

A Business Model Innovation Methodology for Implementing Digital Interpretation Experiences in European Cultural Heritage Attractions

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Abstract

The paper proposes a business model innovation methodology for cultural heritage sites that are implementing digital technology in their visitor journey. Technologies such as virtual and augmented reality are increasingly popular in the cultural and heritage tourism sector, offering providers new tools to present and curate heritage content, and visitors' new modes to interpret and engage with a site's features. Despite its popularity, few studies have focused on the organisational changes that take place as digital technologies are implemented, that is, changes in the way heritage sites propose, co-create and capture value from the innovation. As such, the paper investigates the process of innovation in the business model of heritage sites, namely in terms of value proposition, storytelling, mediation tools, service delivery, and value capture. Based on the study of twelve cultural heritage sites in France and the United Kingdom, the main components and stages of innovation are discussed, alongside issues and implications. In doing so, existent business model innovation frameworks are extended to detail innovation processes driven by new digital interpretation. Furthermore, the paper offers a practical methodology to assist heritage site managers in assessing and guiding organisational innovation whilst undergoing digital innovation. Avenues for further research are identified.

Keywords

business model; innovation; heritage site; cultural tourism; digital technology; visitor intelligence

Introduction

Digitisation is rapidly becoming ubiquitous in the heritage and tourism sectors. As a result of ever-increasing technological solutions being developed at affordable costs, more and more museums and cultural heritage (CH) sites are introducing digital devices and interfaces using augmented, virtual, and mixed reality technology to improve the visitor experience, offer new modes of interpretation, and increase site competitiveness (Loureiro, Guerreiro, & Ali, 2020; Trunfio, Lucia, Campana, & Magnelli, 2021).

While the potential of those digital devices for destination marketing and tourism experience enhancement has been studied (Yung & Khoo-Lattimore, 2019), the implications of digitisation from a managerial perspective have received considerably less attention in the literature. Introducing virtual and augmented reality technologies to the visitor experience involves a transformation in heritage sites' strategy and operations (Gombault, Allal-Chérif, & Décamps, 2016). The misconception that introducing digital mediation tools is merely a question of technology prevents many sites from fully benefiting from the investment. Understanding that technological innovation is tightly linked to innovation in the site's organisational structure, its activities, operations and resources (Baden-Fuller & Haefliger, 2013) ensures the successful introduction of digital tools while preserving (or improving) the site's organisational health.

The aim of this paper is to explore digital innovation in cultural tourism at the organisational level, focusing on the heritage site's ability to change and adapt its business model (BM) for a new value proposition enabled by new technologies. As a result, the authors propose a business model innovation (BMI) methodology for the implementation of digital interpretation devices in CH sites, highlighting aspects in the digital innovation process that are specific to the heritage tourism sector. To address this issue, the authors investigated 12 cases of sites

(observation and interviews) that were either in the process of innovating (6) or had innovated (6) using augmented reality (AR) and virtual reality (VR) technology. An inductive analysis from qualitative data resulted in a BMI methodology for the implementation of digital interpretation devices in CH sites, highlighting aspects in the digital innovation process that are specific to the heritage tourism sector (especially in value co-creation). Theoretically, the paper expands literature on BMI and digitisation in cultural tourism studies by offering a conceptual model and methodology specific to cultural and heritage tourism. In addition, the paper proposes a practical methodology to assist managers of CH sites in the process of digital innovation.

Theoretical review

Digitisation in Cultural and Heritage Tourism

The 2010 decade is notable for the rise in development of work on AR / VR and tourism (Navio-marco et al. 2018). A recent literature review (Yung & Khoo-Lattimore, 2019) shows that, among the 46 papers published in tourism journals on this topic, the majority is interested in the potential of VR for marketing of travel destinations, and for training, in tourism. Across both these themes, the impact of presence in the virtual environment on potential tourists (Tussyadiah, Wang, Jung & tom Dieck, 2018) and on learners (Chiao, Chen & Huang, 2018) is studied. In terms of the visitor experience, research has focused on AR technology because, unlike VR, tourists need to be present at the tourist site to access the virtual information superimposed on the real environment. Further, studies are more often conducted on CH sites and museums because managers are particularly attentive to the mediation of heritage and therefore to its reception by visitors. These themes identified by Yung and Khoo-Lattimore (2019) are echoed within tourism literature on cultural heritage and AR / VR technologies more generally (see Table 1).

[Table 1 near here]

The impact of technologies on the visitor experience has been studied in terms of perceptions of AR (Chung, Lee, Kim & Koo, 2018), VR (Han et al. 2018; Errichiello et al. 2019) and mixed reality (Trunfio & Campana, 2020) and their effect on satisfaction with the experience at CH sites. Flavian et al. (2019) attempted a conceptualisation of the relationship between these technologies and experience by proposing the ‘EPI cube’ which allows categorisation of digital devices according to three main experiential characteristics: the perceptual presence of users, the way they interact with the device, and the technological embodiment. While some authors focus on a target audience, such as students in tourism (Moorhouse et al. 2017) or history (Kysela & Storkova 2015) to study how AR/VR impacted the way they learn, other authors have positioned their work upstream of the experience itself by questioning the way tourists accept AR in an urban heritage context (Tom Dieck & Jung 2018).

The perceived values of AR/VR in CH sites for internal and external stakeholders are multiple: economic, experiential, social, educational, epistemic and cultural-historical (tom Dieck & Jung, 2017). But as noted by Guttentag (2010), there are also several challenges to overcome. The main challenges studied are technical in nature, focusing on the development of digital content. For instance, challenges in 3D reconstruction of destroyed or disappeared elements for visualisation in VR (Bruno et al. 2010) and development of technical specifications for triggering AR models outdoors (Han et al. 2013). In addition to technical challenges of developing content, there is the challenge of creating efficient and user-friendly interfaces (Kounavis et al. 2012; Scholz & Smith 2016; Tussyadiah, Jung & tom Dieck 2018) and the impact of this on willingness to pay (He et al. 2018), storytelling and visitor engagement (Carrozino & Bergamasco, 2010) and visitor learning (Abu Bakar, Zaibon & Pendit, 2014).

Challenges of an organisational nature are less explored, even if they are considered central to the success of the innovation (Gombault et al., 2016; Trunfio et al., 2021). Indeed, in their review of the literature on tourism and technology, Navío-Marco, Ruiz-Gómez, and Sevilla-Sevilla (2018) highlight the development of AR and VR technologies and, more generally, how ICTs impact business functions of tourism companies, but fail to mention the impact of new technological uses of visitors (e.g. digital mediation tools in the visitor journey) on the site's organisation. Through a quantitative visitor survey, Trunfio et al. (2021), demonstrate that AR and VR devices need to be considered as part of the whole service model of a site (general organisation, reception staff, content of the exhibition, AR/VR experience). They find that the satisfaction visitors derive from an experience is not only related to AR/VR devices, but encompasses all services provided by the CH site. As such, there is a need to understand how the introduction of AR/VR devices in the visitors' journey impacts the business model of a site and, furthermore, how to innovate the business model to meet the site's performance criteria. This paper seeks to address this, exploring the relationship between digital innovation and BMI of CH sites.

Business Model Innovation in CH sites adopting AR/VR devices

Whilst Trunfio et al. (2021) highlight the critical role of a variety of elements, including AR/VR devices, on visitor satisfaction, they do not consider how the introduction of AR/VR devices affects the manner in which the wider services of the CH site are provided. In addressing this, we argue that 'business model' (BM) and 'business model innovation' (BMI) can provide an intellectual framework to describe how organisations do business and adapt the way they do business when there is a change in internal or external configuration. Despite its growing academic interest, the BM framework remains primarily a modelling tool (Baden-Fuller & Haefliger, 2013; Foss & Saebi, 2018; Teece, 2010), often deconstructed into three separate but interrelated components: value proposition, value co-creation, and value capture (Baden-Fuller

& Haefliger, 2013; Zott & Amit, 2010). The value proposition specifies the characteristics of the customer offer, clarifying the intended benefits and proposing how customers may derive value from their experiences (Goldstein, Johnston, Duffy, & Rao, 2002). The value proposition component therefore informs the design and improvement of the activity system that supports the proposition (Ponsignon, Smart, & Maull, 2011). The value co-creation component comprises the service delivery system and describes the actual configuration of resources and processes deployed to enable value co-creation. This includes the roles of the employees, technology, physical facilities, and equipment that provide the proposition to the customer. The value capture component specifies how the provider derives value from the transaction, whether that is monetary or non-monetary. Thus, the BM breaks down a company's activities and the links between them in order to understand the process of creating value (Zott & Amit, 2010). It can be viewed statically, describing the components and their interdependencies, or dynamically, as a process of change and innovation (Demil & Lecocq, 2010). Innovation of a BM has been defined as a new BM configuration, that provides a new value proposition to customers (Souto, 2015) or as a result of change in the key components of the BM and/or the links between them (Foss & Saebi, 2017; Foss & Saebi, 2018). As such, a change in value proposition associated with AR/VR devices triggers a process of BM innovation. That process is iterative (Demil & Lecocq, 2010) and made of four cyclical stages: initiation, ideation, integration and implementation (Frankenberger, Weiblen, Csik, and Gassmann (2013). Through this process, the BM framework can support mapping of alternatives and visualisation of the links between the components. However, the process itself requires procedures for facilitating change (Chesbrough, 2010).

Few publications in tourism have investigated the procedural aspects or specific contingencies of innovating a tourism BM (Reinhold, Zach Florian, & Krizaj, 2017). This is further complicated by the role of technology, which is often fundamentally linked with BMI.

Although the BM construct is essentially separable from technology, BMs mediate the link between technology and firm performance (Baden-Fuller & Haefliger, 2013; Chesbrough, 2010; Teece, 2010). Cranmer and Jung (2014) argue for a holistic (i.e. mixed method) approach to research into BM when introducing AR in cultural heritage tourist destinations. Examining AR's potential value for visitors and stakeholders at Geevor Tin Mine museum in the UK, Cranmer, Jung, & tom Dieck (2017) define a business model for heritage sites which have implemented AR in their visitor journey. However, their approach is based on a single case study and remains essentially static, thus does not go so far as to offer a framework for understanding the variety of BMI processes with attention for each component of a BM, including the way services are delivered. Pateli and Giaglis (2005) go further to present a structured approach towards changing the BM when introducing a technological innovation. Their focus lies on identifying alternative configurations for BM development and making decisions based on contingencies of the internal and external environment. Yet the approach is not specific to cultural and heritage tourism sector and does not cover the wider innovation process (i.e. implementation). Jung and tom Dieck (2017) explore how AR technology can enhance value co-creation in CH sites between sites and visitors as well as among visitors. Similarly, Tscheu and Buhalis (2016) propose a framework for analysing the capacity of developers, providers and users to create value from AR in heritage sites. Although the study does not specifically draw on the BM construct, the authors bring to light three key moments in value creation that are significant when considering the whole BM: before installation (requirements of each party); during installation (development process) and after installation (benefits and costs for each part). To sum up, the way CH sites adapt their BM when AR/VR devices are introduced in the visitor journey is not specifically addressed in the literature, especially the changes occurring in the three main components of the BM (value proposition, value creation and value capture). Since these changes raise specific issues (both conceptual

and managerial), it is necessary to study: (1) how to define the BM (and all its components: strategies and operations) of a CH site in a context of mediation tools' innovation, and (2) how to process the BM innovation according to heritage peculiarities. This paper intends to provide answers by proposing a BMI framework for implementing AR/VR digital interpretation experiences in CH Sites.

Research Setting and Methods

Given the research aim, we employ a multiple case study design (Yin, 2003), which is appropriate when dealing with complex phenomenon such as an innovation process. We focus on innovation cases of heritage sites to capture pragmatic, comprehensive and dynamic accounts of the process of innovation specific to the heritage sector. Figure 1 synthetises the methodological approach that is developed below.

[Figure 1 near here]

The study comprises a sample of 12 heritage sites, which Eisenhardt (1989) considers sufficient for generalisability. Six of the cases had completed the process of digital innovation at the time of the study, while the remaining six were in the process of doing so. The latter were part of a European project to diffuse digital innovation at heritage sites. The project consortium selected six sites from France and the UK who had identified the need to improve visitor satisfaction and experience by adding digital interpretation to the visitor journey. The sites having gone through innovation were selected through desk research (e.g. heritage tourism media) and a snowballing approach (using existing contacts in heritage tourism). Care was taken to ensure a diverse sample in terms of heritage type, size, digital technology implemented, and location (see Table 2).

[Table 2 near here]

Data collection for sites having already innovated (Sites G-L, table 2) was conducted between 2018 and 2020. We started with participant observation, to experience the visitor journey as regular visitors (with the same guidance and equipment). This first observation was an opportunity to assess the technological innovation and confirm information from desk research. It also helped inform subsequent interviews. In addition to the visit, we interviewed each site's manager, whose position ensured them a vantage point over the site's transformation. Interviews lasted between 45 and 90 minutes. Informants were asked to narrate the process of innovation, while we made sure to relate it to the site's BM, by raising questions to address all the components of a BM canvas (Osterwalder & Pigneur, 2010; Baden-Fuller & Haefliger, 2013). For instance, we could ask our informant to be more specific about the key activities to maintain the technological devices (value creation), or how they had eventually determined the right price for each tour (value capture). Preliminary visit experience was helpful to identify issues that could affect participants' responses, and we used our participant observations to challenge our informants' accounts (e.g. 'I have gone through your virtual tour and I have noticed it was difficult for some children to stay focused that long: how do you handle families?'). Thus, we managed to establish an account of the BM development through the innovation process.

Sites A-F (cf. Table 2) were examined differently, as they were undergoing the process of innovation, nevertheless we sought to remain as close as possible to the approach previously described. As project participants, we worked closely with these sites between 2018 and 2020, interviewing managers to assess and adapt their BM and implement the technologies being developed. Our collaboration began with a participant observation of the site's offering. Working with the sites' manager in meetings and workshops then allowed regular feedback from the latter about the issues and hesitations they had to deal with as innovation unfolded. Alongside the interviews, these moments were opportunities to comprehensively address the

site's BM and discuss its consistency. This process was repeated every time a substantial modification of the tour occurred.

Finally, data analysis proceeded to highlight the specifics of heritage site's BM relying on AR/VR technology, both in terms of components and process. First, we analysed each case in a 'grounded' fashion (Strauss & Corbin, 1994), with a purpose to list and map the issues / concerns related to the site's design and implementation of its innovative devices. We also paid attention to the moments when these different issues and concerns appeared in the process of innovation. Then, we compared the cases by examining their common features. It allowed to identify five main components (with addition to the traditional BM canvas, as storytelling) and three steps of the BMI process. These were subsequently articulated into an archetypal process of which we derived a methodology for heritage digital innovation – the BMI wheel - a template to structure how a site should proceed to innovate its BM and anticipate critical questions and typical issues along the innovation journey.

BMI Wheel

We now present the composition of the BMI wheel and the process of innovation, which form the BMI methodology.

Composition

The BMI wheel comprises five dimensions: value proposition, storytelling, mediation tools, delivery/operations, and value capture (Figure 1).

[Figure 1 near here]

Value Proposition

One of the main arguments in favour of the introduction of AR/VR solutions at CH sites is improvement to the visitor experience. However, often sites have only a piecemeal and

outdated knowledge of their visitors. In order for new digital experiences to achieve their full impact, site managers need to have identified gaps in the visitor experience and opportunities for improvement. For example, the General Manager at site E discusses the opportunity for inclusivity and meeting different motivational needs of visitors: ‘we could have mindful experiences for people that aren't really interested in the history, but just want... true emotional experiences as opposed to just learning facts... so we can facilitate and set up those experiences in the much more controlled and targeted manner and therefore make them more inclusive as well’. This methodology makes visitor intelligence the cornerstone of technological innovation, focusing on understanding the visitors’ relationship with heritage and their experience of the site in order to develop relevant value propositions. The aim is to create experiences that will match a target visitor profile, motivation and behaviour.

Examples of visitor data include demographic (age gender education, income), geographic (residence, nationality), psychographic (motivations, interests, attitudes), behaviour (spatial behaviour, duration of visit, composition of visiting party).

Understanding visitors in this detail enables the development of value propositions specifically tailored for each audience segment. For instance, research at Site E (see table 1) indicates a person whose ancestors worked in the mining industry may be willing to try a VR tour for a glimpse into what their ancestors experienced while working in the mine in its heyday. Such an experience can highlight their sense of identity and help them forge a connection with the mining heritage (emotional motivation). On the other hand, someone who lacks this affective link with mining heritage may have an interest in trying the same VR experience, albeit to understand better the social aspects of the mining communities (educational motivation). In both cases, the experience is the same (VR tour) but each group derives different value. Thus, a value proposition can be formulated by thinking in terms of the benefits gained from the experience and visitor motivations, whether they are fuelled by social, educational,

entertainment, aesthetic or escapist needs (Falk, 2009; Oh, Fiore, & Jeoung, 2007). For each targeted audience, there would be a value proposition and a corresponding BM.

Storytelling

Before planning new digital experiences, and much like gathering visitor intelligence, it is important to have a clear understanding of the heritage content of the site, that is: the overall story it tells, the visitor journeys offered and the points of interest (POI) on which storytelling is anchored. All of the heritage content plays a key role in the design of the value proposition, and will support an engaging story leading to a higher chance of a memorable visitor experience (Moscardo, 2020). The storytelling itself can be analysed in terms of message conveyed, POI used, and curation.

The new AR/VR experience will enhance the collection of visitor journeys offered by the site. Examples of visitor journeys are family packages, children activities, audio-guides, leaflets, guide books, guided tours, special thematic tours (e.g. night-time tours). Digital technologies can either enhance an existing journey or be used to create a new journey. Regardless, the new experience must fit the collective and the overall message. Breaking down visitor journeys according to their storytelling components (message, POIs used, and curation) produces a list of all the site's POIs, their cultural significance and storytelling potential, and which journeys they are linked to. For example, Sites A and B organised workshops with curation and reception staff members to examine all POIs and decide which to include in the digital experience based on their best value for interpretation.

Once the POIs are listed, a micro-story and curated content is required for each. The same POI can tell multiple stories. At Site B, visitors can listen to a historical/fictional character narrate their role and relationship with a POI, then listen to an expert speak about the academic interest of the POI. This requires script writing to convey the message and curation to ensure

meaningful impact of the experience. A storyboard conveys the narrative of the digital experience and illustrates how and what the visitor will experience at each POI. It also helps identify potential problems before going into production, thus reducing costs.

In some cases, a scientific committee of experts may be required to approve the historical content offered in AR or VR interpretation. Such scientific approval may be mandatory (depending on the site's listed status) or requested by the site and legitimises the accuracy and authenticity of the proposed re-enactments/reconstructions. As the manager of Site A explained: 'from a documentary point of view, we will look for a scientific guarantee for the interpretation provided. We need an architect, if possible highly qualified and very documented on our castle, to draw its architecture according to three periods'. Moreover, a scientific committee could enhance site managers' trust in AR/VR mediation tools and reduce their fear about the lack of authenticity technology could bring, as Dueholm and Smed (2014) noted. This echoes Site J manager's experience: 'as we were developing the VR solution on for our tablet, it was difficult for me to handle the external service provider who was in charge of graphics. He was all about gamification with a wrong idea about Middle Ages, so he wanted to have blood on the walls and so on... I had to stand firm to prevent this misleading historical representation!'

Mediation Tools

Mediation tools come in many shapes and forms, and sites likely already use some as part of the experiences they offer. In some cases, incorporating AR/VR technologies in the visitor journey requires an overall redesign of the site's scenography. At other sites, digital tools are used to complement existing scenography, in which case the new tools must align, in terms of the messages they provide, but also complement other technologies currently present in the journey. Indeed, a too conspicuous difference between two generations of technologies

employed on the same journey could accentuate perceptions that older technologies are now obsolete, as in the manager of Site A commented ‘articulating previous scenography and new digital devices is challenging, certainly in the long term the previous scenography has vocation to disappear’.

Managers also need to consider the dyad interface/technology when designing new digital mediation. The interface has the role to present the content and thus can be a person, e.g. a guide, or an object, e.g. signs, tablets, or audio guides. The technology is what the interface uses to present the content: images (e.g. photographs, drawings, diagrams), audio, video, 360° view, virtual reality, augmented reality, etc.

Choosing the type of technology to employ will depend on what story is being told (cf. Storytelling), how and to whom (cf. Value proposition). Whilst it is possible to design a visitor journey with digital interpretation at every single POI, doing so entails substantial costs in production. Deciding where to apply digital technologies requires examining every aspect of the heritage site, including resources available (cf. Delivery), heritage content (cf. Storytelling), the desire to attract new audiences or to increase visibility of under-used POIs (cf. Value proposition). For example, at Site E it was decided to develop a digital augmentation of the natural landscape showcasing the site in its industrial past, on which the site possessed substantial research. AR technology was seen as a suitable tool to capitalise on this research and create a new experience for visitors that tells the story of its heritage and enables access to inaccessible parts of the site. As the General Manager comments ‘It’s about carefully considering where you do things and why. I don’t think I would put (AR/VR) in a country house, when people are walking through the house in the environment and can see it for real, there has to be something where you’re really enhancing value and solving a problem. With the mining sites you can’t imagine what they were like. They are so changed and so different... a lot of mines are inaccessible now ... that was the problem that we wanted to solve.’

Other issues may emerge from the installation of technological equipment in protected heritage sites that are subject to restrictions or third-party approval. For instance, prevention of cable and wire installation may require a wireless network where possible. Natural constraints made wireless communication difficult in the coastal landscape (Site D), as was the case with architectural constraints for the Medieval cathedral (Site B) and castle (Site A).

Some on-site testing on practical aspects of the device use is necessary to ensure an optimal experience. For instance, the light in a room may have a detrimental impact on how the AR image triggers on a physical model, e.g. if the sun through the window shines too strongly (Sites A, B, C, E). VR experiences require space to accommodate the hardware, e.g. server computer, long cables, and headsets, while simultaneously leaving enough space for visitors to explore the virtual environment comfortably. VR technology may be inadequate in certain heritage sites with space constraints: for instance, Site I is too narrow to accommodate the hardware, or medieval sites where rooms cannot be changed (e.g. Site A). VR experiences are also not recommended in places where visitors' safety is difficult to warrant, in particular in landscape heritage (coastal landscape, tin mines).

Delivery

The General Manager at site E makes the point that '(digital mediation needs to) fit in with the rest of your experience as well? So it doesn't just stand alone... I think we've all been to destinations where there's a either a bit of broken interpretation or a or a random film playing that you're never going to go and watch... I think it's about really integrating and understanding why you've got these (devices)'. As this suggests, introducing digital mediation tools requires changes in site management and services. Services comprise staff activities (front and back office) as well as resources required for the realisation of the value proposition. To begin with, all the services proposed by the site, including temporary offerings, should be listed.

The list of required activities and resources can be drawn up using a blueprint tool (Bitner, Ostrom, & Morgan, 2008). The advantage of the blueprint is that it offers a view of the organisation through the eyes of the visitor, following every step of the visitor journey while mapping out the key components of current operations and indicating the activities and resources required for each step. Ultimately, the blueprint provides a useful basis to anticipate the organisational changes required for the new BM. For each POI in a new visitor journey, it is necessary to identify resources, visitors' actions, and staff 'actions (front and back office).

In terms of resources, physical elements are necessary to indicate how and where to use the mediation tools, and often imply alterations to the site's layout. For example, fitting a sign at the entrance to help visitors get started, and throughout the route with instructions on how to access the digital content, e.g. for triggering augmented reality on physical models (Site A; Site B). For instance, in Site G, a video explaining how to use the AR tablet was displayed on repeat while visitors wait in the queue for their entrance ticket as a way to promote the device and to provide instructions on how to use it. In addition, purchasing hardware such as tablets and VR kits needs to follow guidelines set out by software developers. Finally, additional storage space is necessary to store and recharge the AR and VR devices.

As for visitors' actions, introducing digital tools can modify visitor traffic depending on the type of site and their spatial characteristics (e.g. indoor-outdoor, wide or narrow): this was the case at Site A, a medieval castle where some outdoor spaces were wide and the visitor journey direct the visitors to a narrow indoor space with technological devices leading to queue building. Anticipating visitors' actions at each POI helps to avoid problems such as queuing, conflicts of use, and damage risks. For example, it may be difficult to access the physical model that triggers an AR animation when too many people are in the same space simultaneously, as observed at Site B and E.

Introducing mediation tools also creates new tasks for staff, often requiring additional skills. At Site G ‘staff training was conducted internally with the digital devices provider’ (site manager). Front office actions include distributing the devices, explaining how they work, retrieving them and refunding the deposit (if applicable). ‘We take the time, at the start of every visit, to provide all the information necessary to use the tablet’ (Site I). These new tasks can be assigned to current or newly recruited staff members. Digital mediation tools can also change the way some front-office services are delivered, e.g. guided tours, hence it is important to regularly monitor employee wellbeing to avoid professional identity and legitimacy problems.

Back office staff need to ensure the devices are available and recharged (Site I), manage maintenance and repair internally (Site A) and/or *via* subcontracting with a service provider (Site H). As the manager of Site I explained: ‘We have a rental scheme that requires internal management to know which tablets are out with visitors, which tablets are still available, and when recharged tablets are going to be available’. The communication department also plays a key role in attracting tourists and tour operators *via* social media, website, press, or tourism fairs, and inform them about any use restrictions in place (age, number of participants, etc.).

Value Capture

Value capture is typically concerned with whether or not a BM works commercially. Of course, what constitutes value in the heritage tourism sector is not simply financial, it is often more complex than that. Pricing can be free or, where entrance fees are charged, they are nominal and do not relate to the true cost of providing the service or maintaining buildings and assets. Recognising that profit maximisation is not their only, or their primary, objective¹, BMs that include AR/VR technologies require substantial investment and so information regarding financial viability (income in relation to cost) is an important part of the innovation process.

¹ In Site A, the Mayor aimed primarily to create attachment with the city through its castle.

As the manager at site B explains: ‘the key question is how do you get income in all of this? if we're providing an (AR) experience outside of the building, that's costing us and not generating money? ... The easiest thing for us to do to get people into the building is not to charge them... it was certainly my view that we should be moving away from a charging position. But equally, we've got to get a financial model’

For every value proposition, the sites need to design an associated income stream to capture value. On the other hand, just as for every BM there is an income stream, for every BM there are associated costs.

Monetisation strategies for digital experiences can be direct or indirect. A direct revenue generating strategy directly charges a price associated with the experience. There are three types of right a business can legally sell (Weill, Malone, D’Urso, Herman, & Woerner, 2005):

- Selling ownership rights to an experience can be a scalable way to offer storytelling and mediation, encouraging people to visit the site without adding pressure to existing mediation interfaces and site resources (e.g. guided tours). Examples include selling a tour/guide book or app. When a guide book is bought, customers own the book, they have the right to resell, gift or dispose of it. However, selling an experience (a tour) in this way still encourages visits to the site. Similarly, a trail or tour can be sold as a digital product, as an in-app purchase to an app or as an app in its own right. A digital tour, in comparison to the print version, may be lower in price but is harder to transfer ownership or resell. But we realise that this is not an option used by the sites we studied.
- Selling matching rights represents a fee paid to a site that matches potential customers to advertisers. This is akin to a traditional advertising model. While this model has been criticised on the basis customers do not trust advertising media, often do not view the adverts and no longer need adverts to inform a buying decision. This criticism is often

directed at pop-up advertising, there may still be a place for matching rights where the content is linked and relevant to the activity.

- The most common direct monetisation strategies sell usage of, or access rights to, an experience. When selling usage rights for a digital experience as part of broader cultural heritage offering, sites need to consider how to combine entrance charges with fees for the digital experience(s). For instance, there may be no charge for entry or customers may be charged a price per visit or a recurring membership fee. In addition, charges for the digital experiences themselves may be at an additional ticket cost (Site G) or included in the entrance charge (Site I).

Which strategy to choose will depend on several factors, including willingness to pay of potential customers, competition, existing BMs and current charging structures, and type and length of experience. These factors effect customer expectation of price and their willingness to accept a charge.

Indirect monetisation strategies, on the other hand, generate revenue from activities other than from the experience itself which is free of charge in these cases. For example, using VR and AR to increase relevancy, engagement and visitor numbers, ultimately to attract an increase in new and repeat visits, generating revenues through existing streams. Or driving customer spend in other peripheral activities by monetising downtime. For instance, when visitors are waiting for their turn to play VR or for their peers to finish their turns, operators can sell other forms of entertainment like pay-to-play non-VR games and high-margin food and beverage items - which also encourage people to spend more time onsite. This is the case in site H, where admission to the museum is free however visitors must first walk through the Museum Shop selling vineyards and wine related items.

Table 3 summarises the key questions for each dimension of the BM. Answering these questions allows heritage site managers to build an innovative visitor journey based on AR/VR technology. Table 4 offers a template for step-by-step elaboration of such a journey.

[Table 3 and 4 near here]

BMI Process

The process of BMI consists of three main phases: analysis, design, and evaluation. To make the BMI process more operational and easier to set up for site managers we focus on three main innovation stages/phases.

The 3 Phases of BMI

The first stage defines the current BM of the heritage site, providing a baseline to identify opportunities for digital enhancement. This includes capturing a detailed picture of the current BM i.e. current visitors' profile, experience and behaviour; creating an inventory of the heritage content and points of interest; assessing current interpretation tools; identifying key resources and activities realised by site staff; and having a sound understanding of current income streams and costs drivers. This phase creates a sound basis for development of the following stages. For instance, a rich description of visitors enables multiple approaches to audience segmentation, depending on the site and the experiences being developed. From a practical point of view, the collection and analysis of visitor data can be achieved using three main tools: visitor surveys for profile and personal data; geospatial tracking for visitor behaviour; and natural language processing of online reviews to reveal patterns in visitor interactions and experience. Having such understanding can also minimise potential challenges, e.g. at Site F, conflicts between two targeted audiences were revealed when confronting the existing BM ('search for quiet and contemplative experience by seniors') with the designed BM ('search for entertainment by families with young children').

The second stage is the design of new digital experiences and configuration of the respective BM(s). The design and development of the digital devices should provide particular groups of visitors with relevant content aligned with their interests, as well as the site's cultural and heritage significance. There is a focus on developing personas for these groups, based on visitor data captured, each persona may require a bespoke storytelling experience. Furthermore, technical decisions are made, such as choosing the type of technology, devices and digital content that is most adequate to deliver the new value proposition. As explained by the manager of Site H: 'We worked a lot on intuitive user interface with the developers, because at the beginning the startup messages shown on the tablet were confusing and people got lost between the two functionalities proposed'. Organisation planning is covered to ensure the technology developed is aligned with the available resources. Staff and operational aspects are considered, with particular emphasis on new services and activities necessary to run the operation. Finally, an appropriate monetisation strategy plan is developed to capitalise on the investment.

The final stage is testing and evaluating the performance of the new BM. Despite careful planning, some unexpected issues might occur after digital devices are introduced in the visitor journey. For instance, Site I registered an increase in new visitor segments (younger), as well as in the visit duration. Soon after launching the digital tour, staff at Site I realised that some visitors needed further instructions than those provided before the visit, therefore 'we started providing an additional leaflet to help people who may have difficulties, that they can take with them to remind them of the main actions to use the tablet'. Testing allows site managers to identify such issues and consider possible solutions. This phase should also consider new indicators for success and respective measures/tools to assess specific objectives against the baseline developed in the first phase. For instance, assessing how the new AR/VR experiences impact the overall visitor experience, their satisfaction and learning outcomes; or in terms of operations, evaluate how the staff is adapting to their new tasks. Such an evaluation depends

on the monitoring resources at hand, as the manager of Site J reminds us: ‘We are a modest organisation in a small town. We do not have the tools to implement a systematic, scientific assessment methodology. (...) So, our indicators are very simple: feedbacks from the staff at the welcome desk, reading the good old guest book...’ While their technical development provider had offered to add a monitoring functionality to the tablet (e.g. measuring the time spent by each visitor at each point of interest), the manager admitted that they did not have enough time to make use of this data, which was eventually abandoned.

The Search for Consistency

Throughout the process of innovation, site managers need to keep in mind the importance of a consistent articulation of the different components of the BM. The evaluation phase especially will allow site managers to raise questions, identify problems and come up with solutions for improvement. Accordingly, site strategies in terms of value proposition, creation and capture should be adjusted to maximise its impact. For example, a site manager may find a VR experience generates a 10% increase in revenue. Yet simultaneously, the maintenance expenses and additional staff incurred by headsets corresponds to 12% of revenue. It might then be appropriate to slightly increase the price of the VR experience in order to cover for the loss.

Site managers should not have a restrictive view of this adaptation process. First, it is not limited to the evaluation phase and should be seen instead as a cycle from the first to the third phase, and back to the first phase. In the example above, the price increase is not the end of the innovation process, as visitors will react to this price change. Secondly, it is also important to ensure a certain consistency between each of the BMs (digital or not). As seen before, a new digital gamified experience for the young visitors of a botanical garden will likely impact the experience of visitors looking for a peaceful atmosphere.

Discussion and Conclusion

Introducing digital technologies such as AR and VR in heritage sites is a complex endeavour that involves both technological and organisational innovation. Working with a balanced combination of the five dimensions of the BM means that any change to one dimension requires a rethink of the entire BM wheel to ensure its consistency.

The methodology proposed in this paper runs site managers through several aspects of analysis of: the current BM, design of a bespoke BM for the new digital experiences, and evaluating its implementation. The main challenge of the BMI process is to reach consistency between each dimension of the business wheel, as well as between each stage of the innovation process. In this sense, the methodology proposes a visitor journey table as a central step-by-step tool, offering a holistic view of the storytelling, operational and technological aspects of implementing digital experiences. This template breaks down a digital experience in terms of its value proposition and target audience, storytelling and heritage content, technological mediation such as type of technology and interface, delivery and operations including staff activities and resources, and costs and income projections.

In addition to the visitor journey table, a series of key questions, templates, examples, and tips are proposed for each dimension of the BM to assist in practical application of the methodology. Furthermore, while the five dimensions of the BM are listed and numbered, the process is not so linear. In fact, it is likely that site managers will go back and forth between dimensions as they progress. As such, the methodology is developed in a modular style, making it possible to start with the dimension that makes more sense for each case.

In this way, the methodology proposed in this paper has several managerial implications. Fundamentally, the methodology allows site managers to approach the process of digital innovation based on central aspects including the heritage link of visitors, the significance of

the cultural message conveyed, and the social value generated. It provides a series of procedures and steps to assist site managers in the organisational innovation that inevitably takes place when new digital experiences are introduced to the visitor experience. While there are many solutions for innovation, few have been developed specifically for the heritage sector. As a result, actors in cultural tourism are often required to adapt generic tools to their site, making the process more difficult and arguably less efficient. Thus, the methodology presented here offers procedures and recommendations that are compatible with the needs and requirements of the heritage sector, including conveying heritage in a meaningful way, preserving and safeguarding heritage values, and warranting a memorable visitor experience.

The paper highlights the importance of planning for digital innovation from the managerial perspective and offers recommendations and a blueprint of the main activities necessary for the innovation to be successful. While it is specific for the heritage sector, the tools provided are sufficiently broad to be applicable many different types of heritage attractions (including religious, natural, military or industrial, among others). Fine-tuning operations in several settings including outdoor, indoor, underground, and site-specific requirements such as types of protective listing, can also be accommodated.

As for theoretical implications, the paper offers a BMI model contributing to further conceptualisations of digital innovations in heritage tourism. Few publications in tourism have investigated the procedural aspects or specific contingencies of innovating a tourism BM (Reinhold et al., 2017). The methodology proposed here complements previous knowledge on BMI in heritage sites (Eleanor Cranmer, Jung, tom Dieck, & Miller, 2016; tom Dieck & Jung, 2017; Trunfio et al., 2021), namely by employing visitor intelligence tools that account for visitors' engagement with heritage features and significance, e.g. geospatial analysis indicating time spent interacting with artefacts and points of interests, or visitor motivations for engaging with certain types of heritage (Smart, Phillips, Ross, Manchanda, & Mosconi, 2020);

furthermore, by examining storytelling and curation of value propositions guarantees that the significance of the site's heritage content plays a key role in the innovation process, following recent research underlining how effective storytelling maximises visitor engagement, satisfaction and meaningful experience (Moscardo, 2020; Vrettakis et al., 2019); finally, by exploring value capture strategies that integrate affective heritage value in addition or instead of solely focusing on monetary value of tourism experiences.

We contend the value of our BMI model also lies in the fact that it enriches the understanding of how AR/VR technologies are consistently articulated with the other (non-technical) elements of the service provided by CH sites (Trunfio et al., 2021), with a focus on how the introduction of these technologies effects this articulation within a dynamic BM (Demil & Lecocq, 2010). Finally, while the research field lacks conceptualisation and theorisation (Jung & Khoo-Lattimore, 2019), the paper has the ambition to contribute to theorisation by proposing a structured, holistic approach to BM innovation through the implementation of AR/VR technologies in the visitor journey (Cranmer & Jung, 2014), that is specific to the cultural heritage tourism sector.

Despite its relevance, the study is not without limitations. First, albeit that the study sample comprises twelve heritage sites, the core of research was developed mainly in two of these, which may potentially limit the scope of the research. However, care was taken in investigating the remaining ten case study sites in order to confirm/disconfirm findings and ensure generalizability of the BMI methodology. Future studies could further test and refine the proposed methodology to assess its applicability in other cultural heritage sites and to wider tourism contexts. Further, data for this study was collected over a two-year period (sites A-F) or retrospectively (sites G-K). Future research, based on longitudinal data, may further inform the process of innovation and how it develops over time. Longitudinal data may also provide insight into the performance of BMI in cultural heritage sites. Additionally, research is needed

into the drivers of BMI in cultural heritage sites and research into user experience of these devices.

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Tables and figures

Table 1: Main studies on AR-VR in CH sites

	Topic	Sub-topic	References
Demand side	User experience	Consistency between belief about AR-VR-Mixte and visitor experience satisfaction	- Chung, Lee, Kim & Koo, 2018 : AR - Han et al. 2018 : VR - Errichiello et al. 2018 : VR - Trunfio et Campana 2020 : mixte reality
		Concept proposal (EPI cube) on relations between AR-VR perception and visitors satisfaction	- Flavian et al. 2019
		Student: AR-VR and education	- Moorhouse et al. 2017 : tourism education - Kysela et Storkova, 2015 : history education
	Technology acceptance	Acceptation of AR-VR technologies in CH sites	- tom Dieck & Jung, 2018
		Design ‘impact on willingness to pay, visitor engagement, learning	- He et al. 2018 - Carrozino et Bergamasco 2010 - Abu Bakar, Zaibon & Pendit 2014
		Organisational issues	Manage organisational issues is crucial but less explored
		Visitors ‘ satisfaction encompass the AR-VR device and other services ; the whole ‘museum service model’	- Trunfio et al. 2021

Table 2: Sample of studied heritage sites

Case letter	Heritage site	Stage of innovation	Heritage type	Digital technology	Annual Visitor number	Country	Key informant	Observation date
A	Medieval castle	In process	Military heritage	AR (tablet) VR (immersive room)	100.000+	France	Female 30-35	2018-20
B	Medieval cathedral	In process	Architectural heritage	AR (phone / tablet) VR (headset)	100.000+	UK	Male 25-30	2018-20
C	War shipwreck museum	In process	Historical heritage	VR (headset)	10.000	France	Male 50-55	2018-20
D	Coastal landscape	In process	Natural heritage	AR (phone)	300,000+	UK	Male 55-60	2018-20

E	Tin mines	In process	Industrial heritage	AR (tablet) VR (headset)	150,000+	UK	Male 40-45	2018-20
F	Botanical garden	In process	Natural heritage	AR (tablet)	55.000+	France	Female 40-45	2018-20
G	Royal palace	Implemented	Historical heritage	AR (tablet)	2 million	France	Female 40-45	10/2018
H	Vineyard's ecosystem	Implemented	Natural heritage (UNESCO world heritage)	AR (tablet)	25.000+	France	Male 35-40	10/2018
I	Troglodyte farms	Implemented	Architectural heritage	AR	15.000+	France	Male 40-45	10/2018
J	Medieval castle	Implemented	Historical heritage	AR (tablet)	80.000+	France	Male 45-50	05/2019
K	Mines	Implemented	Industrial heritage	AR & VR (phone or tablet)	- 2000	France	Male 45-50	05/2019

L	War museum	Implemented	Historical heritage		15000+	France	Male 45-50	07/2019
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Table 3: Key questions in business model innovation

BM dimension	Key questions
Value Proposition	<ul style="list-style-type: none"> • What service does the cultural heritage site offer? • What is the value proposition of new digital experiences? • Who are the current visitors? • What is the profile of the target audience of the digital experience?
Storytelling	<ul style="list-style-type: none"> • What is the significance and message of the site's content? • What heritage features will the technology illustrate? • What story will be told, and how, to the target audience?
Mediation tools	<ul style="list-style-type: none"> • What mediation tools does the heritage site use to tell its story? • What technologies are best suited to tell the story and deliver the value proposition? • Do the digital tools integrate current visitor journey or is an entirely new journey required?

Delivery	<ul style="list-style-type: none">• How does the heritage site operate to provide the services offered to visitors?• What activities and procedures will be necessary to provide the new digital service?• What resources will be necessary to implement these activities?
Value Capture	<ul style="list-style-type: none">• What mechanisms will be required for the heritage site to capture the desired value from the new digital experiences (financial, political, reputation, visitor satisfaction, etc.)?• What are the options to monetise AR/VR experiences?

Table 4: Visitor Journey Table

Journey title: <i>AR app tour</i>													
Value proposition: <i>Experience the cathedral through the eyes of a fifteenth century pilgrim, in a visually appealing tour with augmented and virtual reality.</i>													
Target audience: <i>General public</i>													
Pricing:													
Visitor journey			Storytelling			Mediation				Delivery			
Ep.#	Episode name	Duration (est.)	Message	POI	Curation	Interface	Technology	Media	Trigger modality	Visitor actions	Staff actions (front office)	Staff actions (back office)	Resources
1													
2													
...													

Figure 1: – Methodology overview

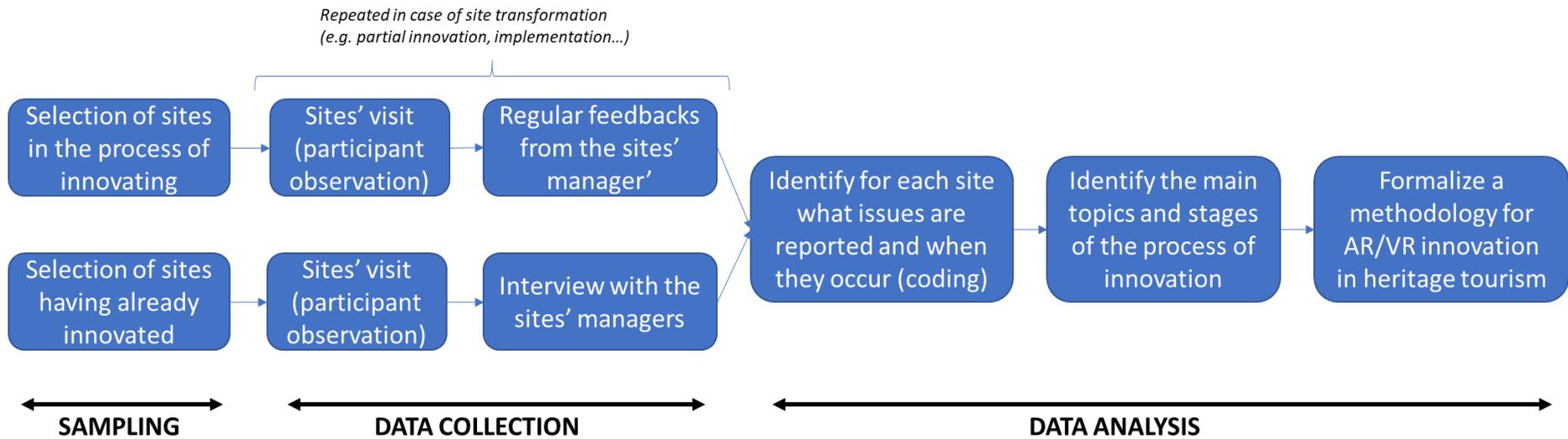


Figure 2: The cultural heritage site Business Model wheel

