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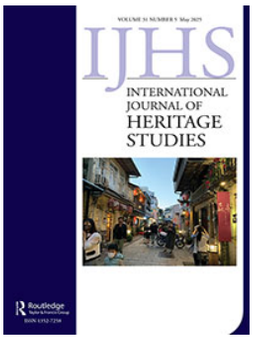

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Immersive sacred heritage: enchantment through authenticity at Glastonbury Abbey

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ABSTRACT

This paper reflects on how immersive approaches can be designed to respect the spiritual ethos of sacred heritage. Glastonbury Abbey (Somerset, UK) provides a case study of 'mixed reality' immersive interpretation, including gamification, at an open-air sacred heritage site which attracts a diverse range of spiritual seekers (Christian, 'New Age' and Neo-Pagan). A cross-disciplinary team collaborated to *design for authenticity*, mediating ethical challenges by integrating spiritual heritage in embodied, playful approaches. Immersive methods offer unique opportunities for sacred heritage sites to engage imaginatively and inclusively with their spiritual heritage, connecting visitors with intangible heritage and drawing on embodied spiritual practices such as pilgrimage. Authenticity and biography emerge in this research as powerful conceptual tools to reconcile potential tensions between immersive storytelling and the spiritual values of place. Authentic objects, materials, spaces and stories are valued by visitors and host communities because they confirm the chain of proximity to the sacred, a direct connection to the life history of the saint, deity or mythical persona that is commemorated by the sacred place.

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Introduction

What are the distinctive challenges and opportunities of immersive heritage interpretation in the context of a sacred heritage site? Immersive heritage is understood to be 'story-led, audience and participation centred, multimodal, multisensory and attuned to its environment' (Kidd 2018). Immersive approaches are often rooted in the digital but can be interwoven creatively with embodied experience, including artistic encounter, performance, and audience participation in physical and cognitive activities such as wayfinding, craftworking and problem-solving through games and puzzles. The resulting 'mixed reality' interpretation has the potential to engage visitors completely, to take them to another time or place and deliver a more sensory and emotionally rewarding experience than a conventional museum exhibit (Macdonald 2022). But how can immersive

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approaches be designed to respect the spiritual ethos of a sacred heritage site? This article addresses this question in relation to the open-air heritage site of Glastonbury Abbey (Somerset, UK), where a cross-disciplinary team collaborated in the design of an immersive experience to engage visitors in embodied, playful approaches that are also respectful of spiritual beliefs. The collaboration combined the academic discipline of archaeology (the University of Reading), with partners from the heritage sector (Glastonbury Abbey) and creative industries (Thread Architects and Arcade XR immersive digital heritage). Previous studies have proposed that design methodologies for immersive experience can be enhanced by cross-sectoral work that explores disciplinary differences as 'productive tensions' that can lead to new learning (Swords et al. 2020). Here we reflect on the processes of co-creation and how the frameworks of authenticity and biography emerged as powerful conceptual tools to reconcile potential tensions between immersive storytelling and the spiritual values of place. These concepts guided our narrative approach, anchoring the immersive experience within the historical framework of Glastonbury's pilgrimage tradition and its spiritual status as a 'thin place'. Object biographies were developed to connect archaeological artefacts with the diverse range of people who used them in the medieval abbey, and to encourage emotional connections between today's visitors and past inhabitants. Immersive interpretation at monastic heritage sites raises the additional challenge of social inclusion: digital approaches developed elsewhere have highlighted the lifestyle of medieval monks (elite, adult males), for example at the Benedictine cathedral-priory of St Mary Coventry and St Mary's Abbey, York (Doulamis et al. 2012; Ahmed Maqbool and Maxwell 2024). Our immersive interpretation is grounded in deep contextual understanding of Glastonbury Abbey's tangible and intangible heritage, enabling ethical and inclusive interpretation that reveals the lives of the Benedictine monks as well as the women, children and men of different social classes who visited and worked at the medieval abbey.

Glastonbury Abbey provides a rich case study through which to explore immersive sacred heritage. It holds a unique place in English sacred history and cultural identity: its significance derives from its combination of tangible and intangible heritage, which were interwoven in the vibrant tradition of storytelling that was promoted by the medieval abbey. The monks crafted written narratives and material culture in an attempt to 'prove' that Glastonbury was the earliest Christian church in Britain, with foundation stories linked to King Arthur and Joseph of Arimathea (a biblical figure regarded apocryphally as the uncle of Christ). The site retains substantial ruins of the medieval abbey (Figure 1), which was one of the wealthiest and most powerful in England. It forms an integral part of the sacred landscape of Glastonbury today, alongside Glastonbury Tor and Chalice Well, and is distinctive among medieval heritage sites in attracting a diverse range of spiritual seekers (Christian, 'New Age', known locally as Avalonian, and Neo-Pagan, including Wicca, Druids and Goddesses) (Bowman 2009; Hutton 2003).

Glastonbury, in common with other sacred heritage sites, is a locale that embodies religious myths and mystical beliefs and conveys a quality of otherness that is separate from everyday life (Coleman and Olsen 2021; Coomans et al. 2012; Gilchrist 2020; Shackley 2001). Sacred heritage sites are frequently associated with the tombs or shrines of saints, prophets or deities who underpin religious and cultural identities; and/or pilgrimage landscapes that are valued for spiritual healing and wellbeing. Sacred heritage is strongly rooted in the embodied experience of a specific place and its sense of the

Figure 1. Glastonbury Abbey: ruins of the lady chapel and great church, showing Glastonbury Tor top right (©Cheryl Green, reproduced with permission).

numinous, whether perceived by a religious visitor seeking a mystical experience, or by a secular/humanist visitor in search of an enhanced feeling of personal wellbeing. The spiritual aura attached to sacred heritage relies on *being present* at the site and engaging sensorially with the place. However, the visitor's emotional experience of the sacred site is facilitated by heritage interpretation that communicates its cultural significance (Duda 2021; Thouki 2022). Immersive heritage approaches generally rely on digital technology, which itself may be viewed as being in tension with the spiritual ethos of a sacred site, or with affective heritage more broadly (Burlingame 2022). The spiritual character of sacred heritage prompts ethical considerations for immersive interpretation, a theme recently explored in relation to 'difficult heritage' sites of trauma, imprisonment or execution (Macdonald 2022). Ethical issues for immersive sacred heritage include: the importance of respecting both contemporary and past spiritual beliefs; understanding that sacred sites are often contested heritage, with the potential for different/conflicting beliefs and stories to be attached to the same locale; demonstrating appropriate reverence for a sacred place, including the imperative to avoid elements of 'disneyfication' that would degrade spiritual aura. Is it possible to 'enchant' visitors through immersive approaches at sacred heritage sites, while at the same time preserving the spiritual values of place?

Immersive storytelling: emotive biographies

Emotion lies at the heart of immersive heritage: the audience is invited to empathise with human stories and to engage physically and/or intellectually with the spaces and

evidential traces of heritage sites. Jenny Kidd situates this movement within the broader affective turn in Museum Studies, highlighting the priorities to represent diverse and multiple voices, to engage visitors emotionally and sensorially, and to experiment with audience participation and play in heritage interpretation (Kidd 2018). Immersive storytelling across a wide range of digital and performance media invests agency with the audience/visitor; immersed and surrounded in an alternative reality, they experience and are able to shape or influence the narrative (Powell 2022). Sarah Perry has used the term 'enchantment' to encapsulate affective responses to heritage sites and the power of emotion-oriented approaches to engender wonder at the past and inspire social action in the present (Perry 2019).

The concept of enchantment has also been applied to sacred heritage, referring to the increasing public engagement with sites of religious heritage as part of the spiritual turn ('re-enchantment') in western societies, a shift away from organised religion towards the personal experience of spirit, mind and body (Badone 2015). Spiritual engagement with heritage may be motivated by particular religious or mystical beliefs or by a personal quest for wellbeing. This accords with views articulated by visitors to heritage sites immediately after the COVID-19 lockdown (2020). The distant past was perceived to construct a sense of ontological security for these visitors: post-pandemic, heritage helped people to locate themselves within an historical narrative of long-term continuity and to re-establish personal relationships to place (Sofaer et al. 2021). These motivations echo those routinely expressed by visitors to sites of sacred heritage: both religious and humanist visitors are drawn to sacred sites as emotive anchors for collective memory; they instil a sense of timelessness, a means for non-religious people to reconnect with the spiritual domain (Badone 2015; Gilchrist 2020; Voyé 2012). The recent popular revival of European pilgrimage is a prime example: while traditional pilgrims are motivated specifically by religious beliefs, non-traditional pilgrims seek the sensory and spiritual experience of the journey, therapeutic contact with nature, and the promise of encountering the 'authentic past' as they journey towards an historic cult centre (Dyas 2020; Maddrell et al. 2015). Pilgrimage can also be understood as a form of enchantment, an emotional and sensory experience produced through the entanglement of physical journeying with the vitality of places, objects and things (Skousen 2018).

But a point of divergence in these models of heritage 'enchantment' can be found in their different understandings of authenticity. Many proponents of immersive/emotive heritage call for the rejection of authenticity as synonymous with the Authorised Heritage Discourse (AHD) (Smith 2006). Critical immersive heritage demands disruptive narratives to challenge conventional thinking in order to achieve the aim of multivocality (Anderson 2011; Perry 2019). Conversely, it can argued that authenticity is *integral* to the spiritual values of sacred heritage, which are culturally contingent and constantly evolving, drawing on local perceptions of the spiritual values of landscapes and material culture (Gilchrist 2020). This understanding of authenticity is allied with intangible heritage, a quality or belief that is culturally and historically relative; what matters is not whether something is genuine, but *why it is valued* when it is deemed to be genuine (Silverman 2015). In the context of Christian Europe, religious concepts of authenticity invest the value of *sanctity* in places and objects, acquired through close spatial proximity to sacred beings and their life histories. Authenticity is a crucial concept through which sacred heritage sites in many religious traditions demonstrate the validity

of their material connection to a saint, deity or mythical persona, for example through relics, grave-sites, and historical or archaeological evidence that demonstrates a direct connection with their life. Alexis Thouki has argued that the living character of sacred heritage sites produces specific understandings of authenticity: for visitors, authenticity is influenced by personal memories and emotional expectations, as well as embodied engagement with the materiality of the sacred site; for host communities, authenticity involves creative engagement with past traditions that shape their identity in the present (Thouki 2022).

Digital technology can be an important agent in the enchantment process, supporting immersive experiences that prompt a sense of awe and wonder, with potential to amplify visitors' emotional engagement (Perry 2019). For example, the EU-funded EMOTIVE consortium developed digital narratives focusing on the affective connections between people and artefacts, including 'Ebutius's Dilemma', an interactive app for mobile devices designed for a gallery in the Hunterian Museum, University of Glasgow ('The Antonine Wall: Rome's Final Frontier'; EMOTIVE 2019). The app is used within the museum by single visitors or pairs and strands of the story are linked to archaeological objects in the museum display. The interactive character, Ebutius, is a Roman centurion on the Antonine Wall (second century CE). The user is asked to help Ebutius to make a life-changing decision: to choose between leaving Scotland with his garrison or remaining with his (local) family. The narrative encourages an emotional connection while also challenging stereotypes about Roman military life. By connecting with intimate themes such as love, loyalty and loss, the narrative subtly disrupts AHD, while enabling visitor agency.

But immersive technology can also introduce challenges around authenticity and affect. For example, when ambitious VR (Virtual Reality) reconstructions were installed at the Roman ruins of Augusta Raurica (Switzerland), the public was impressed by the scale of the technology; however, people failed to engage with it emotionally. The decision was taken to develop a new AR (Augmented Reality) experience that would tell human stories at a more intimate scale, focusing on the last hours before a catastrophic fire, c. 300 CE. The app is accompanied by digital 'audio drama', located in the spatial context of private homes in the Roman city, telling emotive stories of artefacts found in the excavations at Augustica Raurica and how they relate to the (fictional) stories of people who used them (Raselli 2022). In contrast to the VR, 'The Augusta Raurica AR Experience' is multi-sensory and embedded in the real spaces of Roman lives, connecting the visitor with the authentic materiality of Augusta Raurica.

Mixed reality can also be used effectively to connect tangible and intangible heritage. An AR app was developed in western Sweden to encourage families to make connections between Nordic folklore, children's literacy and Viking heritage sites (Holloway-Attaway and Vipsjö 2020). The app combines digital map and game mechanics with traditional storytelling and is linked to a series of children's books featuring mythical creatures such as trolls, gnomes and giantesses. Users employ the app to navigate to a heritage site where AR figures of characters from the books are triggered by scanning signs; the heritage context is explained through 3D digital objects and buildings. The project was co-created with local partners including schools and libraries with the specific aim of improving children's literacy and raising awareness of local heritage. It also supports inter-generational bonding and cooperation, with children and parents working together to

solve a gameboard. This is a strong example of digital heritage activism in practice, as well as demonstrating the potential role for intangible heritage in immersive approaches.

These three examples of mixed reality immersive heritage share common threads that have influenced our approach. The first is an emphasis on *embodied*, narrative storytelling that draws on corporeal movement through space and engagement with archaeological objects and locales, thereby bridging virtual and real environments. The second is the use of *biography* as a key ingredient in telling compelling, digital stories at archaeological heritage sites, using the biographies of objects and people (or supernatural or mythical characters) to prompt empathy and intensify inter-generational engagement.

Glastonbury Abbey: multi-vocality past and present

Glastonbury's evocative legends have attracted spiritual seekers for over a millennium (Gilchrist 2020). The abbey's mythology connects its origins with the biblical character Joseph of Arimathea, who according to the gospels, gave up his tomb for Christ. Joseph allegedly founded the 'old church' at Glastonbury in 63 CE, as stated in the mid-fourteenth century *Chronicle of Glastonbury Abbey* (Carley 1996). This proposed a direct connection between the abbey's origin story and the life of Christ, an enduring belief still held by many today. Glastonbury monks also cultivated stories linking the abbey with the chivalric figures of King Arthur and Queen Guinevere, drawing inspiration from the Grail legends of contemporary French romance literature. In 1191, the monks claimed to have excavated the shared grave of Arthur and Guinevere, translating their remains to a tomb near the high altar of the abbey's great church, and fabricating a lead cross in an antiquated style, to lend authenticity to their find. Glastonbury became a renowned site of pilgrimage in the Middle Ages, possessing the alleged relics of 300 saints, as well as the reputed bones of Arthur. Re-evaluation of the antiquarian excavations at Glastonbury has provided new evidence for the scale, significance and dating of the Anglo-Saxon monastery and the later medieval abbey (Gilchrist and Green 2015). The research also revealed distinctive features associated with Glastonbury's legends, notably a sustained ritual focus on the site of the 'old church', supposedly founded by Arimathea, and the first material evidence for occupation dating to the so-called Arthurian period, the fifth to sixth centuries CE.

Following the dissolution of Glastonbury Abbey in 1539, the monastic ruins drew both Protestant and Catholic pilgrims, and during the English Civil War of the seventeenth century, it became a site of contested spiritual heritage (Walsham 2004). From the late nineteenth century, Glastonbury attracted diverse spiritual, creative and esoteric movements, and from the 1960s and '70s, it emerged as an international centre for Druidism, Neo-Paganism and Goddess worship. This complex spiritual heritage presents challenges for the abbey's trustees, who are bound by their charitable objectives to preserve the fabric and grounds of the site for public benefit, education and furthering Christianity. Until recently, they were reluctant to engage with the abbey's intangible heritage – its rich tradition of legends – because these were perceived to be modern, New Age inventions that were in conflict with the abbey's Christian values. The archaeological research demonstrated that the legends have been integral to the abbey's unique spirit of place since at least the twelfth century; the Arthur and Arimathea stories shaped the spaces and material

culture of the medieval abbey. They were even presented to medieval pilgrims through early forms of heritage interpretation, including the (surviving) Magna Tabula (c. 1400 CE), a book-shaped object that was located in the church and outlined the Arimathea story, and a sixteenth-century brass plaque which explained Arimathea's connection to the crypt of St Joseph, located beneath the surviving Lady Chapel (Gilchrist 2020).

The heritage site currently attracts around 180,000 visitors per year (in 2023 and 2024), surpassing pre-pandemic visitor levels (170,000 in 2019). However, post-COVID, the visitor demographic has shifted away from international visitors and tour groups (previously 50%) towards UK family visitors. The extensive grounds of 36 acres also serve as an open green space, sanctuary and cultural resource for the town of Glastonbury (population 9,000), of whom over a third are members of the abbey. It is estimated that at least a quarter of the population of Glastonbury (and a similar proportion of the abbey's visitors) can be regarded as alternative spiritual seekers (Phillips 2019). Visitors must pay to enter the abbey, which is a contentious issue for spiritual pilgrims to many sacred heritage sites (Coleman 2019). However, recent reconfiguration of the abbey's entrance has increased visual and physical access in front of the paywall (Abbey Yard development 2025). A further point of conflict for some alternative pilgrims relates to the performance of religious rituals: visitors are asked to respect that Glastonbury Abbey is a Christian site and non-Christian rituals are prohibited.

A new interpretation strategy is aimed at four audience segments identified by visitor research: adult learners/hobbyists; explorer families; tour groups; and spiritual pilgrims. Five themes provide a framework to explore Glastonbury Abbey's 'unique significance as a special place of Christian heritage which remains spiritually important today for diverse faiths and beliefs': myths and legends; monastic life; pilgrimage; the craft tradition; and the natural world (Bell and Gilchrist 2023). The pilgrimage theme resonates with spiritual seekers and provides opportunities to explore multi-vocality in the past. Rather than focus solely on the masculine community of Benedictine monks, interpretation highlights the role of secular men, women and children as pilgrims, patrons, servants, craftworkers and agriculturalists. The themes have been evaluated through consultation workshops and a public survey (516 responses). The main reasons cited for visiting were 'to relax or escape' (45%) and to 'enjoy the natural open space' (45%). The most attractive themes were 'myths and legends' (52.6%) and 'the natural world' (49.7%) (Bell and Gilchrist 2023). In common with visitors to other sacred heritage sites (discussed above), Glastonbury's visitors seek therapeutic contact with both nature and spirit.

The abbey is gradually shifting its interpretation towards mixed reality, immersive storytelling, with the dual aim of encouraging visitor agency through exploration and enhancing the offer for families (the fastest growing audience segment). The grounds function as an open-air museum and parkland, interpreted by a costumed, living history team, with cooking and craft displays in the fourteenth-century abbot's kitchen, and a reconstructed medieval herb garden, orchards and ponds. These multi-sensory elements complement the monastic ruins and artefact displays in Glastonbury Abbey's museum, which also features touch-screen interactives with digital reconstructions based on the archaeological research. However, many key features of Glastonbury's story are no longer visible on the ground, such as the monastic cloister, Arthur's tomb and the 'old church' associated with Joseph of Arimathea.

Immersive approaches offer the potential to animate this intangible and lost heritage. The emphasis is on 'mixed reality' immersion, harnessing a wide range of creative and participatory experiences to support all visitors to explore and understand the monastic landscape (including costumed living history, artistic installations and craft demonstrations). Digital approaches support this engagement but are not the primary focus. Two complementary immersive components were developed for this project, one analogue and one digital: (1) a route of stational markers to signpost and interpret key locations on a heritage trail, including legendary and historical elements that do not survive today; and (2) a mobile storytelling AR app aimed at explorer families (with child age range of 9 to 14 years), to interact with the interpretative trail.

Designing for authenticity: the Glastonbury Abbey heritage trail

Gilchrist and Bell collaborated with Thread Architects in 2019 to review current practice in mixed reality immersive approaches and to identify those best suited to Glastonbury Abbey. This pilot work emphasised the need to improve visitor orientation to support better understanding of the 36-acre monastic landscape. It recommended the creation of a 'ghost cloister' to stand in for the lost cloister that was a key feature of monastic identity, and a self-guided trail for visitors to encourage exploration beyond the core spaces of the church and cloister, with a combination of digital and artistic interventions as stational markers. These initial ideas envisaged technologies including interactive LED displays, LED lighting and holograms. The collaborative, cross-disciplinary research conducted during this project prompted a rethink regarding the use of technologies and a shift towards authentic materials. The 'ghost cloister' was created during the reconfiguration of the abbey's entrance but in analogue form as an artistic reconstruction of the Romanesque cloister arcade, in screen-printed and kiln-fired enamel on glass, across twenty-two panels of the new visitor facility (Abbey Yard development 2025).

The stational markers provide a wayfinding trail for the majority of abbey visitors who prefer a non-digital experience. But they also complement the app by providing the physical location for image markers that connect with its game content and AR. The challenge was to design both types of markers in a way that would be sensitive and appropriate to their historic setting, while also enhancing visitors' spatial and sensory experience. The locations for the stational markers of the heritage trail correspond with the 'time rifts' of the app (discussed below), all of which are key locales for the interpretation of the legends and archaeology (Figure 2). When the team convened to design the heritage trail, early discussions focused on the importance of *materiality* and how this may be perceived in relation to the authenticity of the sacred site. This perspective was influenced by heritage research on the reception of replica crosses at Iona Abbey (Scotland). Sally Foster and Siân Jones demonstrated that materials introduced to a sacred site must be perceived as original, in order to be 'valued' as authentic (Foster and Jones 2020). Authenticity of materials was prioritised for both the heritage trail markers and the related image markers for the Glastonbury app. Standard QR codes (quick-response barcodes) could negatively impact the historic setting and disrupt the sense of timelessness of the sacred site, particularly for those who prefer a non-digital experience (Ciolfi 2015).

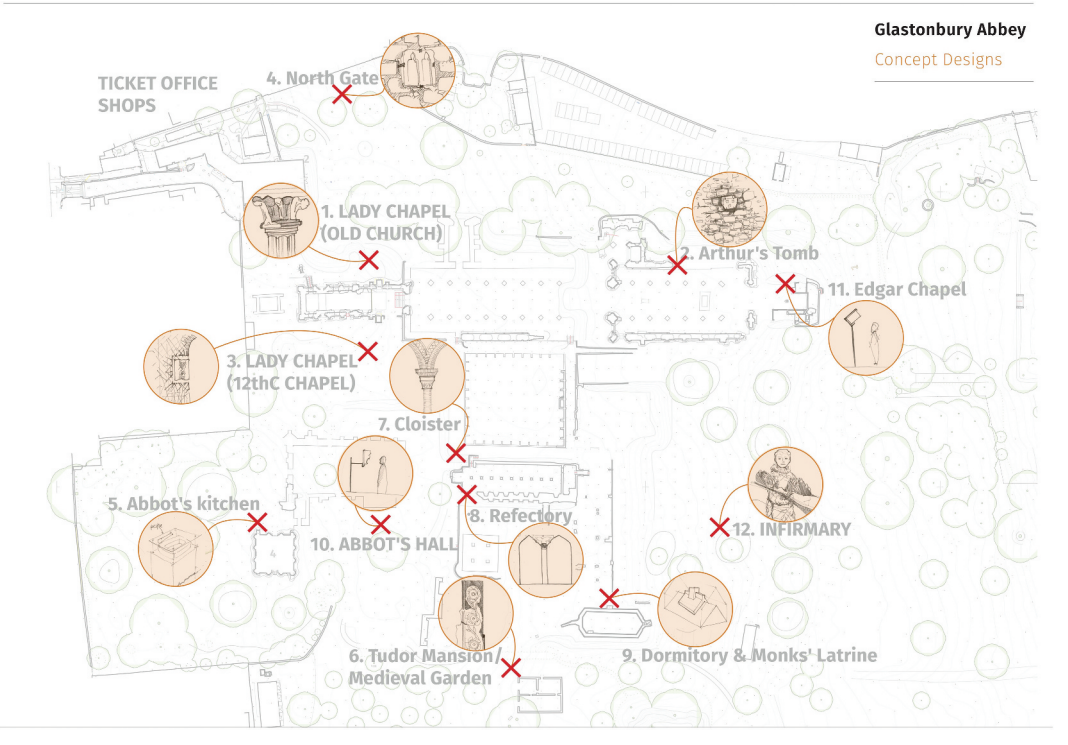

Figure 2. Glastonbury Abbey heritage trail: locations of selected sculptures and preferred options for mounting. Locations of 'major rifts' of the app with associated VR scenes indicated in upper case (©Thread).

The ideal solution for the trail markers was found in Glastonbury Abbey's collection of medieval worked stone (comprising 1600 fragments) (Gilchrist and Green 2015). Sculptural fragments were selected based on their potential to contribute to the sensory experience, through their aesthetic and tactile qualities, and to add authenticity through their contextual association with the location they represent. For example, the fragment selected as a trail marker for the Lady Chapel is part of a late twelfth-century jamb stone that was original to the chapel. To add a human biographical element, the fragment selected for the monks' infirmary is a full-size funerary effigy of an abbot (William of St Vigor, abbot 1219–1223). A conservation assessment for each stone determined that some could be used in an outdoor setting, while those more vulnerable to weathering will be 3D-printed, with the replicas used as markers.

Thread identified a series of options for how to mount the worked stone fragments as artistic installations along the heritage trail, ranging from sculptural metal armatures to frameworks of wire, glass, foliage, mirrors and stone. They developed a rigorous methodology to assess the suitability of eleven different possible treatments for each of the twelve stones, including the essential requirement to mount the fragment in its original orientation and elevation; its accessibility for touch; its clarity and value to interpretation; and its negligible impacts on stone conservation, buried archaeology and visual setting. Figure 3 demonstrates the range of options considered for a sculptural panel from the medieval refectory. At the time of writing, the heritage trail is being piloted with temporary markers comprising medieval worked stone fragments placed on black timber pallets. Further experimental work is in progress, including 3D-printing of replica sculptures in different materials, before seeking formal permissions and funding for the full heritage trail (Figure 2).

A sensitive and highly innovative solution for the app's image markers was also found in the abbey's archaeological collections. Rather than use a standard barcode, the app reads an image based on ceramic tiles selected from the abbey's extensive collection of 7000 medieval floor tiles (Gilchrist and Green 2015). Several options were considered for the 'tiles' including replicas made in resin or handmade ceramic. These options were expensive and the resulting replicas would not withstand outdoor conditions in the UK climate. In addition, the original medieval tiles are muddy hues of ochre-coloured glaze on red clay fabric, and greater contrast was needed for the app to read the images. The most effective solution was to print the medieval designs onto a white ceramic tile, which provides sufficient contrast in an affordable, durable material. We selected twelve medieval tile designs based primarily on the theme of animals and mythical beasts (Figure 4) to appeal particularly to younger children. Leaflets have been created for those who wish to follow the trail without the app, providing additional information on the twelve locations and their significance, and the twelve associated tile designs.

Gaming the sacred? The 'Glastonbury Stories' AR app

Collaboration with Arcade XR digital heritage included a series of knowledge exchange workshops in 2022 involving the abbey's interpretation team. The immersive concept was shaped by Arcade's first questions: 'What do you want visitors to *experience*?' and 'What do you want visitors to *feel*?' The abbey wanted their target audience of explorer families to experience different ways of learning and to engage their senses. They hoped

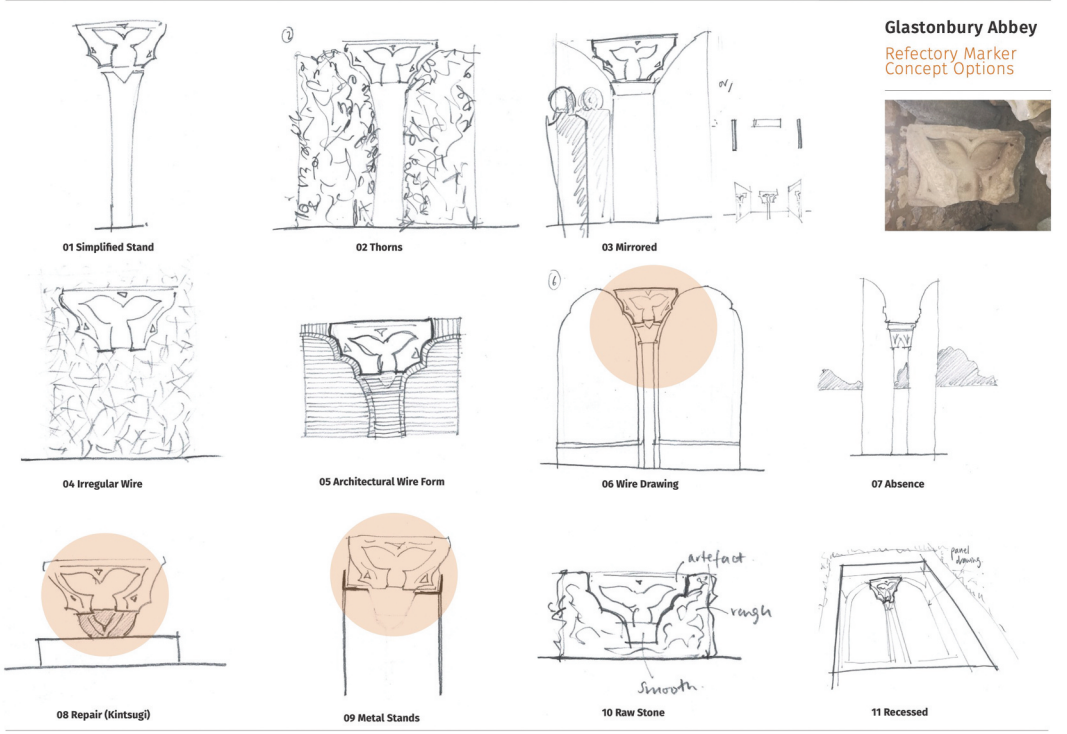

Figure 3. Glastonbury Abbey heritage trail: options for mounting Refectory marker; preferred options circled (©Thread).

Figure 4. Glastonbury Abbey heritage trail: app image markers based on medieval ceramic tiles from the abbey's archaeological collections (©Glastonbury Abbey).

visitors would take away a feeling of discovery and excitement. An AR app was therefore selected to support open-air exploration, with an element of fun introduced through location-based gameplay. Games can be used in a heritage context to facilitate the learning of new knowledge, skills and attitudes towards the past, including empathy with historical characters and events (Mortara et al. 2014). Games in an open-air heritage environment are typically based around the genre of puzzle games, for example solving

logic puzzles, navigating mazes and treasure-hunting for locations and objects. Gaming can augment an embodied, emotive response to heritage, but this demands a compelling narrative to engage the user in the story. The user is often cast in the role of the active 'hero' who solves a challenge or quest; in such cases, a narrative device is required to explain *how* they are able to engage directly with the past – for example through time travel, ghosts or superhero powers (Powell 2022).

The greatest challenge in designing the 'Glastonbury Stories' AR app was around this narrative device: can a game be fun for children but at the same time sensitive to sacred heritage? Extensive co-creation was needed to resolve this tension, bringing together immersive design experience with contextual knowledge of Glastonbury's spiritual and archaeological heritage. Arcade presented early concepts based around a treasure-hunting quest for the Holy Grail, with time travel enabled by the 'wild magic' of the abbey. Clearly these themes would appeal to many families with younger children, drawing on popular stories of King Arthur. However, these initial proposals did not engage with Glastonbury Abbey as a sacred place; nor did they offer authentic objects and stories associated with the abbey. The suggested narrative device of 'wild magic' is especially problematic in the town of Glastonbury, where 'magic' is regarded as synonymous with non-Christian beliefs (such as the existence of fairies).

The narrative concept that was eventually adopted emerged from the abbey's sacred significance to a diverse range of spiritual seekers. The game is framed in terms of pilgrimage, with visitors invited to view themselves as part of a pilgrimage tradition stretching back centuries. We chose a female pilgrim-narrator to highlight the presence of women at the medieval abbey (Figure 5). She introduces the narrative device that enables the app user to make a direct personal connection with the past; crucially, one that respects its spiritual heritage. She explains that Glastonbury is a '*thin place*', a theological concept well known in Celtic Christianity, where the boundaries between spiritual and earthly worlds have worn thin: 'This is a special place, where time does not work in quite the same way as elsewhere. You can reach back, and history can reach forward'.

The pilgrim-narrator explains that time has become unstable at Glastonbury Abbey and therefore potentially 'dangerous', resulting in objects from the past slipping through to the present. She asks the user to help return objects to the past, to the medieval people who have lost them, to ensure that time remains stable. The app provides a scroll of instructions and a map for the user to navigate to 'rifts' where time is particularly thin (Figure 6). At each location, they scan a marker and solve a simple puzzle, spinning the 'rings of time … until the pathway to the past is open'. When the rings are aligned, hidden voices from the past provide a clue to help the user select the correct object for that location. They are asked to identify which object they have found, selecting from a menu of twelve potential objects in the app's pilgrim satchel. Many of the objects are only partial fragments, reflecting their actual state as recovered by archaeological excavations. When the object is successfully identified and returned to the past through the rift, the user is rewarded by seeing the intact object in its original condition. Through the power of AR, it transforms from an archaeological fragment into a pristine object; for example, at the monks' infirmary, a tiny ceramic sherd is transformed into a medicine jar (Figures 7 and 8). The user can examine the 3D object in detail before storing it in their pilgrim satchel. At four key locations, the rift opens up a 360 VR scene of a building as it

Figure 5. 'Glastonbury stories' splash art: the female pilgrim-narrator (©Arcade XR).

would have appeared in the Middle Ages (Figure 9). This gives a sense of the scale and grandeur of medieval Glastonbury while also demonstrating how the past can be reconstructed from archaeological research.

The rifts are located at twelve points around the abbey grounds that are significant for interpretation (e.g. the 'old church', Arthur's tomb) and which correspond with the heritage trail. Each object was selected for its educational value and authentic connection to the specific location, comprising either excavated artefacts from the archaeological collections or objects linked to the legends. The archaeological objects range from a mundane cooking pot to specialist religious and medical objects. The short audio clues feature the voices of monks as well as an almswoman, pilgrims, a cook, gardener and child servant. The dialogue conveys information about daily life but often in a humorous way. The dialogues were co-created with the abbey's living history team and they voiced the characters.

The app was refined through two stages of testing with twelve family groups in 2022, evaluated qualitatively through observation, structured interview, and an independent evaluation report. Ethical approval was given by the Research Ethics Committee of the School of Archaeology, Geography and Environmental Sciences, University of Reading (SREC2022/25). All parties were provided with a Participant Information Sheet and signed a Participant Consent Form. The first stage of testing focused on game dynamics

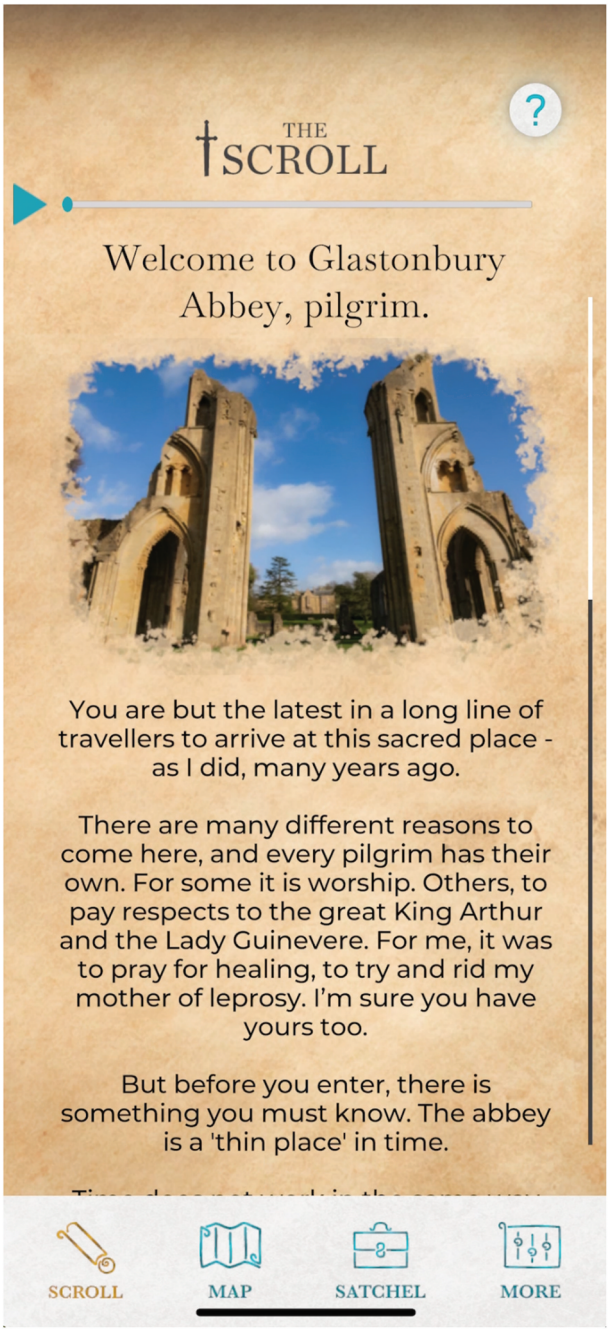

Figure 6. 'Glastonbury stories' welcome scroll explaining the 'thin place' narrative concept (©Arcade XR).

and confirmed that the families enjoyed the adventure element but wanted more variety in the mini-puzzles and a map for clearer navigation. The second stage of testing focused more on the narrative and children confirmed that engaging with object clues and voices from the past enhanced the experience, with the highlight being the reconstructions.

Figure 7. 'Glastonbury stories' infirmary rift: an excavated fragment of a drug jar imported from Italy in the early fifteenth century, which would have contained an exotic medicinal compound (©Arcade XR).

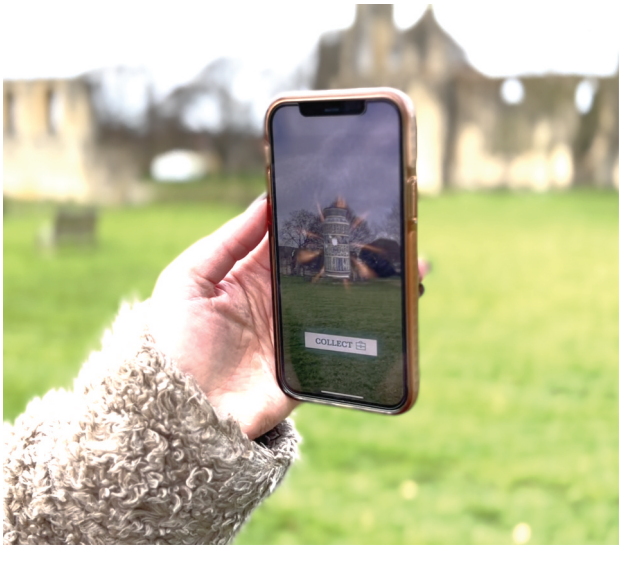

Figure 8. 'Glastonbury stories' infirmary rift: the medieval drug jar reconstructed in AR after the app user has returned it to the past (©Arcade XR).

> When you had to pick the certain objects and really listen in to what was being said, I thought that was really cool. The fact you could see the artefact how it was compared to how it looks now. And the fact you can keep the information for later so you've got it forever is really useful.
>
> I really liked when the portal opened at the end you could see how the buildings looked. I liked how you had to do the puzzles.
>
> Turns the abbey into an exciting adventure people coming with their parents wouldn't expect.

Figure 9. 'Glastonbury stories' lady chapel rift: VR showing outline of the building as it would have appeared in 1186 (©Arcade XR, based on reconstruction by the Centre for Christianity and Culture, University of York and reproduced with their permission).

Some parents suggested they were more likely to learn and retain information through this type of active learning and also that the game enhanced family interaction. One welcomed the representation of female voices at the medieval abbey.

> It was really good because it was like an exciting story, took you all over the abbey. Very engaging, captured the kids' imaginations, the questions were great, a good level of difficulty. The technology is amazing!
>
> Good as a group because everyone can have a turn at mini games. Brings a family together more. You could solve it all together.
>
> It was really great hearing the different voices, females, not just males.

Two families commented positively on the use of technology at the sacred site:

> I was hesitant about bringing technology into the abbey but I can definitely see how rather than detracting from it, it would enhance someone's experience.
>
> Christian children would really enjoy it.

The app was launched in April 2023 and in the first eighteen months there were 3,954 downloads, and 5,250 leaflets were distributed for those who wanted to follow the trail without the app, or to have additional information on the sculptural fragments and tiles. The test families reported confidence in their use of technology: 'I'm a real technophobe and even I felt I could have navigated without any stress'. In practice, however, users less familiar with AR technology found it difficult to scan the markers and return objects through the rifts. The abbey addressed this issue by introducing a new volunteer role for Digital Engagement during the 2024 season, to encourage use of the app and support visitors to use it with confidence. The volunteer confirms that the app is taken up mainly

by families and younger couples visiting the abbey. There have been several requests from international visitors for the app to be provided in German and the abbey aims to provide a multi-lingual version when funding permits.

Discussion: enchantment through authenticity

Our research offers creative insights to the distinctive challenges of mixed reality immersive heritage interpretation in the context of a sacred heritage site and the opportunities stimulated by a cross-disciplinary design methodology. The ethical challenge was to balance respect for spiritual heritage (and associated contemporary beliefs) with an exciting gameplay narrative aimed at explorer families. 'Productive tensions' (after Swords et al. 2020) were resolved by *designing for authenticity*, integrating spiritual heritage in the app's narrative device and taking inspiration from archaeological evidence specific to Glastonbury Abbey. The app's time disruption narrative engages directly with the spiritual character of Glastonbury as a 'thin place', a concept shared by Christian and alternative spiritual beliefs surrounding the sacred site, and complementing its mystical, otherworldly quality. Other important decisions included the use of language in the app appropriate to cultural context, describing the sacred place as resonating with 'spiritual energy' rather than 'wild magic'. The physical location of the gameplay is also critical, with the markers for the app sited well away from spaces used for worship or spiritual contemplation (the consecrated space of St Patrick's Chapel and the altar in the crypt of the Lady Chapel).

Immersive approaches offer unique opportunities for sacred heritage sites to engage imaginatively with their spiritual heritage. The app's pilgrimage narrative enables visitors to connect creatively with a living spiritual tradition that unites the abbey's past and present. Its dialogues feature women, children and men of different social classes who are known to have either lived or worked at the medieval abbey or visited as pilgrims. This inclusive approach challenges AHD narratives that monasteries were exclusively elite *masculine* institutions. The AR models provide a means for visitors to encounter Glastonbury's intangible heritage – including Arthur's tomb, Arthur's cross and the 'old church' of Joseph of Arimathea – as well as significant architectural features of the abbey that have disappeared. The archaeological objects in the app were given a sense of material patina by employing a mixture of realistic material references and hand-drawn details to complete the final 3D models. This was done in response to concerns that 3D digital representations of ancient objects and buildings generally lack a sense of patina, a 'pastness', that conveys a sense of aura and authenticity (Jeffrey 2015).

Authenticity and biography emerged as the two underpinning concepts that guided our cross-disciplinary collaboration and enabled us to integrate immersive approaches with sacred heritage. Authenticity at sacred heritage sites is a form of intangible heritage in itself, a means for visitors and host communities to value and experience the spiritual (Gilchrist 2020; Silverman 2015; Thouki 2022). Authentic objects, materials, spaces and stories are valued at sacred heritage sites because they confirm the sanctity of the place, acquired through *proximity to the sacred*, a direct connection to the life history of the saint, deity or mythical persona that is commemorated by the sacred place. This authenticity demands embodied engagement with the specific *materiality* of the sacred site (Foster and Jones 2020; Thouki 2022), in preference to artificial materials and new technologies. This premise guided our approach to the heritage trail: design solutions were inspired by archaeological evidence and

authentic materials from the abbey, with the trail markers comprising medieval worked stone fragments and the app's image markers based on medieval ceramic tiles.

Experience at Glastonbury and elsewhere suggests that biography is key to emotive storytelling in immersive practice, connecting the biographies of people, objects and places, and bridging virtual and real environments (EMOTIVE 2019; Raselli 2022). The theme of biography is explored at Glastonbury Abbey through the pilgrim's tale of the app's narrator; the twelve archaeological objects and associated historical voices featured in the app; and the twelve sculptures and ceramic tiles that narrate locations on the heritage trail. The AR and VR reconstructions of objects and buildings deliver 'enchantment' through technology, while the object biographies and dialogues add an emotive, human element to the story. Heritage enchantment can be understood both in terms of emotion-oriented digital approaches (Perry 2019) and as embodied engagement with sacred heritage as part of the spiritual turn (Badone 2015). These two aspects can be combined by designing for authenticity at sacred heritage sites, to create immersive approaches that enchant spirit, mind and body.

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