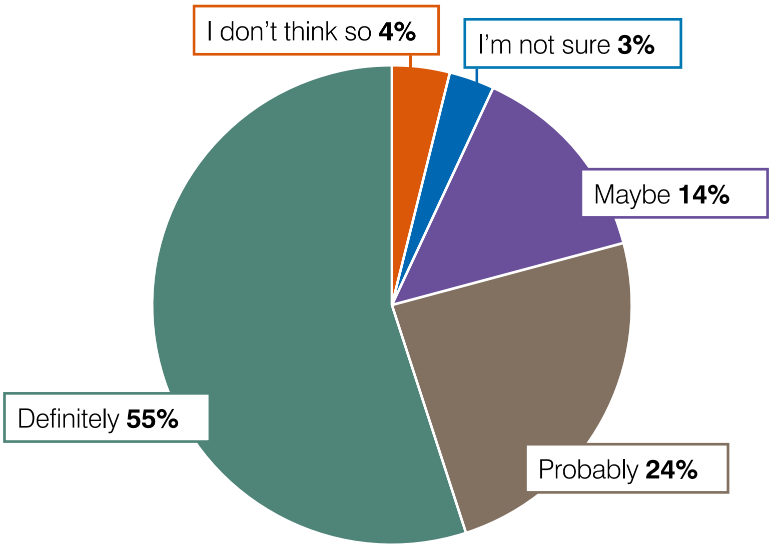
General Digital & VR Technology Engagement & Sentiment

The MiM platform will be built upon and utilise innovations and advances in digital technology. As such, our survey sought to capture a snapshot of contemporary M&CH audience confidence, engagement, and sentiment regarding digital technology – and to frame the benefits of the still relatively novel XR format (VR) in the context of a general digital technology 'value-add' in realising expanded access to collections.

Respondents were first asked to indicate their overall level of confidence with digital technology (once again, no specific definition was provided, giving participants broad latitude to interpret what 'digital technology' might mean for them). A majority (60%) reported that they were 'very confident' with such technology, with a further 32% saying they were 'somewhat confident'.

Participants were then asked if they would be 'interested in using digital technology to view or interact with cultural artefacts that are inaccessible to you' (i.e. the broad activity type into which engagement with a MiM platform would fall). Encouragingly, 79% of respondents reported that they would either 'definitely' or 'probably' be interested, with a clear majority saying that they 'definitely' would.

Q13 – Thinking about Cultural Heritage artefacts – would you be interested in using digital technology to view or interact with artefacts that are inaccessible to you?



Filtering the above data point for the M&CH typical visitor demographic (c.36-54), we did not record any significant overall variation against other demographic groups, however the lower age cohort making up this broader demographic (36-44) did show a statistically significant lower value of 'definitely' sentiment than typical (44% vs. c.58%), and a statistically significant higher 'maybe' sentiment than typical (23% vs. c.13%).

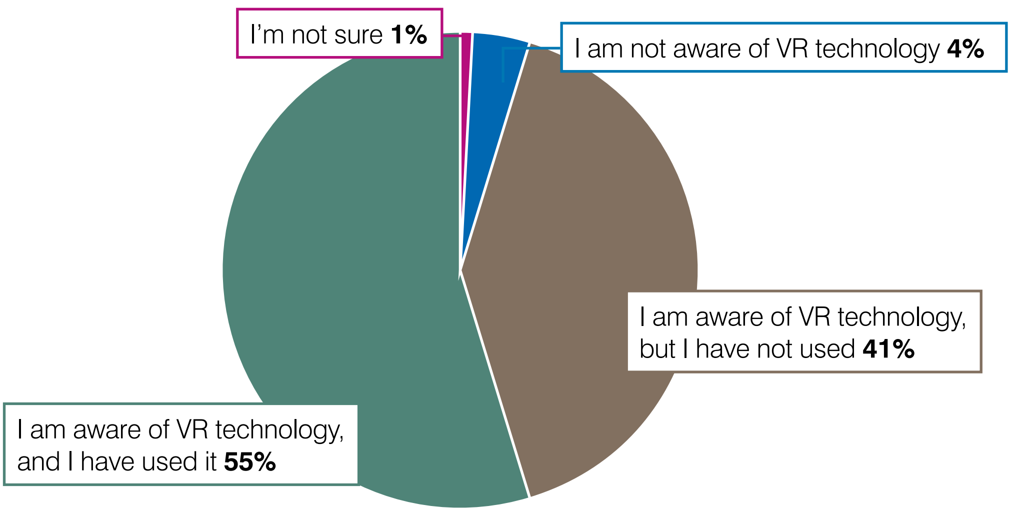
There was also a strong correlation between respondents who indicated confidence with digital technology and those 'definitely' interested in using it to view or interact with artefacts normally inaccessible to them.[4]

VR Technology Awareness, Engagement & Sentiment

The MiM platform will launch using VR as its initial XR format, given that VR hardware and related supporting technologies are the most mature and, at present, have the largest market share. It was therefore germane to our research to test our M&CH aligned survey audience for levels of existing awareness of - and prior engagement with - VR technology.

Participants were asked if they were a) 'aware of VR technology and have used it', and b) 'aware of VR technology and have not used it' - a majority (55%) reported that they were both aware of and had tried VR, and a plurality of the remaining respondents (41%) reported that they were aware of VR but had not used it.

Q15 – Are you aware of VR technology, and if so have you ever used it (e.g. via a VR headset)?



Notable in the above result is the comprehensive level of general awareness of VR technology in our sample (96% of respondents), and also that a clear majority of respondents having also experienced VR. Recruitment for the survey did not specifically target awareness or usage of VR, and as such these results cannot be explained by a sample that deliberately selected for these characteristics. The social media posts inviting participation did, however, include both the word 'Metaverse' and an image of a person wearing a VR headset, which may have drawn in a participant pool with some pre-existing interest and engagement with the technology, though perhaps not to an extent that would account for the high levels of awareness and engagement in a dataset of this size.

The above result, instead, may be consistent with - or indicative of - an overall increase in public awareness of and access to VR experiences in recent years, particularly since the launch of Meta's Quest 2 headset. Recent research by The Academy of Animated Art and KommandoTech indicates that c.78% of Americans are now 'familiar with VR' (an increase of 33% vs. 2015), and the VR headset market in the UK was also worth £315M in 2023. 2024 sales volumes are expected to be three times 2020 levels (per Statista), with 23% of Americans owning a headset, and 3.2M reporting owning a headset in the UK.

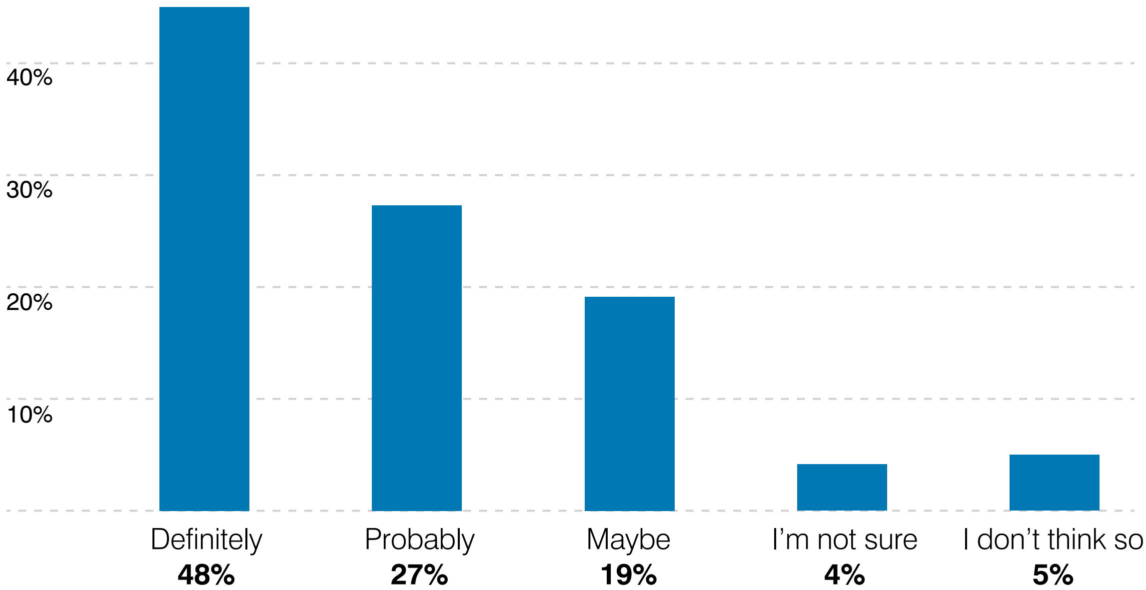
[4] 37% of respondents who reported being 'very confident' with digital technology also expressed 'definite' interest in using the technology as described above.

3.3 Data Theme 3

VR Value-Add for Cultural Heritage

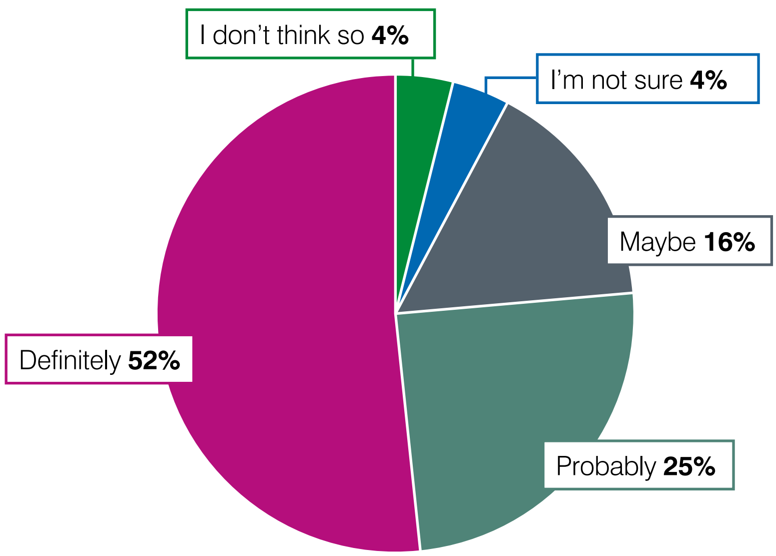
Continuing in the same theme, our survey tested sentiments regarding the general benefits of VR for CH visitors. Participants were given some example benefits afforded by VR and asked if they thought these would be valuable for visitors to CH attractions. A clear plurality of respondents (45%) thought that VR would be 'definitely' valuable in this context, with a further 27% thinking it would 'probably' be valuable. This high proportional sentiment that VR is at least 'probably' valuable for cultural visitors - with a plurality believing it 'definitely' would be so - is an encouraging finding for both MiM and other VR M&CH initiatives.

Q16 – VR technology enables users to view, interact, travel, and learn in a manner that would otherwise be impossible, expensive, or involve risks. Thinking about these benefits – do you think VR technology would be valuable for visitors to Cultural Heritage attractions?



Participants were also asked if they thought that VR could be specifically useful in enabling access to normally inaccessible artefacts, with very clear overall positive sentiment that it could be (52% 'definitely' and 25% 'probably').

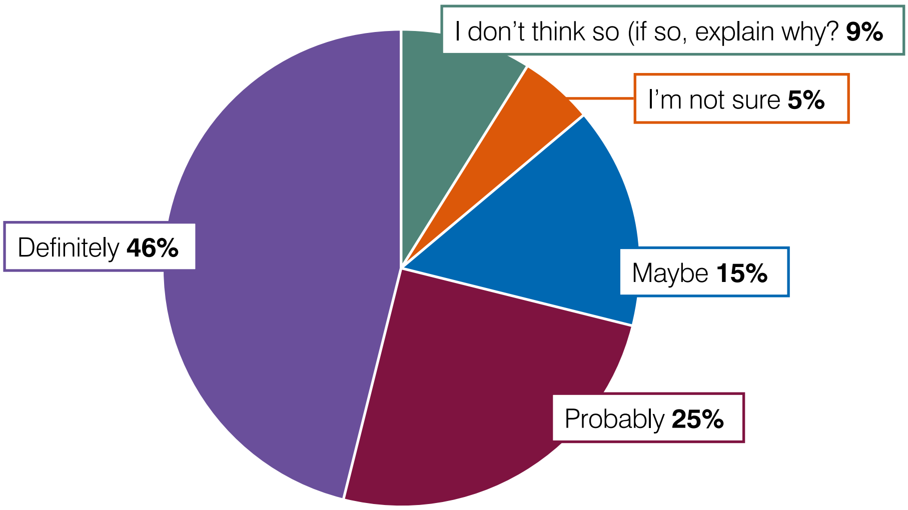
Q17 – Thinking about Cultural Heritage artefacts which are normally inaccessible to you – do you think VR could be useful in enabling access to those artefacts?



The above result is also encouraging for the MiM project and of course for other initiatives, products, and GLAM organisations considering leveraging VR for enhanced access to collections.

Having tested participant sentiment regarding the general usefulness of VR in accessing normally inaccessible artefacts, the survey then tested participant's personal interest in using VR for this purpose. The results recorded were similar to those recorded for the previous question, with a clear plurality (46%) of respondents stating a 'definite' interest in personally using VR as described, and a quarter of respondents saying they 'probably' would be interested.

Q18 – Thinking about VR technology and inaccessible Cultural Heritage artefacts – if you could use VR to access digital versions of such artefacts, would you be interested in doing so? – Selected choice



Free text responses were collected for the 'I don't think so' option for the above question. Several recurring themes appeared across the 93 respondents (8.5% of those who answered this specific question) providing feedback, including:

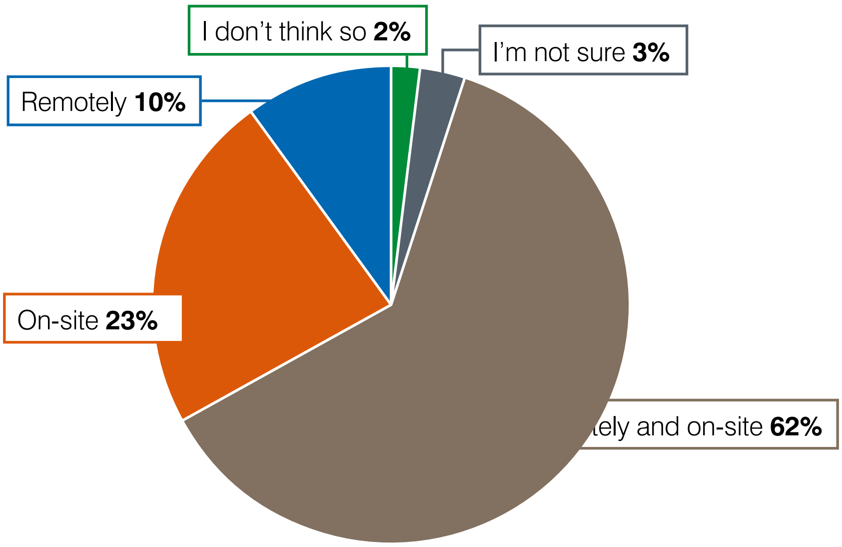
- Respondents stated a preference for 'real-life' CH experiences
  - A more nuanced, though not statistically significant sub-set of responses (<5% of overall responses) stated that VR was 'not real' or 'not genuine' and therefore has a perceived inferior experiential value.
- Respondents reporting previous experience of VR Sickness/Cybersickness and a resulting disinclination towards VR.
- Respondents reporting that they 'don't like VR' or cognates (either with an indication that they had tried VR, or without - though we can of course presume that those reporting this sentiment are likely to have had previous VR experience).
- Respondents also stated various sentiments to the effect that VR was 'not appropriate' in CH contexts, or not best deployed as a tool for accessing CH subject matter material
  - The cohort stating these views was again not statistically significant (<5% of overall responses), however where detail was provided this tended to align with the sentiment noted above that 'real-life' experiences have some form of undescribed/ ineffable (but innate) superiority to those that are digitally mediated
- Respondents stated issues with the Accessibility of VR - particularly for those with impaired vision.

On-site vs. Remote VR Access

A recurring concern amongst some M&CH visitors and institutions is that digital access to M&CH collections may undermine or attenuate reduce in-person and interest at physical exhibition spaces. In this regard, our survey sought to test general preferences relating to *where* participants would prefer to use VR to access CH artefacts.

Our results demonstrated a clear majority preference (62%) for accessing CH artefacts in VR 'both remotely and on-site', indicating that respondents do not necessarily see the introduction of new remote access formats as a binary choice *vis-a-vis* their general visitation habits. That a clear plurality of the other responses (23%) indicated a preference for using VR *on-site* further suggests that enabling virtualised access to collections either at primary exhibition sites or other cultural locations may be perceived as distinct value-add by visitors.

Q19 – Do you think you would prefer to access Cultural Heritage artefacts using VR remotely (i.e. online) on-site (e.g. as part of an exhibit), or both?



These findings are consistent with previous research suggesting that GLAM attractions and institutions' digital offers tend to at the least reinforce and may increase physical visitation.[5]

User Generated Virtual CH Content

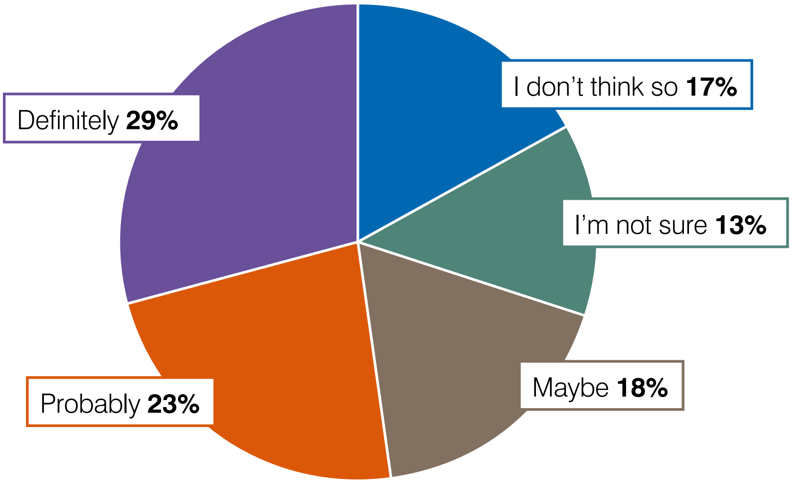
Having tested sentiments regarding general benefits and engagement options offered by VR as a format for accessing cultural content, our survey then featured a sequence of questions testing sentiments related to some example functionality the MiM platform may offer and related Willingness to Pay (WTP) and Willingness to be Paid (WTBP). Participants were again given broad latitude to interpret the terminology and described functionality (in the interests of measuring sentiment and reaction to such a platform and any perceived value-add in general terms).

Participants were first asked if they would be interested in creating their own CH experiences using both access to normally inaccessible artefacts *and* VR technology. A combined 52% of respondents reported either 'definite' or 'probable' interest, with the remaining responses more evenly distributed between 'maybe' (18%), 'I'm not sure' (13%) and 'I don't think so' (17%).

[5] See, for example, p.13 of UK Govt. DCMS (2023) study 'Measuring economic value of museums and galleries digital offers'; p.25 of the previously referenced SHP (2018) study; and p.5 onwards of Lee et.al (2020) 'Experiencing immersive virtual reality in museums'

Whilst over 50% of respondents stating they had a 'probable' or better interest in using VR to create their own experiences using cultural artefacts is an encouraging result, a combined 48% of respondents indicating uncertain or negative sentiment may be attributable to a lack of 'hands-on' or illustrative examples of the novel functionality described and was, thus, to an extent an expected result. (This sentiment is being re-tested in focus group settings on subjects who have direct experience of demonstration material).

Q20 – Would you be interested in creating your own digital Cultural Heritage experiences using: Access to normally inaccessible Cultural Heritage artefacts, and Virtual Reality technology?



Relating the sentiments expressed above to the respondent's age did reveal two statistically significant relationships: Respondents in the 19-24 cohort showed much higher 'definite' interest in creating their own CH experiences using access to collections and VR than was typical (50% of this cohort indicated 'definite' interest), with respondents in the 66+ cohort showing a notably higher incidence of 'I don't think so' sentiment (30% reported this). Respondents who identified as M&CH professionals were also notably more likely to express 'definite' sentiment for this same question (35% vs. 26% in non-professionals).

3.4 Data Theme 4

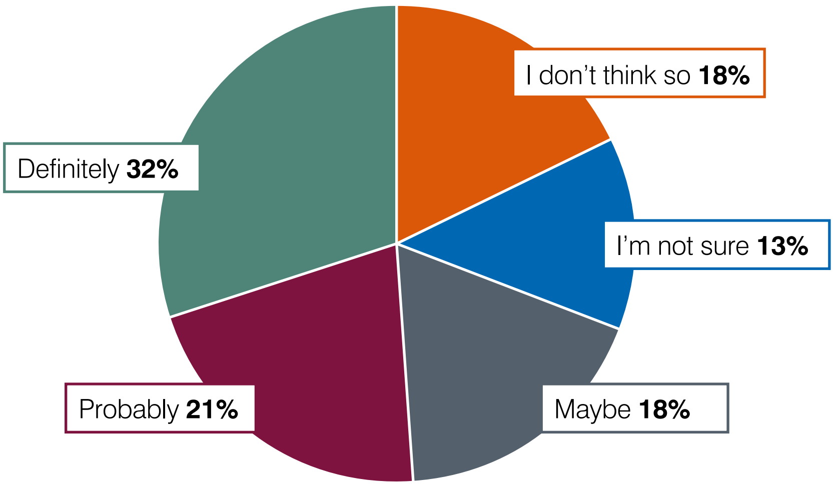
Willingness to be Paid (WTBP) and Willingness to Pay (WTP) for virtual CH experiences and content

Willingness to be Paid for Digital CH Experiences

MiM is exploring several commercial models with a view to generating economic activity from the project's outputs, and so having established sentiment from respondents on creating their own digital / virtual CH content, we also wanted to test their willingness to be paid (WTBP) for digital / virtual CH experiences that users might create themselves. To do so, participants who answered 'definitely', 'probably' or 'maybe' to Q20 were then asked about being paid for self-created 'digital CH experiences', rather than for purely virtual CH experiences. Once again, the broad 'digital' framing here was deliberate in seeking to capture general, in-principle sentiment about this concept - not about experiences created using any MiM platform or VR-specific functionality (WTBP for self-created virtual experiences is being tested during in-person focus group sessions).

Approaching one third of respondents (30%) said they 'definitely' would be interested in being paid by other users for self-generated digital CH content, with a further 21% indicated they 'probably' would. This indicates broadly positive overall sentiment regarding the concept of a user-to-user market for self-generated digital CH content. The research team is currently re-testing and cross referencing this sentiment against a similar question asked of in-person focus groups that have experienced specific virtual and MiM-enabled content.

Q21 – if you were to create your own digital Cultural Heritage experiences, would you also be interested in being paid by other users for access to the content you create?



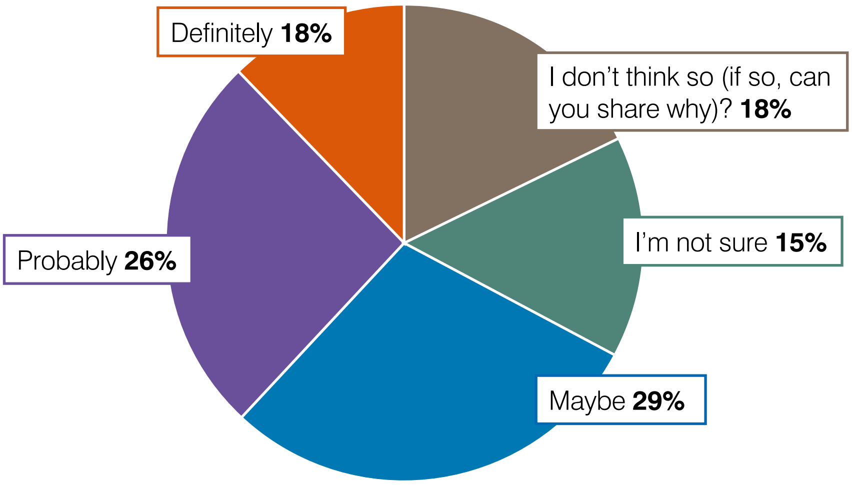
Relational analysis of sentiments expressed for the above question by age again found significant relationships between the 19-24 cohort and the expression of 'definite' sentiment (55% of this cohort expressed this sentiment); and between respondents who were 66 or older and expression of 'I don't think so' sentiment (28% of this cohort expressed this sentiment).

Willingness to Pay (WTP) for Virtual CH Experiences

Our survey then tested general WTP sentiment for a service that provides 'virtual visitor experiences and educational content created by professional curators'.

The framing of this question around 'professional' curated content reflects the intention that respondents consider the question in the context of existing M&CH payment models and behaviours – that is, visitors are already habituated to paying for both general access to attractions containing professionally curated material and experiences (e.g. door fees or other general admittance fees), and for specific professionally curated exhibits and experiences (e.g. special exhibitions). Such attractions can – and increasingly do – also feature virtual or immersive technology.

Q22 – Thinking generally about accessing Cultural Heritage using VR – would you be willing to pay for access to virtual visitor experiences and educational content created by professional curators? – Selected choice



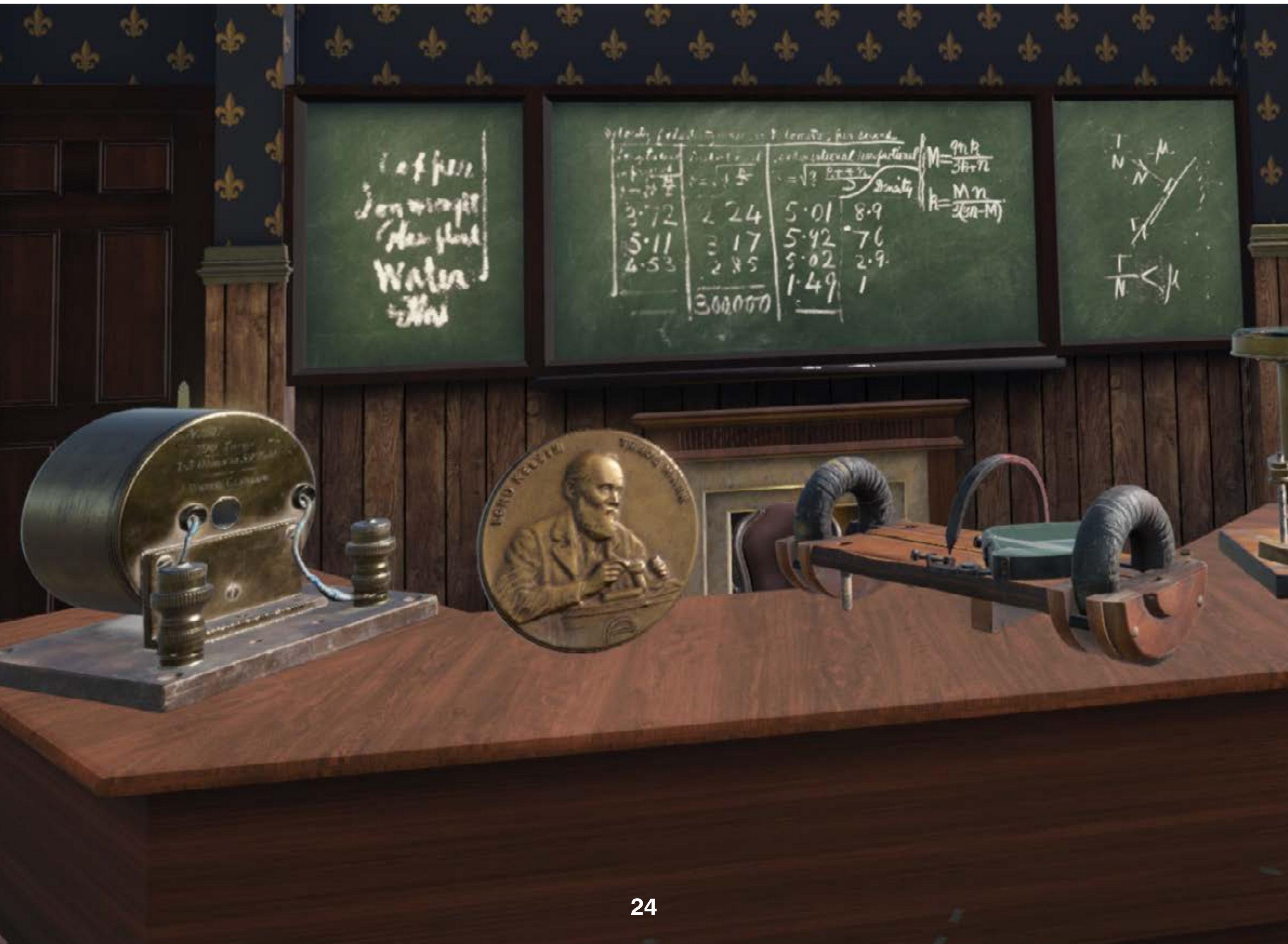
Once again, amongst over 1,000 responses to this question, younger respondents reported higher levels of 'definite' interest in the above, with 18% of 19–24-year-olds and 19% of 25–35-year-olds reporting this sentiment against a 13% average. Older respondents reported less interest (particularly those in 66+ cohort, of whom only 7% chose 'definitely'). Cross analysis of WTBP and WTP question responses also revealed some useful insights – 20% of those who expressed 'definite' interest in WTBP for self-generated digital CH experienced also expressed either 'probable' or 'definite' WTP for professionally curated virtual CH content, suggesting an interconnected interest between *being paid* and *paying for* digital CH content.

Respondents who answered 'Definitely', 'Probably' or 'Maybe' to the above WTP question were then asked that when 'thinking generally about paying to access to CH using VR', what they would 'expect to pay for a service providing such experiences?'. Free text entry provided space for participants to indicate figures for monthly subscription and pay-as-you-go options.

In the context of determining the commercial viability of a service or platform of the kind described above – though acknowledging the deliberate lack of specificity in that description, and that this sentiment is being re-tested with subjects who have had direct experience of relevant functionality – the results from the respondents who chose to provide price-points for the above question were very encouraging. The specific figures are commercially sensitive, however for a monthly subscription, respondents provided a median price-point valuing a service as described above within the price range of existing digital content subscriber platforms.

Respondents also provided a similar median price point for one-off paid experiences, placing price expectations for 'MiM' like one-off experiences some way below spot-tested pricing for recent paid immersive exhibits (e.g. the examples on page 11, above). In this later 'PAYG' case, the price points recorded tended to corroborate NESTA/I2 Media's (2018) findings relating to WTP for 'arcade' style PAYG VR experiences - but within the context of the specific use cases and benefits envisaged for both VR in M&CH generally, and by MiM specifically.

That the price point indication for a one-off experience recorded in our sample was lower than typically levied for real-world 'Virtual CH' settings may be attributable to the nature of the question presented: Participants were asked for price expectations for a service or experience *described* and not *demonstrated*, and thus the price points indicated do not reflect an expectation for (nor are they based on experience of) a specific product or experience.



Given the price points extant in the global market, we might expect that when the same question is put to in-person focus group users this will return a median PAYG price point closer to the in-market examples (assuming a compelling demonstration is provided). In either case, the findings above do tend to suggest that a distinct market exists for both monthly and PAYG virtual museum platforms.

WTP Free Text Feedback

Free text responses were also collected for the 'I don't think' so option for Q22, above. Whilst not breaching thresholds of statistical significance in any case, some recurring themes were recorded across respondents who offered feedback. These included:

- Concerns or objections relating to cost
  - Around 12% of free-text respondents (<2% of all respondents) fully or partially ascribed their negative WTP sentiment to a general objection to *any* additional or new cost for accessing CH experiences, and that they would be unlikely, unwilling, or unable to pay this.
- Ethical objections to levying any cost at all for access to CH experiences and material (irrespective of format or setting).
  - In this particular study, such sentiment may be partially attributable to the high percentage of Scottish and UK domiciled respondents in the sample, who are likely to be more inured to free access to cultural attractions than audiences in Europe or the rest of the world (this is particularly so in Glasgow – see further discussion on this below).
- A recurring sentiment that CH collections are 'public assets' or are 'held in the public interest' and that the public should therefore not be charged to access them, irrespective of the format (some respondents suggested that access should be government funded)
  - This ethical/political position is already well understood in GLAM settings and broadly amongst M&CH enthusiasts and audiences.
  - This is particularly so in the UK, where many collections are free at the point of access, and particularly in Scotland/Glasgow. With c.70% of our sample reporting 'Scotland' or the 'Rest of the UK' as their origin, we may consider it probable that such sentiment is overrepresented here versus what may be found in a broader international demographic more accustomed to paying to access M&CH experiences.
    - This is borne out by relational analysis of responses to Q22 by geographic origin: Where around one third of respondents from Scotland (33%) and the Rest of the UK (34%) said they would 'definitely' or 'probably' be willing to pay, nearly half (49%) of respondents from Europe said they would, with similar positive sentiment towards payment observed in respondents from the Rest of the World (46%).
- Responses stating a preference for 'the real thing' and/or that virtual access to artefacts and experience is in some manner inferior to real-world M&CH access.
- Concerns that charging for virtual access to M&CH experiences would be tend reduce equitable access to cultural content, and thus risk creating or reinforcing 'two tier' structures, and/or a perceived classism & elitism in the M&CH sector.
- Responses stating some scepticism regarding the overall value-add that VR offers in M&CH

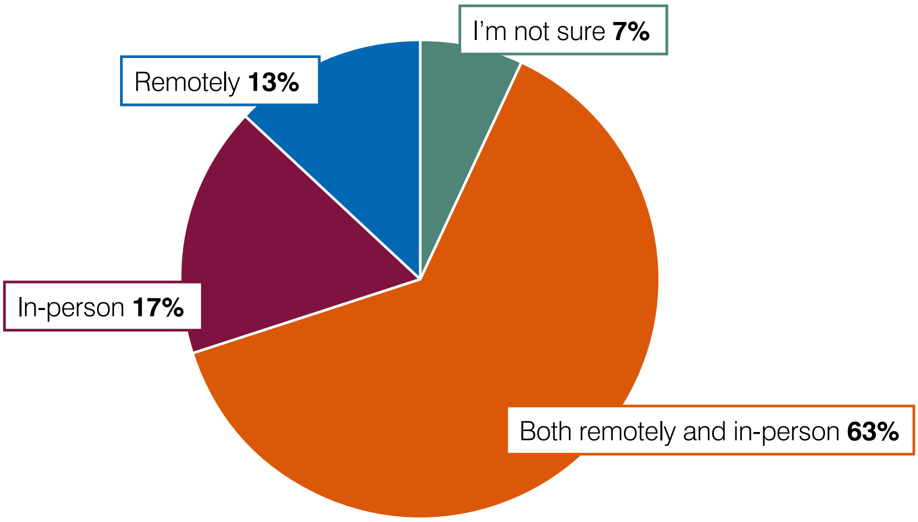
To further contextualise negative sentiment relating to cost, it should be noted that major exhibitions normally cost around £20 a head and that accessing these also carries a cost in time, transport and sometimes accommodation. For a family of 4 to visit the Dundee V&A Tartan Exhibition from Glasgow for the day might cost upwards of £200, with costs for visiting major London exhibitions at far more elevated levels. In that sense additional curatorial content and object availability are already normally charged for even in a 'free' museum service. In addition, VR added value exhibitions add a dimension to museum and gallery experience for which there is demonstrable willingness to pay: for example the VR Impressionist experience at the Musee d'Orsay in 2024 attracted c.10% of the daily footfall to the museum, all of whom had to pay an special exhibit uplift, and whom also already had access to a physical companion exhibit included with their door fee.

Willingness to Pay - On-site vs. Remote Access Preferences

As a point of comparison to the sentiments measured in Q19, above (regarding whether participants preferred to use VR to access CH artefacts on-site or remotely), participants who indicated they were 'definitely' or 'probably' willing to pay for virtual CH experiences were asked a version of this question again *(see Q24, overleaf)* to assess if a stated willingness to pay for CH experiences in a fully digital format like VR varied preferences regarding in-person or remote access.

No significant variation was found between the majority result for Q19 and respondents who answered a similar question after expressing positive WTP sentiment for virtual CH experiences: An almost identical majority of the positive WTP cohort (63%) said that they would prefer to access paid virtual CH experiences 'both remotely and in-person'. However, a notably lower proportion (6% less) of the positive WTP cohort stated they would prefer to access such content in-person only; a slightly higher proportion (+3%) stated a preference for remote access; and slightly higher proportion (+4%) were 'not sure' which they would prefer. These numbers are generally within survey tolerances and are not significantly material.

Q24 – If you would be willing to pay for either professionally OR self-created virtual Cultural Heritage experiences – would you prefer to access these remotely (e.g. via your phone), in person (e.g. as part of an exhibition), or both?



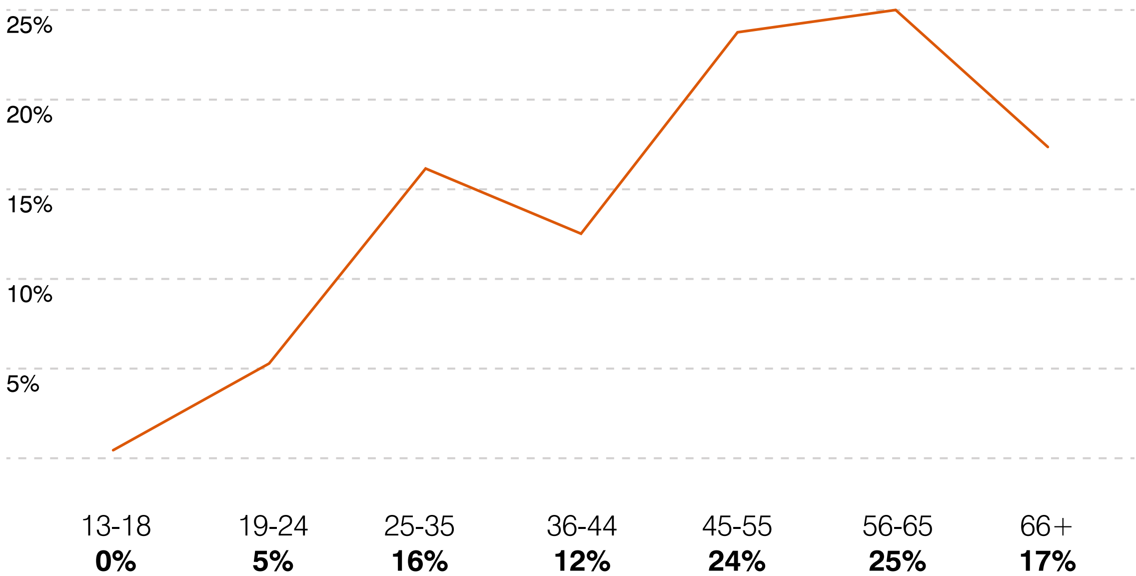
3.5 Data Theme 5

Demographic Information

The survey asked participants for simple age and geographical origin information. In the case of age demographics, the distribution of ages ranges across all respondents is in-line with what would be expected of a sample collected from individuals with a stated or demonstrated interest in M&CH. That the M&CH cultural visitor / enthusiast tends to be in early to later middle age is well recorded and understood within the sector (see SHP, 2018), and this trend is reflected in a near majority of respondents to this survey (49%) falling into 45-55 and 56-65 age ranges.

Notably low levels of participation from those in 13-18 (only 4 respondents, rounded down to 0%) and 19-24 age brackets may be partially attributed to the social media platforms targeted for recruitment (Facebook, Instagram, LinkedIn) tending to be more popular with older demographics, alongside generally lower interest and visitation trends in these brackets across M&CH attractions. Recruitment campaigns on additional social media platforms (e.g. TikTok, Snapchat) may have increased representation in teenagers and younger adults.

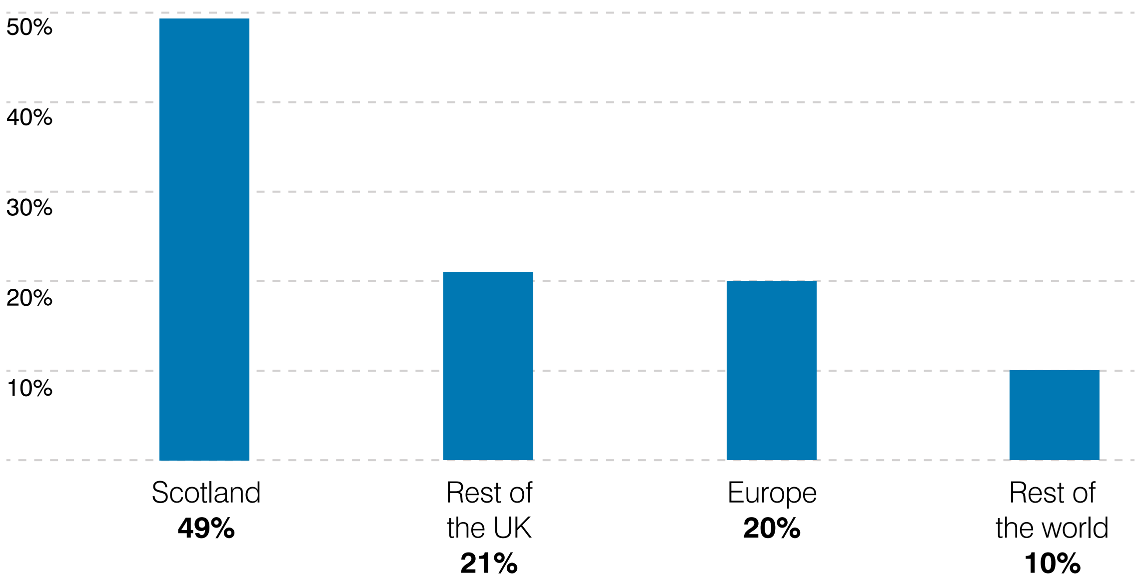
Q25 – What is your age?



Geographically, respondents primarily identified as being from Scotland (49%), with the around one fifth each from the rest of the UK (21%) and Europe (rounded up to 20% in the graph below), and the remaining 10% from the rest of the world. This is again consistent with a recruitment campaign targeted on Scotland, the rest of the UK, and Europe.

Whilst UofG enjoys strong brand recognition and impact world-wide, we may assume that nearly half of respondents in this sample identifying as Scottish is result of both elevated levels of recognition, interest, and engagement with UofG and its communications channels within Scotland, and also of the targeted recruitment campaign for this survey running for slightly longer in Scotland than the rest of the UK and Europe.

Q26 – Where are you from?



4. Conclusion

This MiM Report has engaged a wider set of stakeholders and audiences internationally than any previous research. Its findings, and the growing arcade and museum/gallery VR economy growing up around us (sometimes, as with some Annerin shows - https://www.annerin.com - with very low to no curatorial and interpretative input) bear out the marketability of the technology. The Museum and Galleries sector provides multiple opportunities for a platform for that technology: magnificent pay to view exhibitions that cannot be visited or which come to an end all too soon; enormous stores with millions of objects that can be accessed by a fraction of the visitor audience, again often not without cost of one kind or another; and holdings such as coins, medals, scientific instruments, jewellery and insects, all of which and more are difficult to display at scale for detailed viewing and are particularly suitable for digital capture at a sophisticated level. The possibilities for a low-cost platform to further transform the accessibility and marketability of museum collections are here, real and demonstrable.

The economic research team for the MiM project is currently engaged with partners in ongoing user testing and focus group activities using live prototypes of the MiM platform. Initial results from this test programme (derived from more than 500 in-person MiM demonstrations to-date) clearly indicate that direct experience of virtual CH content in the formats described above tends to produce near uniformly elevated positive sentiment in test subjects. This has been observed in both recorded sentiments relating to the MiM platform and virtual CH experiences *per se*, and also in WTP for virtual CH experiences (in-person test subjects to date have indicated being willing to pay at significantly greater median price points for both subscription and PAYG models than those described above). These results, and those reported above provide valuable evidence of key trends and sentiments in addressing the research questions focussed on here and should certainly offer value for ongoing study outwith the MiM project in other GLAM contexts.

Future research expanding on the work done here will investigate - amongst other considerations - what factors might influence WTP for virtual museum experiences of the kind enabled by a MiM platform; differential trends in finer grained demographic and professional cohort analysis; relational analysis of WTP vs. perceived value of and exposure to VR; analysis of WTP for virtual museum experience in the context of driving re-visitation and long term loyalty amongst audiences; and analysis of WTP against other general visitation trends (e.g. type of visit, physical setting, motivation for visiting, local vs. remote/digital visitation).

It remains the MiM research team's intention to publish and disseminate findings derived from this ongoing activity widely, wherever and whenever appropriate.

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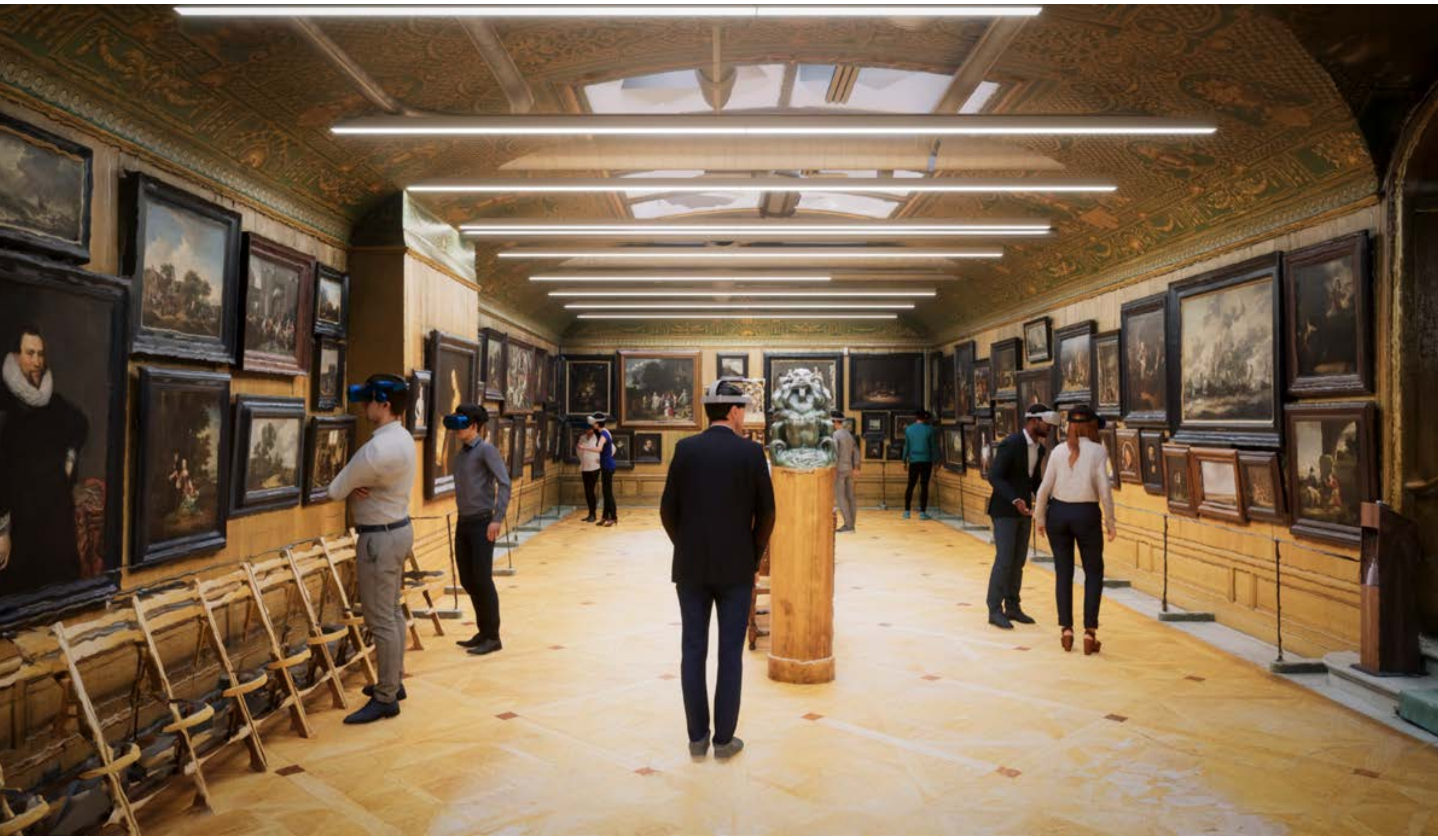

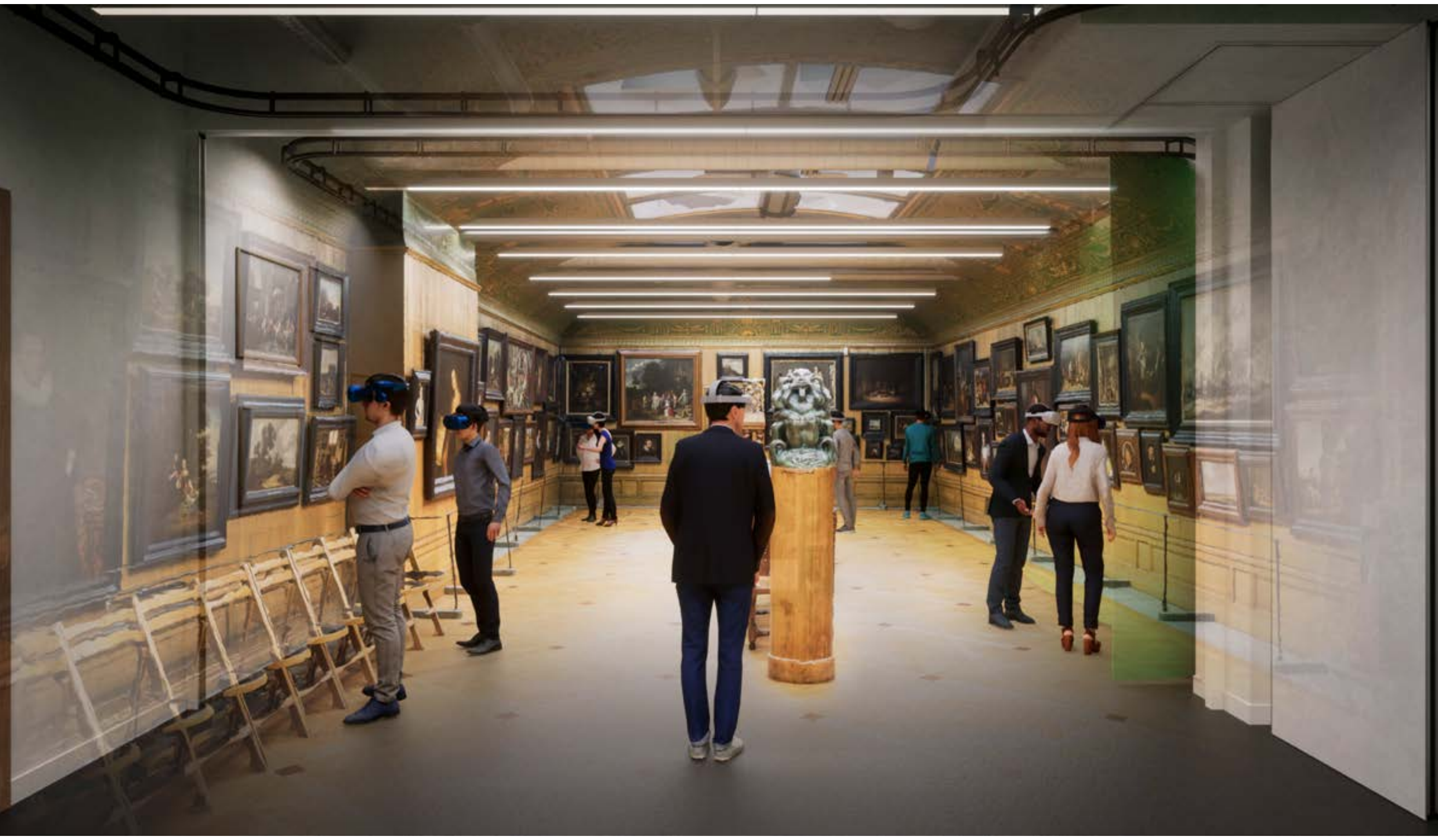

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