

DIGITAL INNOVATION OF CULTURAL HERITAGE:

Handbook for tourist destinations and
cultural heritage institutions



Concept and content: Matevž Straus, head of the Heritage+ programme, dr. Urška Starc-Peceny, research and development lead and head of the Tourism 4.0 department, Katarina Ceglar, project manager, and Tomi Ilijaš, director

Graphic design: Arctur d.o.o.

Publisher: Arctur d.o.o., Industrijska cesta 1a, 5000 Nova Gorica

Print run: 100 units

Publication location and date: Nova Gorica, February 2022

The contents of the handbook have been primarily prepared for the publications in the project for the Ministry of Economic Development and Technology of Slovenia in 2019 and also for the INSITES project in 2021 (co-financed by the Erasmus+).

CIP - Kataložni zapis o publikaciji
Narodna in univerzitetna knjižnica, Ljubljana

004.9:338.48-4(035)
719:004.9(035)

DIGITAL innovation of cultural heritage : handbook for tourist destinations and cultural heritage institutions / [concept and content Matevž Straus ... et al.]. - Nova Gorica : Arctur, 2022

ISBN 978-961-94587-2-3
COBISS.SI-ID 99110659

INTRODUCTION

When the first toolkit on digital innovation of cultural heritage was published in the Slovenian language in 2019, we could not have imagined the interest it received – not just within Slovenia, but especially outside of our borders. The path that Slovenia is taking toward becoming one of the leading European country in the field of unique tourist experiences through the systematic digital innovation of cultural heritage has received many interest by foreign destination management organisations (DMOs), public sector, academia and NGO sector.

The main purpose of this toolkit has always been sharing knowledge and opening up questions on the development of complex projects at the intersection of 1) tourism, 2) cultural heritage and tourism.

Thus an English version with additional learnings and new insights has been long awaited and much needed. Hopefully this toolkit engages new ambassadors for our millennium-old roots, ensuring that they become (and remain) part of our future.

Shaping the Tourism of the Future

Many things are happening around the world right now. For example, at this very moment 3 million Google searches are performed and every day 30.000 people would visit Leonardo da Vinci's Mona Lisa at the Louvre gallery in Paris. An incredible amount of resources is used all over the world, as a result, 2.12 billion tons of garbage is created every year and a huge amount of CO₂ is pushed into the atmosphere. The numbers show us the impact of our everyday life, habits and behaviour on the world around us.

Talking about numbers, tourism is a major economic activity in the European Union with a direct 10% contribution to the GDP. Moreover, it has a wider impact on economic growth and employment. Tourism is often intertwined with life in the visited destinations (e.g., hospitality facilities, events, culture) and tourism-related activities accounted for 22,4% of persons employed in the service economy in Europe in 2018 (Eurostat, 2018). Cultural tourism in Europe is accounted for 40 % of tourism as 4 out of 10 tourists choose their destination based on its cultural offering based on a rich heritage – museums, archaeological sites, historical cities, traditions, etc. Cultural tourism has the capacity to enhance Europe as a global destination and Tourism 4.0 can significantly contribute to achieving this goal.

The European Commission has published a recommendation on a common European data space for cultural heritage with the accelerating digitisation of cultural heritage assets – monuments and sites, objects and artefacts for future generations, to protect and preserve those at risk, and boost their reuse in domains such as education, sustainable tourism and cultural creative sectors. **The Commission encourages the Member States to digitise by 2030 all monuments and sites that are at risk of degradation and half of those highly frequented by tourists** (Tourism Transition Pathway, 2021). This is a very important goal also for Slovenia as we are extremely rich in cultural heritage with 29.359 units registered in the registry of immovable cultural heritage, of which 8.470 units are declared as cultural monuments.

Our aim is to preserve our cultural heritage by bringing digital innovation processes into the heritage sector.

For Slovenia, two main documents will set the guidelines and standards. The first one is the Strategy for sustainable development of Slovenian tourism 2022–2028, which will be complementary to the priorities in the Digital Transformation Strategy of Slovenian tourism 2022-2026. Both documents reflect the spirit of Tourism 4.0 which is driving Slovenia towards smart, green, sustainable tourism that uses technologies to build sustainable high value-added tourism by involving and focusing on the quality of life of the local residents.

The Slovenian path has already been paved in the last two years with the digital transition in the heritage sector resulting in 100+ units of cultural heritage being digitised.

Digital innovation of cultural heritage was recognised as one of the key priorities on a national level. Slovenian leading destinations (35) were given the opportunity to digitise their heritage and to create unique 5-star experiences.

The national project, co-financed by the Ministry of Economic Development and Technology, led **Slovenia to become one of the pioneers and the most advanced European countries in digital innovation of cultural heritage.**

Now is the time to use this experience and to strengthen the collaboration between the heritage sector and tourism. We all have the same goal, to welcome sustainable and responsible tourists who would treasure our heritage in our local communities. Innovative digital content allows us to present our local heritage, tell untold and forgotten stories by using advanced technologies – VR/AR glasses, holograms, object recognition tables and many others.

This booklet is here to share this knowledge and to inspire. Together with you, we want to transfer our roots from the physical to this new hybrid reality for us and all next generations. Join us!



»We owe the preservation of our European cultural heritage to future generations. This requires building and deploying our own technological capabilities, empowering people and businesses to enjoy and make the most of this heritage. We must take advantage of the opportunities brought by artificial intelligence, data, and extended reality. The European data space for cultural heritage will promote creation and innovation within the cultural heritage sector, and beyond, in education, tourism, and cultural and creative sectors.«

THIERRY BRETON, EUROPEAN COMMISSIONER FOR INTERNAL MARKET
PHOTOGRAPHER: JENNIFER JACQUEMART
EUROPEAN UNION, 2019

Cultural heritage faces a challenge

Cultural heritage consists of the achievements, teachings and values of our forebears and it is the foundation upon which the identity of a space and its residents is formed. Unfortunately, it often goes unnoticed or is pushed aside due to the constant flood of information, social media and instantaneous entertainment that we are exposed to.

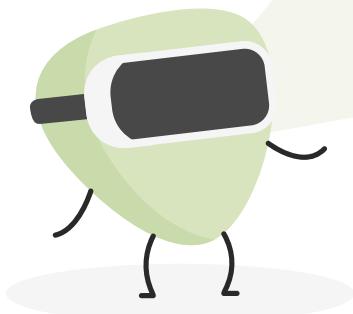
As humans, we have always experienced the world in two ways, the imaginary and the physical. New technologies have given rise to various new experiences where these two dimensions intertwine and shape a new reality which young people tend to have taken for granted, while some of us are still getting used to it.

This new reality is filled with imaginary characters and stories that excite the youth while our cultural heritage lies forgotten in the display cases of carefully preserved museum collections.

We want to change this.

We wish to uncover all the hidden gems, to find stories that have been sparking the imagination of our ancestors for centuries and bring them to life. We wish to use modern technology to create new tourist experiences that will connect our modern reality with our roots in a unique way.

It is Slovenia's vision to become the leading European country in the field of digitally enhanced experiences of immovable cultural heritage.





Castle Strmec (Socerb)

What are digitally enhanced experiences of immovable cultural heritage?

The digital innovation of heritage can be understood as the intentional development of new, user-oriented products and services which take advantage of the potential of advanced technologies (augmented reality, 3D scanning and 3D printing, internet platforms...). This innovation happens in conjunction with the respectful treatment and preservation of heritage (by using non-invasive technologies) and the development of appropriate knowledge and skills that connect heritage studies with business approaches and skills (art & design thinking, business models, user experience, digital marketing).

Digital enhanced experiences of cultural heritage:

- | imply an engaging and user-friendly conveyance of the values connected to natural and cultural heritage
- | make use of advanced technologies for greater interactivity, memorability, storytelling and the global recognition of tourist experiences
- | develop new business models and demonstrate positive effects on the local economy
- | develop hybrid competencies of heritage and business approaches and skills (art & design thinking, business models, user experiences, digital marketing)
- | meaningfully include the offers of local businesses (accommodation facilities, food establishments...) and connect with other tourist products.

"Heritage tourism is travelling to experience the places, artefacts, and activities that authentically represent the stories and people of the past and present."

THE NATIONAL TRUST FOR HISTORIC PRESERVATION IN THE U.S.

Digitally enhanced experiences of cultural heritage or Cultural Immersive Experiences (ITE) are the inner voice of a cultural heritage site.

They must be able to:

- | Create a real competitive advantage for the site;
- | Focus on what is truly unique, memorable and engaging in the area;
- | Meet the needs of the target audience.

Today's travelers are eclectic. In planning and developing experiences, we should look at tourists as groups of individuals or micro-segments, each with his or her own motivations, culture and way of relating to others. The growing demand for customised experiences has forced the cultural sector to reinvent itself. Pushing the pace of digital development.

In the next pages we'll look at how to design immersive tourism experiences for your visitors, both technological and non-technological, with concrete examples and international case studies.

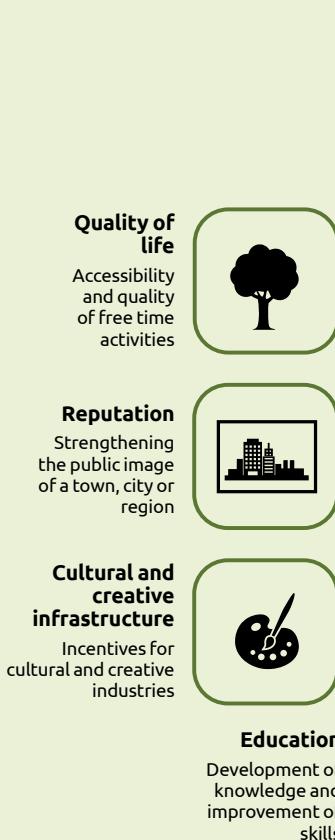
Van Gogh: The Immersive Experience

In the video at the link you can see an example of an immersive experience where visitors don't just observe the artworks but they actually "enter" into them.

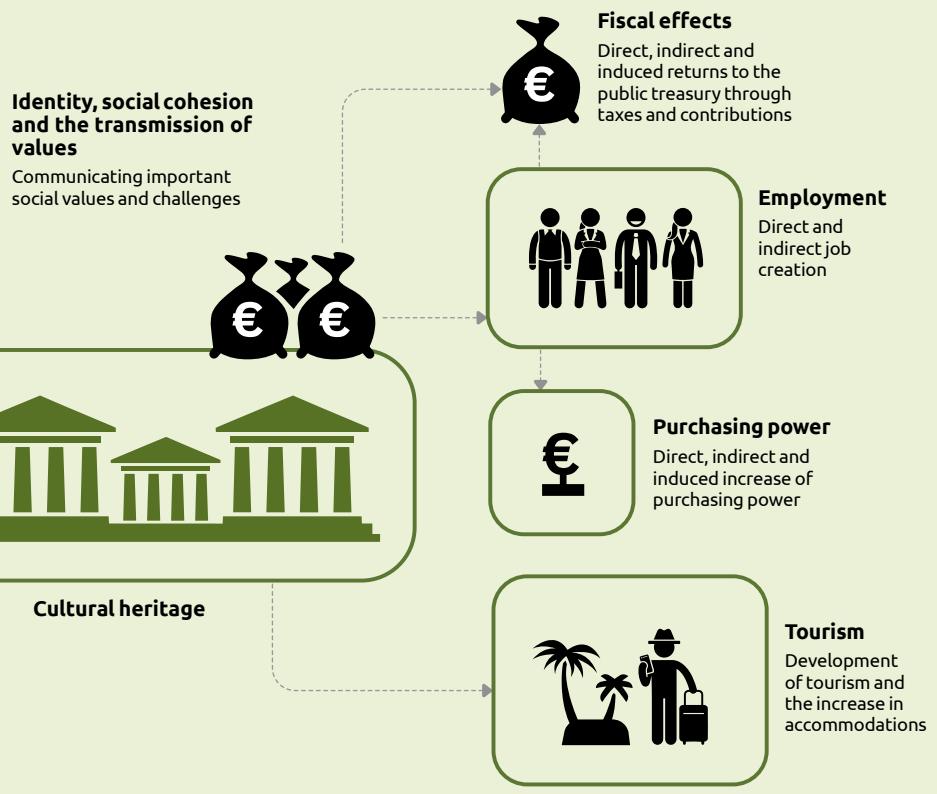
More: www.youtube.com/watch?v=dZkQSjZYsgc

Direct and indirect effects of cultural heritage

Social and cultural effects



Economic effects



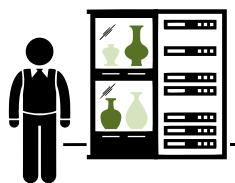
Summarised from: Muchitsch, W. & Kradischnig, G. 2018. Zur Lage der österreichischen Museen. Graz: Museumbund.

5 good reasons for the digitisation of cultural heritage



1. Attracting new audiences

New technologies can attract fresh audiences that had not shown any previous interest in cultural heritage, who had overlooked it or considered it boring. Digital technologies present new methods for presenting content – for example in a visually more attractive way – and offer better explanations or breakdowns of information that include the visitor. **These kinds of solutions are also attractive for groups that don't consider themselves drawn to cultural heritage.** New interactive technologies and new methods of digital storytelling are not meant only for those already interested in cultural heritage but can also **widen the circle of potential visitors.**



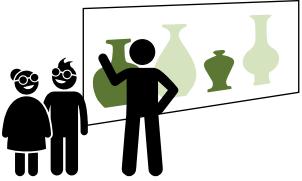
2. Preserving cultural heritage in the digital world

Technological development has created an increasingly large and complex environment of digital information, objects and relations. We are slowly shifting to digital copies of our real world: we started with paper documents and letters, many of us now have more digital than printed photographs. Maps, blueprints and many other services are now also primarily digital. On the other hand, cultural heritage remains mostly un-digitised. Even though the physical preservation of cultural heritage is the primary measure of stewardship, **we must ensure the presence of cultural heritage wherever its potential audience might be, including the digital world; the internet, mobile applications, video games, digital registers, online libraries etc.**



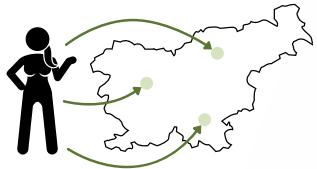
3. Greater interactivity and involvement

Digital technologies enable communication and interactive experiences that classic methods of presentation do not allow for (texts, articles, information boards, photographs, videos...). Through the use of technology, the process of learning about cultural heritage can become **interactive, simultaneously making it more educational, memorable, individualised and experiential.** Cultural heritage can be introduced to people through (serious) play and practical experience.



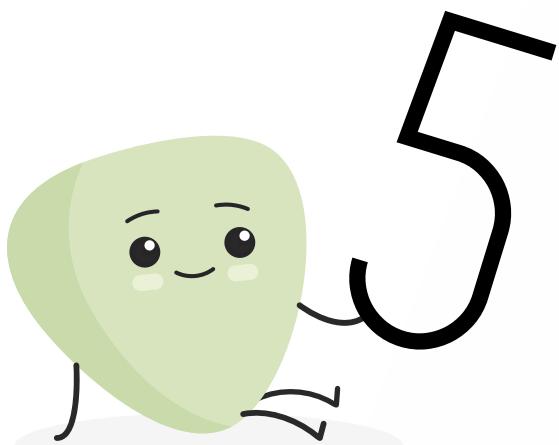
4. Creating opportunities for creative industries

Heritage institutions – museums, archives, galleries and libraries – have always been keepers of information who share it with the wider community. Digitisation and digitalisation make this sort of exchange of information even easier – without any concern that the original might be damaged, digital copies of cultural heritage from scanned photos and documents to 3D models of buildings and objects can be **shared with the public, with creatives, developers, researchers, schools and faculties or anyone who wishes to create new value.**



5. Redirecting visitors to new destinations

European cultural heritage is one of the most evenly distributed goods – it is present to the east and west, north and south, it is everywhere unique, but still part of a common story. It is a local resource and an **opportunity for either creating new destinations or for developing existing ones, as well as shaping new flows of tourists**, thus ensuring a more even distribution of both the benefits and burdens of tourism.



Elements of a good project

As is true of every project, the successful application of digital solutions to cultural heritage depends on many elements, such as content, technique and administration. The key to success lies in effectively balancing four key factors: interpretation, technology, sustainability and the protection of heritage.

Storytelling and interpretation

- Meaning
- Creativity
- Content
- The visitors' needs and wishes

Technology

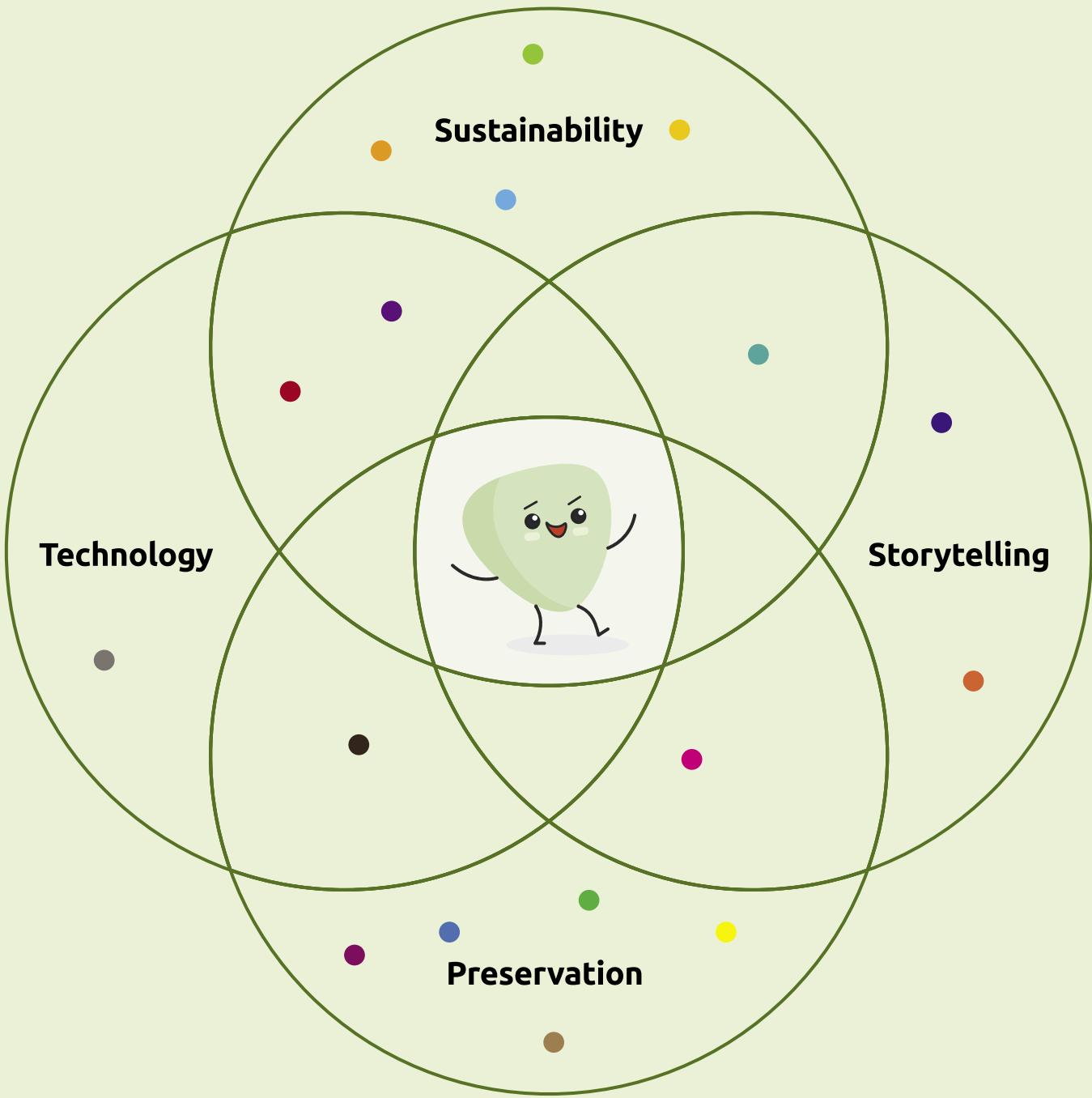
- User experience
- Quality
- Accessibility
- Accuracy

Sustainability

- Agreement of stakeholders
- Cost and time efficiency
- User experience
- The visitors' needs and wishes
- Inclusivity
- Accessibility
- Constant development

Preservation of cultural & natural heritage

- Meaning
- Stewardship
- Long-term storage
- Education and raising awareness
- Based on scientific evidence
- Considered in context
- Accuracy



Explanation of the factors

Storytelling and interpretation

● Meaning

The project should communicate a clear and memorable message, with values relevant to the cultural heritage in question.

● Creativity

The process of planning and execution can involve artists, creatives and creative industries. New methods are used to achieve unique results (for example art thinking, design thinking).

● Content

The project should include well-rounded content that is focused on the cultural heritage in question. The cultural heritage asset should be chosen prudently to avoid negative impact on the heritage itself, ensure safe visits and the dispersal of tourist flows onto new locations.

● The visitors' needs and wishes

The solution must be derived from the needs and wishes of the visitors, considering both the existing and desired audience (general/professional, children/adults, shorter/longer visits ...)

Technology

● User experience

The project should be particularly attentive to the user experience and make use of different methodologies to anticipate, evaluate and improve the interaction between the user and the solution.

● Quality

The project should rely on quality digital materials. Digital scanning of cultural heritage assets should comply with the standards and recommended minimum criteria, allowing further use in other (tourist and non-tourist) applications.

● Accessibility

The project should emphasise accessibility for people with special needs. It should consider not only the accessibility of physical spaces but also the accessibility of information and services.

● Accuracy

The project should avoid excessive generalisation, lose assessments and misleading facts about the cultural heritage asset.

Sustainability

● **Agreement of stakeholders**

The project should be based on a widely accepted consensus of the key stakeholders (local community, experts, tourist industry and other consenting parties..)

● **Cost and time efficiency**

The project should make effective use of available resources – it should be cost-efficient and produce the best result in the given timeframe.

● **User experience**

[see under Technology]

● **Needs and wishes of visitors**

[see under Storytelling and interpretation]

● **Inclusivity**

The project should include a diverse range of social groups and achieve wider acceptance and a higher level of creativity through a participatory process.

● **Accessibility**

[see under Technology]

● **Constant development**

The project should be designed in a way that allows for relatively simple upgrades, improvements and further development that reflect technological developments and the reactions of the visitors.

Preservation of cultural & natural heritage

● **Meaning**

[see under Storytelling and interpretation]

● **Stewardship**

The project should adhere to the recommendations for the safeguarding of cultural heritage and the project's intervention may not negatively impact the asset in question or its natural or cultural surroundings. If it is at all possible, it should contribute to the protection of cultural heritage.

● **Long-term storage**

The project should follow directives for long-term storage of cultural heritage materials in a digital format – as pertaining to the quality, formats, metadata ...

● **Education and raising awareness**

The project should not only entertain, but also raise awareness and educate users about cultural heritage – in each case adapted to a given desired audience.

● **Based on scientific evidence**

The project should be based on scientific evidence and verifiable historical facts. In the case of drawing inspiration from myths and legends or contradicting expert opinions, this should be stated unambiguously.

● **Considered in context**

The project should consider the chosen cultural heritage in the context of its historical period – in addition to the assets themselves and their traits, it should present the conditions in which they existed and draw attention to both the achievements and injustices of the past and the deviations from commonly accepted values of today.

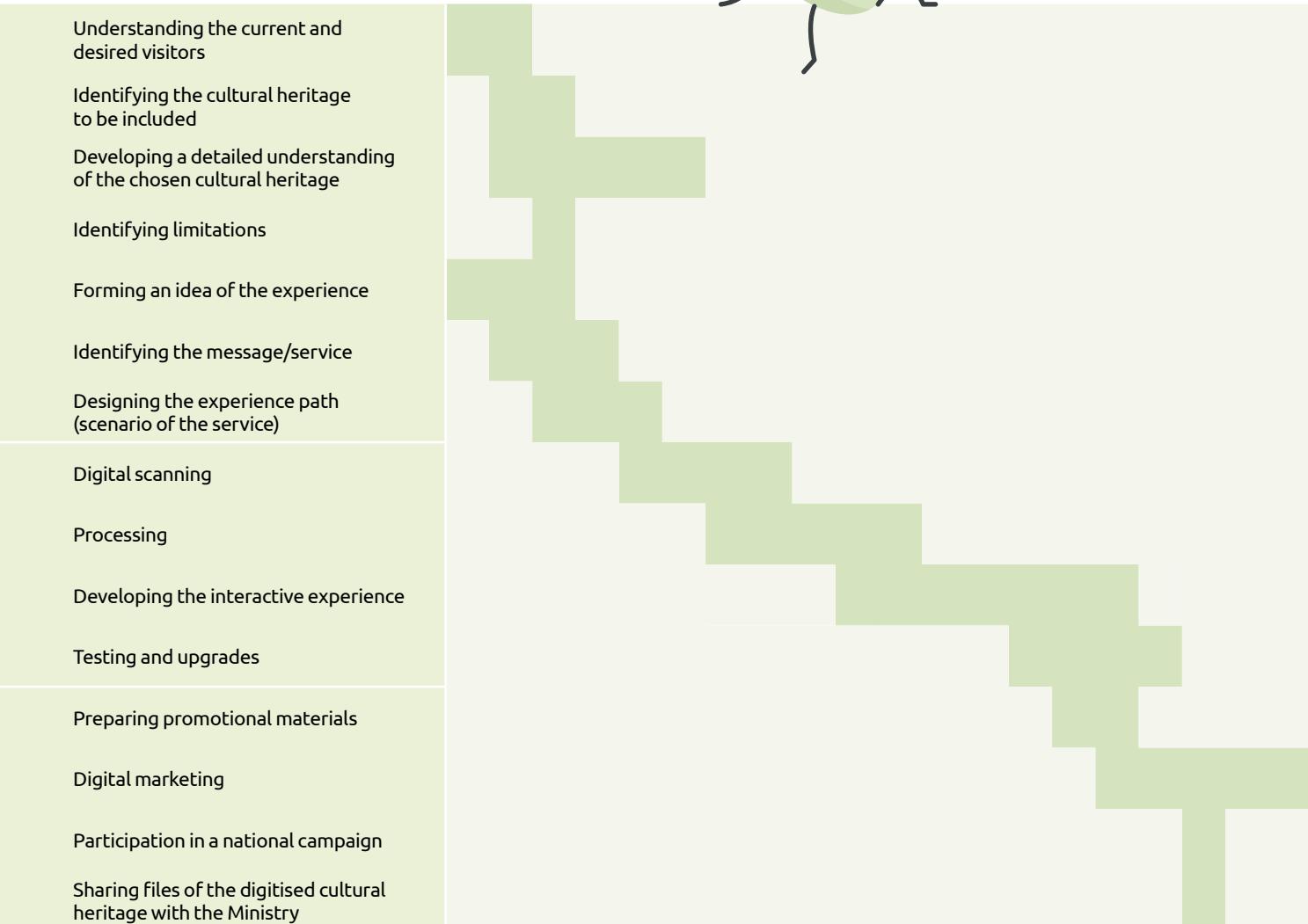
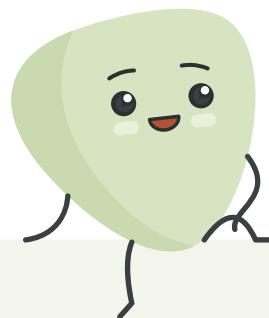
● **Accuracy**

[see under Technology]

The process of digital innovation of cultural heritage

The process of digital innovation can be considered as a three-step process: conceptualising the experience, implementation and launch. Even though creative processes often require backtracking and continuous adjustments, it is advisable to hold the bigger picture in mind when planning the experience. This is particularly important when we wish to avoid rushing things in the final weeks.





From TE to ITE

Transforming a Tourism Experience into an Immersive Tourism Experience is often harder than it may seem at first.

Technology is not just an add-on to a well-designed and successful Tourism Experience. It is a defining element that needs to be conceived holistically to be integrated successfully into an experience.

There are several things to be aware of:

- | Firstly, not any digital technology can turn a Tourism Experience into a successful Immersive Tourism Experience.
- | Secondly, technology without content and concept is just a gadget. Interesting for beginners, but soon turns into its own enemy.
- | And thirdly, technology cannot substitute for a human interaction and spontaneous moments - let's not expect that of it.

One should intensify his focus on content and concept to deliver experiences that are not just nice-to-experience, but thought-provoking, sensorial, and educational.

Where is it needed

- | One should use technology in a way that the positive features of it are strengthened and negative features minimised - and not the other way around.

Using technology, we can:

- | visualise the unseen or hard to be seen,
- | organise and present a broad range of information and different materials,
- | add interactive and playful moments,
- | enable customisation.

Cultural Immersive Experience Design

To design successful immersive experiences for the visitor, there is a precise design path for you to follow.
"tourist product" --> "tourist experience"

Consider the needs of your heritage organisation

"Experience Design", offers you a strategic approach that allows you to improve the competitiveness of the tourist offer of your destination.

Consider the ever-changing needs of travellers

The fundamental demand of good Experience Design is that it is "user centred", that it always puts the final user at the centre of the entire design process.

Problems

The starting point is an analysis of one or more problems or needs your visitor experiences. Once you have a clear idea of the needs/problems you are going to design for, then go on to the next step in your analysis.

Travel motivation

Understand what drives travellers' choices to deliver an experience that aligns with their expectations by conducting surveys and analysing travel data, both online and offline. Ask yourself why do visitors choose your site and why do they prefer your destination over all the others available?

Fears

Understand what possible fears or obstacles the visitor has that may be holding him back. Are there reasons why our immersive experience might not be suitable for some travellers? Is there anything we can do to address this problem?

Solutions

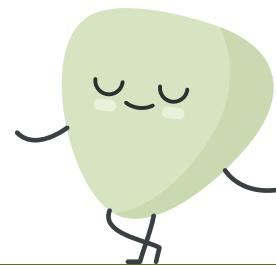
Once possible obstacles have been identified, you can start to look for possible solutions. These depend very much on the type of cultural heritage you want to promote and the assets or opportunities you have in your organisation.

Alternatives and competitive advantages

It's very important to understand why a traveller would choose us over others and to target the experience design in a way that enhances your strengths. Are there similar experiences around you? Is there anyone already offering the same experience, and if so, what competitive advantages can you offer to the traveller?

Unique value proposition

With an analysis of your strengths you can identify your unique value proposition (UVP). Find the essence of your experience, that thing that only you have and that, from a market perspective, really makes the difference to your traveller.



10 tips for creating unforgettable experiences

- | Start with the uniqueness of your assets: what's a unique thing that visitors can't find elsewhere?
- | Create a story: your site should tell an inspiring story.
- | The visitor is protagonist: design experiences that exceed consumer's expectations.
- | Stimulates the 5 senses: design experiences that generate strong emotions.
- | Give exclusivity: make the visitor feel special and part of an exclusive adventure
- | Give authenticity: stay true to local history and tradition.
- | Create surprise: create unexpected emotions in the visitor.
- | Create unforgettable moments: create moments in the mind to share with family and friends.

Unique selling proposition

It is important to start by defining the unique selling proposition of the experience we want to design and the cultural heritage we manage.

The USP refers to the unique benefit that enables you to stand out from competitors. It's the distinctive element that only you have and that the visitor can't find from your direct competitors.

These are the first questions to ask yourself to identify your superpower!

- | What makes your experience unique?
- | Why should the visitor choose your experience specifically?

Knowing your target

Your experience is not for just anyone.

Understanding what your target audience is critical to design a tailored experience.

- | Does the experience appeal to an adult audience or is it for children?
- | Does it require being active?
- | Can people with disabilities participate?

Once we understand the USP, we need to identify the exact audience we want to target and then design an experience based on the needs, desires, and interests of this audience.

Wow moments

A tourism experience is made up of a series of moments.

So called "wow moments" are those that the visitor will carry in their heart for a lifetime, and they are the ones they will tell their friends and family about.

It can be a sunset aperitif, an hands-on experience, a chat with a local ...

For getting to wow it is important that:

- | you know the moments in which your visitor's heart will leap,
- | stitch the rest of the experience around those moments.

Experience storytelling

There is no real experience without a story to tell and/or listen to.

What is the storytelling, the common thread that ties all the scenes and moments of your experience together?

All key ingredients for a storytelling are

- | structure
- | emotion
- | empathy
- | facts

Unforgettable storytelling has to inspire and keep the visitor engaged before, during and even after the experience.

Is storytelling possible only through spoken or written words? Storytelling should engage all our senses!

Storytellers have always tried to use different approaches to stimulate imagination and have been for this purpose evolving and adapting various technologies of their time.

Now, in the world of digital technologies, storytelling can take many different forms, but the best examples still engage people on a personal and emotional level.

There are some storytelling tips to be followed for the cultural heritage sector:

- | be personal,
- | be informal but expert,
- | tell hidden stories,
- | illustrate your points,
- | signpost your journey,
- | be specific,
- | be evocative.



IDEA AND CONCEPT:

Target audiences and user demands

Even though digital innovation revolves around the use of advanced technologies for the presentation of cultural heritage, the focus should be on the user, not the technology or the heritage. Properly understanding who the solution is being developed for is the basis of a successful project.

There are many ways of learning about (existing and desired) audiences and choosing a specific method depends on the intentions, expertise and preferences of the people implementing the project.

Due to space constraints, this handbook does not consider or present specific methods, as these are presented in considerably more detail on freely available websites and other printed media. We shall only mention some of the most common methods here.

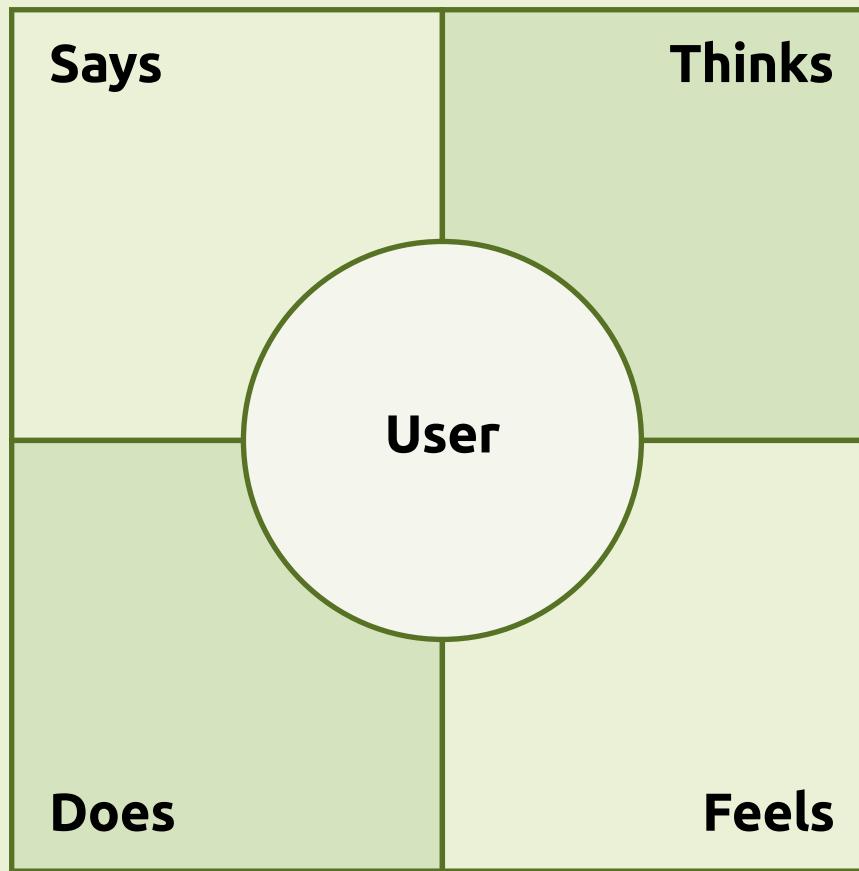
- | **Statistical analysis:** Quantified data can be useful for identifying individuals and questions for qualitative research.
- | **Surveys:** Just like statistical analysis, a survey can be a starting point for a deeper understanding of the users.
- | **Observing the visitors:** Observation can deepen our understanding of our users, and provide us with themes and questions for interviews.
- | **Interviews:** Face-to-face conversations can reveal the wishes and expectations of the visitors and the obstacles they face.
- | **A Day In The Life:** The objective of this method is to understand a user's perspective by following their activities.
- | **Developing a Persona:** A Persona is an archetypal character that represents a group of users with common goals, lifestyles and attitudes toward the product/service.
- | **Customer Journey:** By mapping the user path we describe a typical user experience and their interaction with the cultural heritage in question. Mapping allows us to identify each individual step: problems, ambiguities, surprises...
- | **Customer Empathy Map:** This method is used to describe the user through the prism of four of their activities: what they are saying, thinking, doing and feeling.



Empathy Map

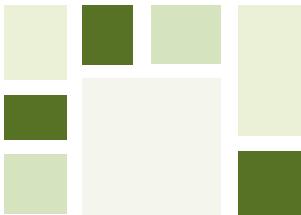
The Empathy Map is a popular method for deepening our understanding of a target user and basing our activities on the insights it provides.

You can read more about the empathy map method on:
www.nngroup.com/articles/empathy-mapping/



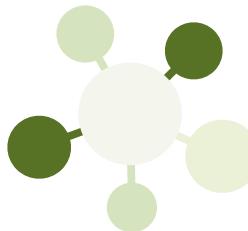
Author: David Gray

Looking for an appropriate method? Search for the following terms online:



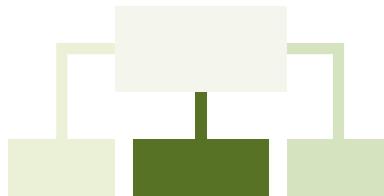
Moodboard

A collage of photos, words and examples of materials that helps us to formulate the general "mood" of our solution.



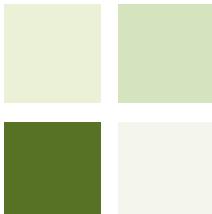
Mind Map

A diagram that represents multiple ideas and is useful for understanding the connections between different information.



Problem Tree

A tool for better understanding the hierarchy of the problems that we wish to solve. Appropriate for more complex challenges.



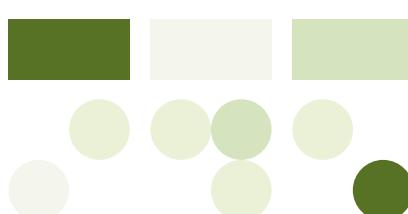
SWOT Analysis

A commonly used method for developing strategies. It comes in the form of two tables - one with the advantages, disadvantages, opportunities and dangers and the other with strategies that are formed at the intersections of the four elements.



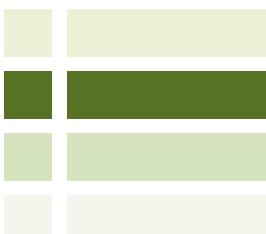
Lotus Blossom

An exercise in creativity that helps us to form new ideas. The main theme is divided into eight core themes, each of which has four sub-themes.



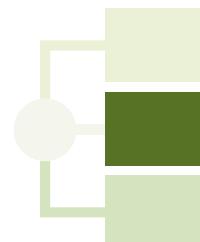
Harris Profile

A way of visualising the pros and cons of different design concepts.



MoSCoW

A method for defining the importance of individual traits of the solution: "Must-have", "Should-have", "Could-have", "Will-not-have".



Future Workshop

A method in which all stakeholders sketch out their desired future, without limitations.



Storyboard

A tool originating in film production. It helps with better visualisation of activities, experiences and interactions.

Identifying heritage objects and stories

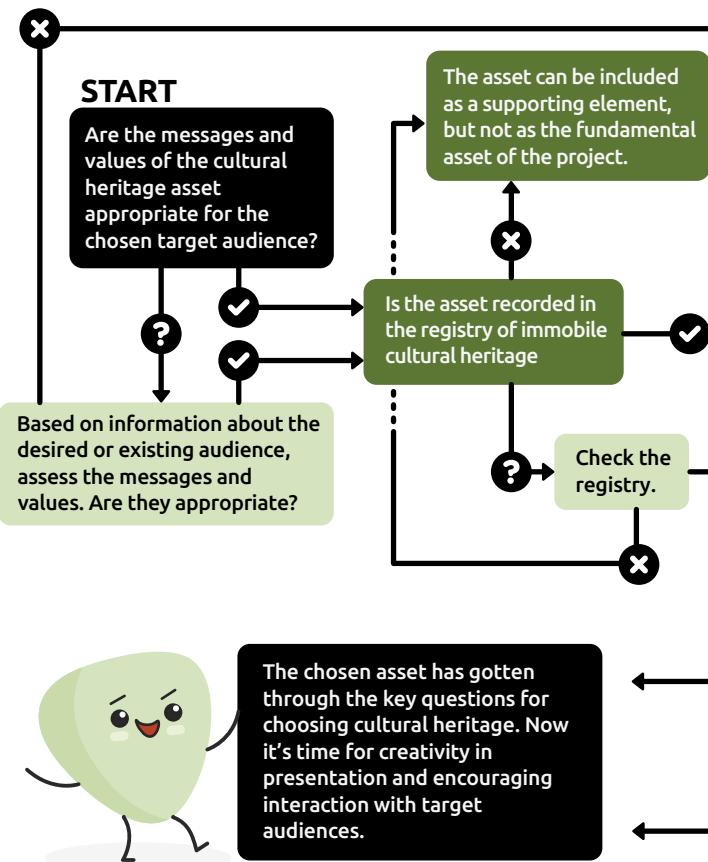
One of the most common questions we face when designing digitally enhanced tourists experiences is: which cultural heritage assets should we choose?

The **values, stories, information and legends** that are connected to this asset play an important role – perhaps more important than the physical traits of the immobile cultural heritage asset itself. Whereas the latter will be the base onto which we shall add information through the use of technology, the former elements are the source material for the digitally enhanced experience itself.

Thus, when choosing, we should consider:

Which values does the given asset express? What is unusual, invisible or unexpected about it, that could fascinate the visitor? What sets it apart from other similar assets from the same time period? What message and what values does it communicate? How has this heritage asset affected or still affects the life of the modern person, perhaps a visitor?

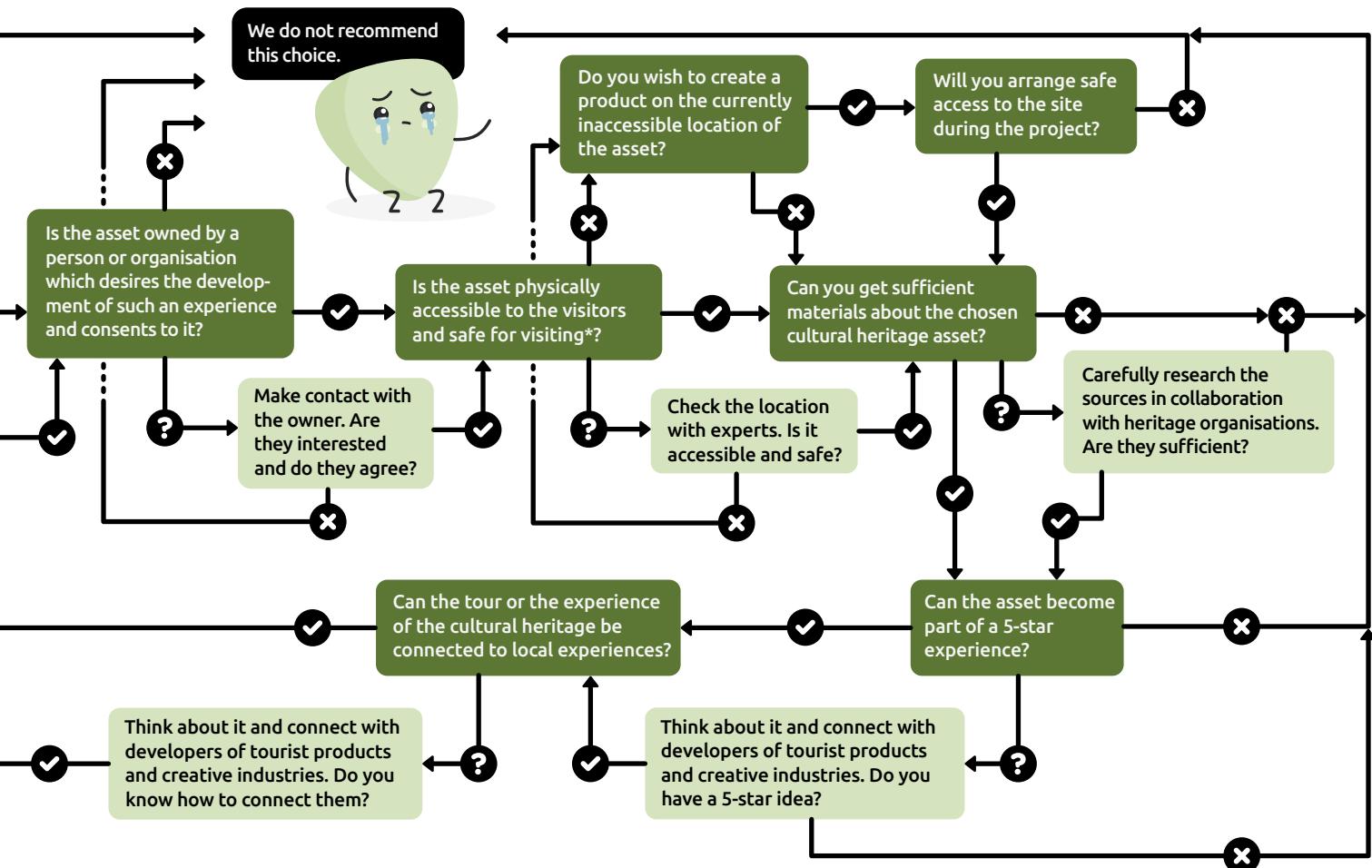
We should of course also take into consideration the ownership, accessibility, and the existence of sources as well as other elements, all of which we can present in the decision tree.



YES

NO

I DON'T KNOW



* Keep in mind all the involved infrastructure (public transport, parking spaces, public toilets, road signs), access to the space as well as services and access for people with disabilities.

Cooperation with stakeholders

A project of digital innovation for cultural heritage combines many different sectors and demands the inclusion of various fields of expertise, institutions, knowledge, skills and perspectives. This makes it interesting, but for many people, it may also present a new kind of (co)operation that requires more preparation, argumentation and consensus-seeking.

Advice: Collect as many sources on the chosen assets of cultural heritage as possible

The bigger the set of visual materials, the better the opportunities for creativity. Visual artists can creatively use old photographs, sketches and plans, old postcards, paintings and other artworks as well as conservation plans, restoration drafts and graduate theses. These can all be used as sources of information for creating reconstructions or adding explanatory materials to the digital experiences.

Experts at the heritage protection institutes

Experts at the concerned museums

Museum associations, folklore associations & other formal / informal groups which concern themselves with cultural heritage

Artists and other creatives

Experts on a given cultural heritage (for example architects, machinists, historians, ethnologists...)

Universities and schools

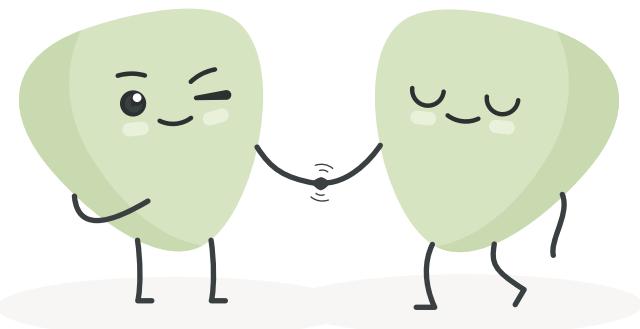
Youth organisations and other cultural NGOs

Technology companies

Tourist companies and supporting organisations

There is no recipe for successful cooperation within an interdisciplinary group or a universal solution for all possible dilemmas.

As one of the founders of a project, ensure from the start that everyone involved feels like a part of the partnership and is treated as such. The goals and frameworks of cooperation should be clearly stated. You should trust your partners' expert assessments and maintain constant mutual communication.



Consent	Expert orientation	Sources & materials	Ideas and suggestions	Usability testing	Execution and support
✓	✓	✓	✓		
✓	✓	✓	✓		
	✓	✓	✓	✓	
			✓		✓
✓	✓	✓	✓		✓
	✓	✓	✓		
		✓	✓	✓	
✓			✓		✓
			✓	✓	✓

Collaborating with experts on heritage: conversation starters

Once we've established a principled consensus and the institution responsible for the chosen heritage asset has shown an interest in collaborating, it is important to understand the chosen cultural heritage in depth. It is not recommended to rush this phase.

- | Where can we find as many textual and visual materials as possible regarding the cultural heritage in question?
- | Who can give the best presentation about the cultural heritage in question?
- | What is the thing that the visitors of the asset have the most trouble understanding?
- | Which fact about the asset would fascinate the general public/young people/children/experts?
- | Is the chosen asset controversial for someone? Can an inadequate presentation of the asset offend or negatively affect someone, and if so, why?
- | What restrictions exist with regards to physically altering the asset?
- | Which other immobile, mobile or intangible heritage is the asset in question inevitably connected to?

Identifying limitations

In addition to gaining consent, garnering interest and gathering materials, each process of digital innovation of cultural heritage should also identify the key limitations – both physical and interpretational.

Unacceptable interpretations

Which interpretations of history are unacceptable: not factual, inaccurate, misleading, too simplified, offensive?

Unacceptable interventions into the property

Which physical alterations (construction, adaptation, maintenance) of the asset are unacceptable?

Unacceptable gamification

Which kinds of gamification are unacceptable: banal, offensive, misleading?

Conceptualising the experience

Ideation is a complex process during which we direct a group of people towards innovative ideas through a series of structured creative exercises. The more ideas we generate, the greater the chance that one of them will be right for our project. Let us take a look at some of the better-known methods.

Round Robin

We start by posing the question "How could we...?". In the first round, each participant suggests their own unusual solution to the given problem. In the second round, they critically assess the solution of their predecessor. In the third round, they present an answer to the criticism they received. We repeat the process with several starting statements and wrap up by presenting the most interesting ideas.

Mash-up method

We start by posing the question "How could we...?". Next, we choose two broad and unconnected categories and try to write several possible solutions/combinations for each of them. Then we mix the points from both lists and try to form unconventional solutions for our challenges. The method was developed by IDEO, the pioneers of design thinking.

Analogy thinking

This method has participants responding to challenges with analogies to other, already existing solutions. By identifying the elements that make other solutions successful, we can apply the same principles to our project.

Rip & rap

We start by posing the question "How could we...?". Participants then cut up photographs, illustrations and other graphic elements from newspapers or the internet and distribute them to three groups. The groups have a limited amount of time to collage the images in a logical way to present a new service or product.

Collaborate with creative industries!

Digital innovation of cultural heritage is a complex process, which combines technical and technological as well as creative activities – which is why it also creates opportunities for collaboration with artists and creative industries. They can introduce new ideas, considerations and solutions in their unique ways. The basic principle applies here as well: include them in the project as early as possible.

Brainstorm, braindump & brainwrite

The most well-known method, brainstorming, has two lesser-known variants: the braindump, in which the participants brainstorm individually and then share their thoughts with the group, and brainwriting where participants individually write down ideas and then share them with people sitting next to them. The latter then elaborate and build upon the ideas they received before sharing them with the group.

Worst possible idea

This is an effective method that can encourage those that otherwise prefer not to share or doubt their ideas. Instead of searching for good ideas, this method asks the participants to suggest the worst possible ideas, which lowers the stress and allows participants more playfulness and deviation from the norm, leading to more creativity.

More free tools:

www.boardofinnovation.com/staff_picks/our-favorite-ideation-tools/

Shaping the experience path

By shaping the user's experience path (the scenario of the service) we create a fictional story featuring a series of events with the user at their heart. The story should be as detailed as possible and take technological, physical, social and emotional aspects into consideration. These considerations will help us design the optimal interactive solution.

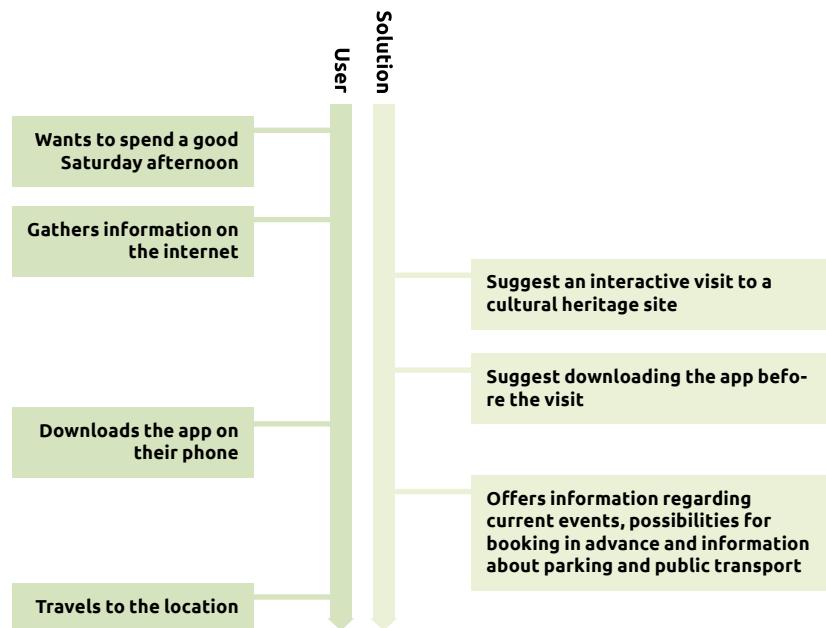
This kind of scenario, which we can outline as a two-column table, forms the base for experimentation and seeking the optimal solution. We can imagine the optimal kind of interaction between the user and the system and then implement it, or we can imagine what could go wrong – and how to avoid or alleviate such an outcome. Since no user enters our solution as a blank slate but arrives with previous experiences, patterns of behaviour and expectations, we need to understand them and adapt the solution to them. The user will not adjust to our solution and its demands. On the contrary, our solution must reflect the (sometimes unconscious) expectations of the users.

Some general guidelines to consider:

- | Never promise something you can't deliver.
- | Clearly communicate to the user what the service is currently doing (for example "Loading", "Processing data", ...)
- | If the service is 'smart', consider that users will expect it to have social skills. A 'smart' service should adhere to the rules of courtesy and etiquette.

In the book *The Design of Everyday Things* the author Donald A. Norman, one of the pioneers of user-oriented design, established some fundamental assumptions required for designing good solutions:

- | Simplify the structure of tasks until the available actions become intuitive.
- | Visualise your structures, activities, results and feedback.
- | Clearly indicate the connection between the expected results and the actions required.
- | Accept the limitations of the system and build upon them.



We should consider

Cultural heritage should be communicated in a way that makes it:

- | **Engaging/Inclusive:** Visitors should be drawn in and included in the experience – either with interactive elements or by seeking parallels with the visitor's life experience, ideally both.
- | **Readable at two speeds:** The experience should allow for two "readings" – a fast experience with a few key points of information and an extended one with additional information for those that want to learn about individual elements in more detail.
- | **Thought-provoking:** The experience should be thought-provoking and ask questions beyond the answers it provides – it should encourage the visitor to research further.
- | **Instagrammable:** We should keep in mind the visual effect of the experience – can the users take a good photo or video of the experience?
- | **Friction-less:** If the experience includes several constitutive elements (for example on different locations) we should make sure the connections are reasonable and intuitive.

Principle of Least Astonishment

This principle (POLA) is used in software development and requires that each element of the system behaves in a way that the user already expects. The principle is founded on the observation that users have a developed 'mental model' of how the world works. These models are based on previous experiences and influence our behaviour in present situations. Studies show that users are unhappy when reality deviates from their expectations. By following this principle when developing solutions we can avoid negative surprises which could deter users from further use.

ISO standard for interactive systems

ISO standard (ISO 9241-210:2019: Ergonomics of human-system interaction – Part 210: Human-centred design for interactive systems) consists of the demands and recommendations for people-oriented digital interactive systems. It is intended for lead designers who wish to improve the interaction between people and systems.

Would you like to learn more about principles for the interpretation of cultural heritage?

The charter of the international organisation for monuments and sites (ICOMOS) sets and describes seven principles for the interpretation and presentation of cultural heritage:

Principle 1: Access and Understanding

Principle 2: Information Sources

Principle 3: Attention to Setting and Context

Principle 4: Preservation of Authenticity

Principle 5: Planning for Sustainability

Principle 6: Concern for Inclusiveness

Principle 7: Importance of Research, Training, and Evaluation

* The entire text is available in English at: icip.icomos.org/downloads/ICOMOS_Interpretation_Charter_ENG_04_10_08.pdf

User path

The user path is a method of systematically planning an experience - starting from the first contact with the service to the experience itself, and beyond to the user's relationship to it after the experience concludes and they return home. Because the method requires us to consider the user's entire path, it is a useful tool for planning and improving several connected elements at once (for example marketing, promotion, technology, human contact, setting, evaluation...).

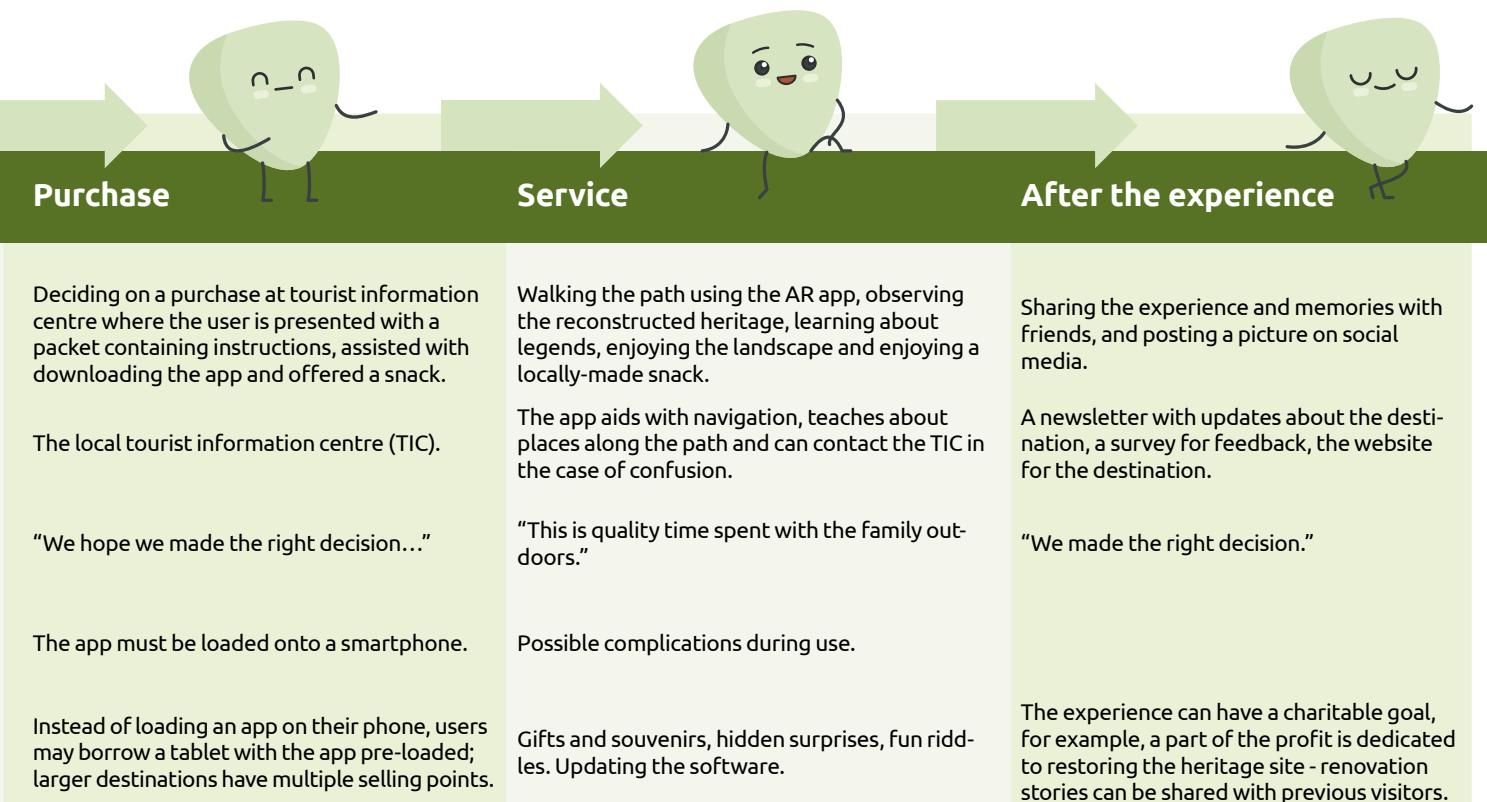
Example of a completed user path:

Example of a completed user path:				
	Awareness	Interest	Consideration	
User actions	Browsing the website of the destination and search engines for tips.	Noticing the advertised experience of a walk that includes an AR application for mobile devices.	Comparing and weighing the different options for spending a free day with their family.	
Connections and points of contact	The destination's website, the main tourist information portal.	A sub-page of the destination's web page.	A subpage with highlights and photos of the experience.	
The user's thoughts	"What could we do that's simultaneously entertaining and educational for the kids?"	"This might be appropriate for us..."	"Perhaps we can enhance our walk with this technology..."	
Difficulties	What's a good choice for one afternoon?	Will the app work as promised and will it be interesting enough for the kids?	Where to start the walk? Where to get the app?	
Opportunities for improvement	Placement on the website, with eye-catching photographs (including online advertising).	Additional videos of satisfied users; strong presence on social media and sharing of positive experiences.	Very simple and graphically represented instructions.	

Universal accessibility

Take a comprehensive approach to the experience from the very beginning. When planning, consider a wide array of user groups and ensure that the information, services and spaces are accessible to all, including vulnerable groups. We recommend collaboration and consultation with expert associations and organisations in collaboration with which you can find many universal solutions while still in the planning phase.

More: www.dostop.org



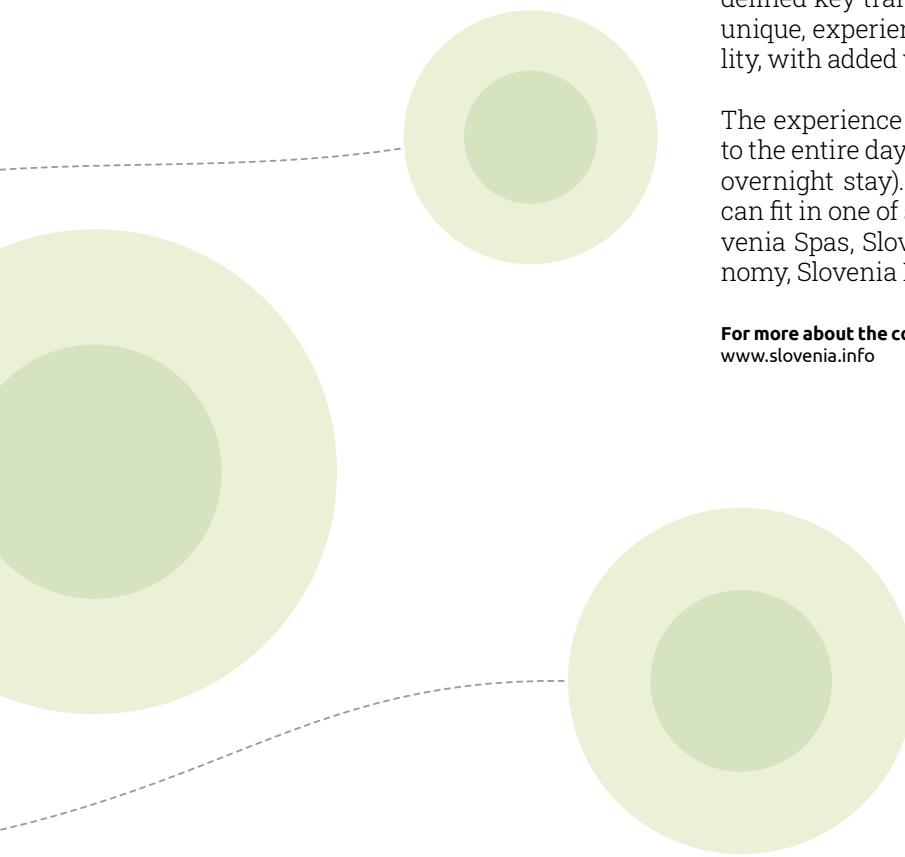
Connecting with local businesses

Studies confirm that investments in cultural heritage have a strong effect on the local economy — tourists who visit cultural heritage destinations perform 90-96% of their spending in the vicinity of the landmark (either for sleeping accommodations, food, related services, transport...). To strengthen this bond between cultural heritage and the adjacent businesses, the solutions must be designed accordingly and simplify the visitors' choices regarding quality products and services in the surrounding area (for example by presenting them with digital information...).



Unique 5-star experiences

Scanning and presenting cultural heritage isn't the only goal of digital innovation. Digital content can reach its full potential as a component of tourist experiences that contribute to the green boutique destination ambition and the I feel Slovenia brand.



In the year 2018, the Slovene tourist organisation put out a call that defined key traits required for a 5-star experience: local, authentic, unique, experiential, sustainably green, boutique, of premium quality, with added value, out of season and with a digital presentation.

The experience should be either guided (lasting from a few hours to the entire day), either a package or tour (that includes at least one overnight stay). Based on its dominant character the experience can fit in one of several categories, including Outdoor Slovenia, Slovenia Spas, Slovenia Meetings, Slovenia Culture, Slovenia Gastro-nomy, Slovenia Nature, Slovenia Tours or Slovenia Countryside.

For more about the conditions and methods of applying for a 5-star experience visit:
www.slovenia.info

DIGITALISATION

Digital capture

The purpose of digital capture is the creation of a digital copy of an object of immovable cultural heritage. In the process of digital capture, the object is prepared (cleaned) and captured in 3D. The following sections present the key technologies of digital capture.

Laser scanning

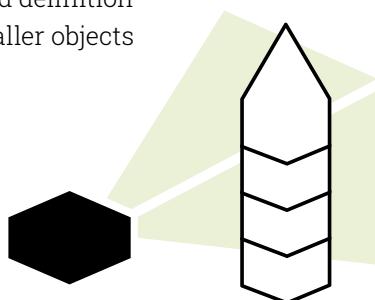
Laser scanning (occasionally "lidar", short for "Light Detection And Ranging") is a catch-all term for a range of approaches that use laser technology for determining the locations of points in 3D space. The greater the number of lasers emitted, the denser the point cloud.

Terrestrial laser scanners (TLS)

- ⊕ appropriate for measuring distant objects
- ⊖ don't capture textures and materials in sufficient detail

Hand scanners

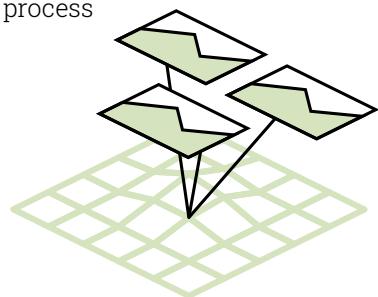
- ⊕ portable
- ⊕ high accuracy and definition
- ⊖ good only for smaller objects



Photogrammetry

Photogrammetry determines distances with the use of several photographs. With the advances in software, algorithms and increases in computing power, it is possible to process a large amount of data and compute point clouds from captured photographs. The software automatically identifies similar scenes in a large number of photos and arranges them in a 3D shape – either a point cloud or a wireframe.

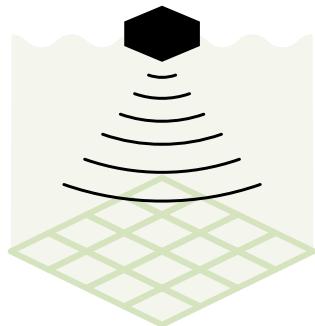
- ⊕ good for larger areas
- ⊕ flexibility in capturing (aerial, terrestrial or interior photography, photos of details)
- ⊕ captures textures
- ⊖ results depend on natural and weather conditions
- ⊖ time-consuming process



Sonar

Using soundwaves to determine an object's location and distance can be applied in three dimensions. A sonar uses one or several pulses of sound ("pings") to determine the location of points in a three-dimensional space, which forms the basis of 3D scanning.

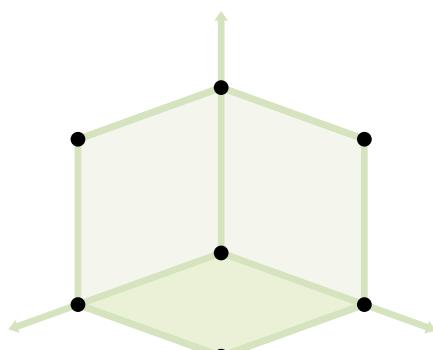
- ⊕ useful for scanning underwater
- ⊖ focused on underwater application



3D Modelling

The crafting of a 3D model using the software. Based on blueprints, sketches, measurements or imagination.

- ⊕ useful for recreating 3D digital objects when the heritage is ruined, no longer existing or difficult to reach
- ⊖ high level of expertise in the use of the software is required



360° photography

Photographing an environment, resulting in a comprehensive spatial-visual effect.

- ⊕ allows pre-defined walks through a space
- ⊕ appropriate for both interior and exterior photography
- ⊖ doesn't create 3D digital shapes
- ⊖ appropriate mainly as a supporting resource for the presentation of 3D models

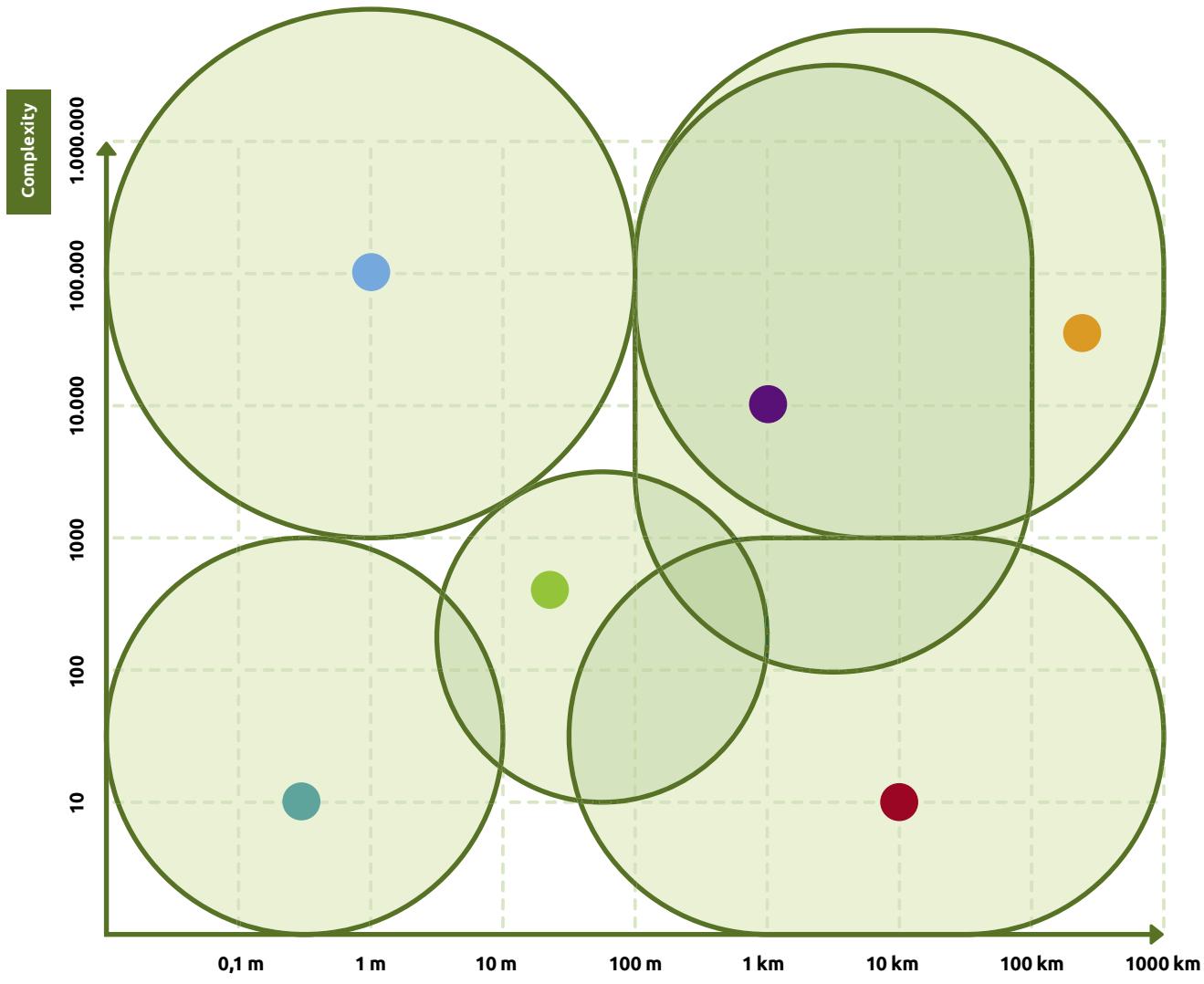
Ensuring the quality of digitisation

The quality of digital documents is constantly increasing due to the speed of technological development and requires continued monitoring of advances so that the digital materials can correspond to contemporary demands. The Partnership for Tourism 4.0 has established The T4.0 Technical Guidelines for The Digitisation of Cultural Heritage. The guidelines define the basic technical standards used in the processes of digitisation of cultural heritage and cover the digitisation of photographic, audio and video sources, 3D models as well as 360° photography and video.

The technical guidelines are available at:
www.tourism4-0.org/articles-papers-and-guidelines/

When to use which technology?

Choosing the correct technology depends on the size of the object and the desired resolution and precision. The graphic below shows the feasibility of different technologies.



Summarised from: Historic England. 2018. 3D Laser Scanning for Heritage: Advice and Guidance on the Use of Laser Scanning in Archaeology and Architecture. Swindon: Historic England.

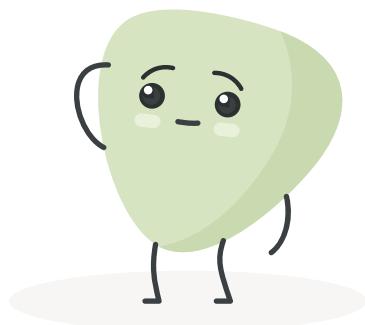
Size of object

What to keep in mind when preparing 3D models?

When preparing 3D models, in addition to the technical guidelines listed below, it should be your goal to pursue the greatest realism of the model and faithfully represent the condition of the original. The model should be at a scale of 1:1. During scanning an appropriate level of lighting should be maintained (to avoid deformations due to shadows) and moving and changing elements should be removed (for example people, vegetation, shadows, trash and other elements that might disturb the scan).

When including the result on portals of digitised cultural heritage (for example portals with 3D models) it is recommended that multiple models of different qualities are created, but always with the intent of preserving key traits of the source (for example you may prepare a model with 60% fewer polygons, or a model adapted for use in video games...). In the case that various elements are a defining feature of the original (for example, the pronounced vegetation on a castle wall), it is sensible to create two models – a cleaned-up version and an unaltered version.

- **Photogrammetry of the ground/laser scanning with handheld phase scanners**
- **Satellite imaging**
- **Photogrammetry from the air/laser scanning from the air**
- **Manual measurements**
- **Geodetic measurements**
- **Global positioning satellite system**



Processing data

An unprocessed point cloud can offer useful information as it visualises the object, but typically additional processing of data is required to create more generally useful files — for example, a photorealistic 3D model with colours and materials.



Cleaning

Removal of all extraneous elements (electrical wires, telephone poles, traffic signs, bushes, trees, people, cars...) and other elements that are unnecessary to the finished model. This part involves simultaneously fixing the 3D model and the texture that will be wrapped around it.

Filtering

Because a scanner detects everything in its way, it also captures a lot of "noise". This is why filtering is an important step that removes all the unnecessary points in the cloud and facilitates the creation of the model. A poorly filtered cloud will result in a poor model since the software will include unnecessary points to draw lines. Filtering is usually done with software, the quality of which impacts the quality of execution. After automatic filtering, a manual check is typically done – either on the whole model or just a specific area.

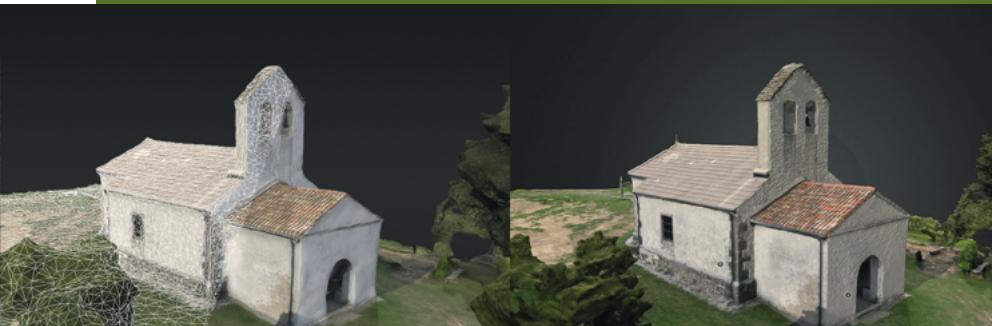
Partitioning and classification

A cleaned-up point cloud is carefully examined and points are grouped and marked (typically by colouring them) based on their relatedness and application. We separate the points into structures, vegetation, interiors, exteriors, roofs, floors...and name them by section. Groups of points can also be separated depending on their source (lidar, photogrammetry...), the time of scanning, their author... The separate groups of points will form the basis for more specific processing. During this stage we repeat the first two steps, adjusting the result with the help of other reference models or points.

Metadata and Europeana's publishing parameters

Metadata are data about other data – in this case, the name, author, timeframe...of the scanned cultural heritage asset. These data ensure better searchability, faster exchanges and easier editing of collections of digitised cultural heritage. In the field of cultural heritage, it is thus recommended to follow the standards set by EDM (Europeana Data Model), which is used by Europeana, the European portal of digitised assets of cultural heritage. Equipping files with metadata is a key part of digitisation, especially as it pertains to long term storage and sharing of materials in digital collections. The registry of cultural heritage demands the use of metadata descriptions, specifically metadata descriptions following the Dublin Core standard. In addition to Dublin Core, we recommend following the specifications of Europeana Professional and the EDM (Europeana Data Model). When using these materials for business purposes, it is recommended to supplement the above principles with the guidelines of the Partnership for Tourism 4.0.

www.tourism4-0.org



Creating a mesh

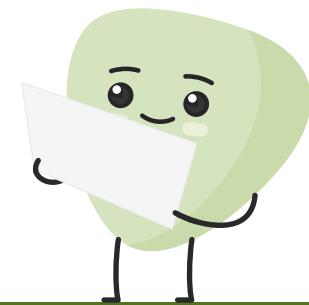
A mesh is the actual 3D model of an object. It is formed from a large number of triangles that are generated from the point cloud by specialised software. More advanced software can generate more detailed meshes and requires fewer manual adjustments (usually done in different software). A mesh is created from partitioned groups of points, which allows for better control over the process and adjustment of parameters depending on the goal. The process of creating meshes requires precision and exploration of different settings with the intent of finding the best result. Because of the complexity of algorithms, the process can take a long time, which is alleviated by the use of high-performance computing. The resulting files can be extremely large.

Creating textures

A detailed mesh of triangles doesn't necessarily result in a realistic visualisation of the object – an important role is played by textures that are added to the model using specialised software. These textures can be either sourced from photographs (for example from the photogrammetry process) or can be drawn manually. Very detailed (high definition) textures can create the impression of a detailed model, even though the wireframe might be simple – this is a common method in computer games where a visual impression is often more important than precise dimensions.

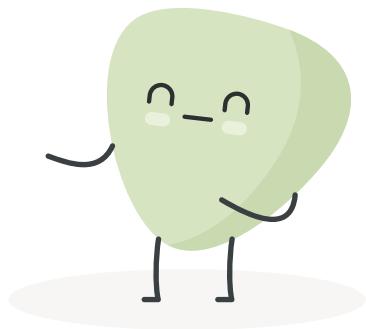
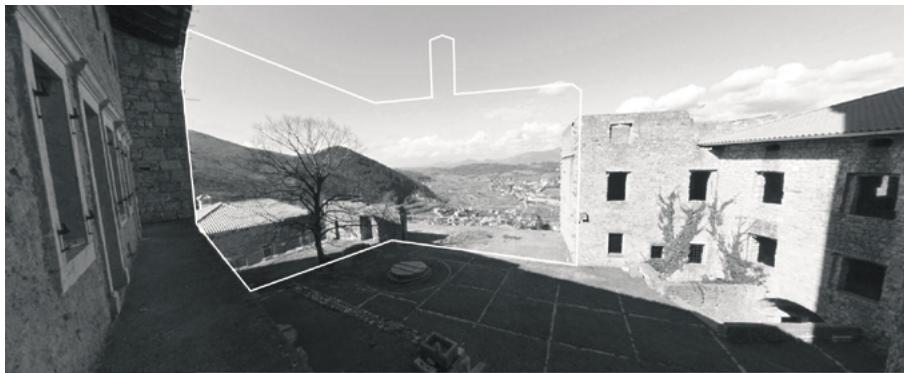
Exporting, animation, visualisation

During the final part of the process, we fill out the mesh and patch potential gaps in the frame, light up the model using principles similar to those used in studio photography and finalise the render. Rendering is based on complex algorithms which take into account the physical characteristics of light, materials and human sight to create a photorealistic view of the scanned object. High-performance computing is often used for speeding up the process.



Simulated reconstruction

Using the process of a simulated reconstruction we supplement a mesh by adding in 3D elements which were not captured by scanning – because they don't exist. In this way, we can add ruined, damaged or removed structures or present different development phases through different time periods. The 3D model of these elements is treated in the same way as the scanned ones but we usually give them a different texture, so the viewer can discern between the real and the supplemental elements.



Case study: Castle Rihemberk

Castle Rihemberk is the most striking castle in the Primorska region and has kept its pristine mediaeval design. The Lords of Rihemberk began building the castle in the 13th century, on the site of an older, prehistoric settlement. Today, the castle is in the process of revival and can be brought to life in new ways using digital technologies.



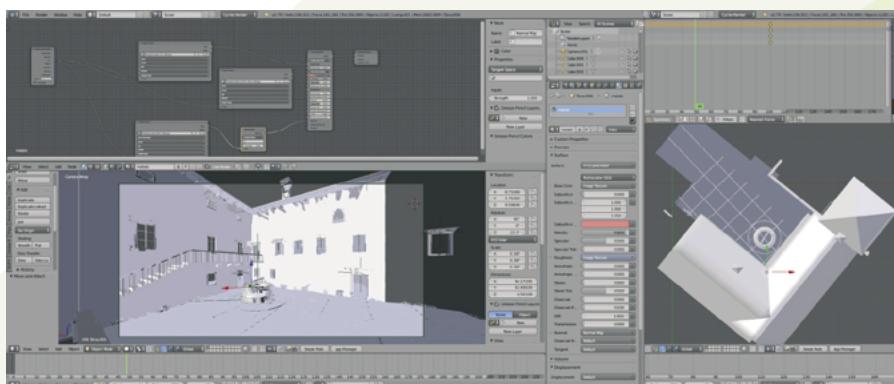
Starting with the archives

The process begins with the in-depth knowledge of the castle's condition, its meaning and key traits. We rely on various materials – plans, sketches, drawings, old photos and orthophoto recordings.



Creativity & technology

During the creative process, we actively collaborate with the client and the heritage institutions responsible for the site. We begin with professional photography, including 360° cameras, drones, planes, cranes and tracking dollies.



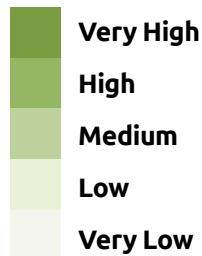
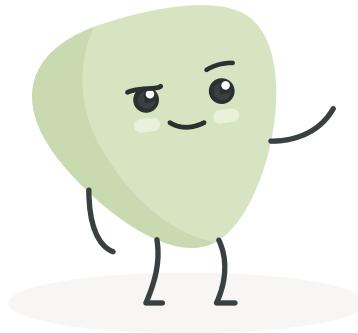
Towards digital stories

Towards digital stories: The collected materials are processed, modelled and prepared for different kinds of use – virtual museums, virtual tours, AR/VR/xR apps, 3D printing (for replicas, displays or souvenirs...).

Challenge: Perhaps your 3D model can become part of a videogame or a movie?

Developing an interactive experience

Decisions about which media a presentation will use depends on several factors — the target audience, the type of desired experience, the purpose and the type of the installation. Due to the rapid advances in technology, new uses for tools and their increasingly common combinations, you may find the following matrix of new media helpful.



New media matrix for museums

New Media Tools in Comparison

suitability by type of visitor

- children (0-12 years)
- teenagers (12-18 years)
- young adults (19-30 years)
- adults (31-60 years)
- senior citizens (61+)
- school classes
- handicapped (mobility-impaired)
- handicapped (blind or sight-impaired)

suitability by type of visitor (Falk & Dierking)

- explorers
- facilitators
- professionals/hobbyists
- experience seekers
- rechargers

suitability by type of exhibition

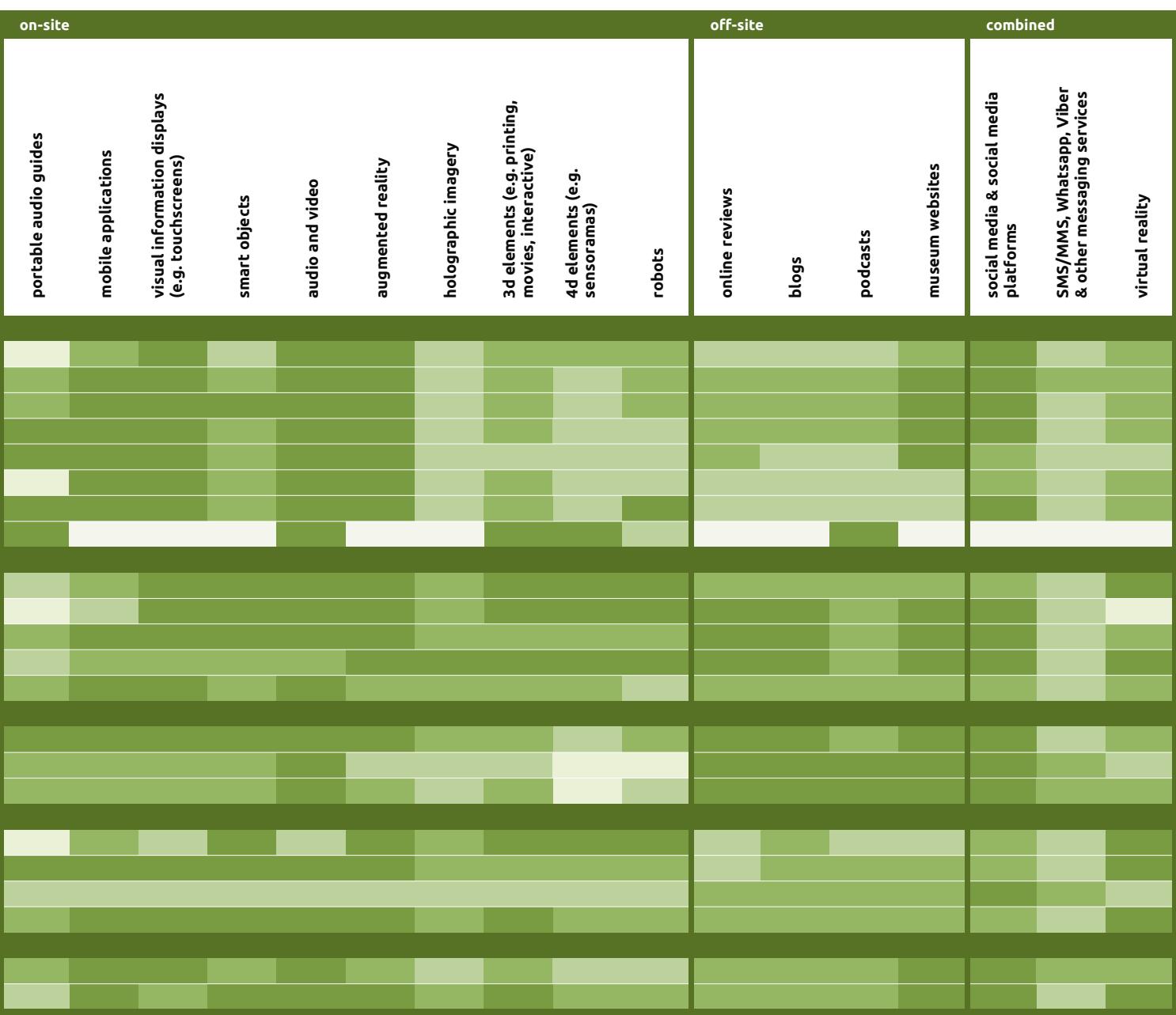
- permanent exhibition
- special exhibition
- travelling (multi-stop) exhibition

suitability by objective(s)

- creating a "wow" effect
- educational purposes
- attracting (additional) visitors
- enhancing the experience

overall conclusion (suitability by period)

- now
- in five years



Summarised from: Widmann, S. 2019. Influence of New Media Technologies on the Success of Museum Exhibitions.

An overview of some possible interactive experiences

Web & mobile apps



Mobile Web applications rely on the use Web technologies. They offer basic functionality when presenting information in a readable, action-oriented format. Their advantage is that they require only a web browser to be installed and are not limited to the underlying platform for deployment. Mobile native apps require a full installation and can offer more powerful technical features (use of mobile sensors) and options when delivering information, graphic content and real-life interaction on the go.

With apps, you can:

- provide additional information to exhibition (photos, videos, maps or games)
- deliver interaction to remote or diverse locations,
- enable interaction where physical interventions need to be minimal.

VR Games



VR game is a video game played on virtual reality (VR) hardware. Most VR games are based on player immersion, typically through head-mounted display unit or headset and one or more controllers. The headset typically provides two stereoscopic displays in front of the user's eyes to simulate a 3D space. VR games are appropriate for involving visitors in cultural heritage stories, especially when material remnants are scarce, hard to reach or otherwise inaccessible in person.

With virtual reality games, you can:

- provide play-and-learn experience,
- Simulate interaction with inaccessible objects or places,
- simulate virtual tours (see the next slide).

Interactive OR tables



Interactive object recognition table is a touchscreen table, with which can users interact by putting objects directly onto it. The touchscreen recognizes the objects and responds by showing information associated with them. Interactive object recognition (OR) tables are appropriate for structuring complex information of diverse formats and showcasing it in easy-to-interact way.

OR tables can integrate high-resolution images, videos & graphics, so user can:

- intuitively move through different content,
- observe the presented material trough different perspectives,
- zoom in and focus on details of his interest,
- immerse in interactive games.

AR Web & mobile apps



Augmented reality app (mobile or web) is a software application that integrates digital visual content (and sometimes audio and other types) into the users real-world environment. It achieves this by adding layers of digital information (digital layers) on top of a screen showing physical world. Augmented reality is most applicable when in order to tell a story of cultural heritage, a material remnants should be augmented with a digital layer.

With augmented reality, you can:

- bring exhibitions to life,
- provide play-and-learn experience,
- renovate the place,
- let the visitors see how it was before.

Virtual tours



Virtual tours offer a panoramic view or video simulation of a place. They that can be viewed, through a browser, an app or through a set of VR glasses. They may also use models in place of real-life video and images and are able to offer some level of interactivity. Online virtual tours are usually a collection of panoramic images of an existing place that are played in sequence to view like a moving video with added sound and text effects. VR Virtual tour is a simulation of an existing location, usually composed of a sequence of videos or still images. It may also use other multimedia elements such as sound effects, music, narration, and text.

Virtual tours can:

- bring remote or inaccessible locations to users,
- show how it was before,
- be used for travel or vacation-related research.

Interactive screens & walls



Interactive screens and walls are physical wall surfaces that are mapped with a digital display, by using digital screens or (cheaper) using a projector and can be interacted with - to manipulate content displayed on it. With the integration of different sensors (cameras and face recognition IA), the interaction with screens is not limited only to the touch.

Interactive displays are highly customizable and can suit an individual museum's requirements. They can be used for:

- animating objects,
- playing games,
- Delivering virtual exhibitions of unavailable exabits,
- Displaying interactive maps.

Holographic projection

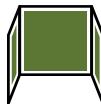


Holographic projectors create an image that has three-dimensional qualities but is still flat. Many "holograms" currently on the market are still technically 3D images shown on a 2D surface. With a little bit of ingenuity one can make 2D or 3D basic holographic projector at home. Holograms are best used in applications where wish to tell a story of an object, building, animal, character, old technology working principles.

With holograms, you can:

- Demonstrate 3D qualities of an object.
- Animate an object in 3D to make it more life-like.

Immersion rooms



An immersion room is a virtual reality room that is a self-contained space, customized with embedded or portable technology that delivers or enhances a highly immersive multimedia experience. Immersive environments are simulations that fill the user's visual field, giving the sensation of physical presence. Virtual reality delivers immersion from the individual's point of view, while immersive rooms bring many viewers into the same simulation.

Immersive rooms offer all the functionalities of the already presented VR technology. **They are best used** to convey an atmosphere or a feeling through a group experience.

Architecture & space design



Architecture and space design change experiences in a digital environment into a wholesome, holistic experience and stimulate all senses. The non-digital, physical and material aspects of an experience evoke different feelings. By designing space, we define the atmosphere - the sensorial qualities that a space emits. Peter Zumthor in his book "Atmospheres" describes architectural atmospheres as "this singular density and mood, this feeling of presence, well-being, harmony, beauty... under whose spell I experience what I otherwise would not experience in precisely this way".

Hologram: what is it?

Behind the term "hologram" are hidden several distinct technologies that produce to a general public similar effect.

Take a look at different types of holograms in this video:

www.youtube.com/watch?v=f7fffZ_k9ow

5 Ingredients for immersive storytelling with technology and space

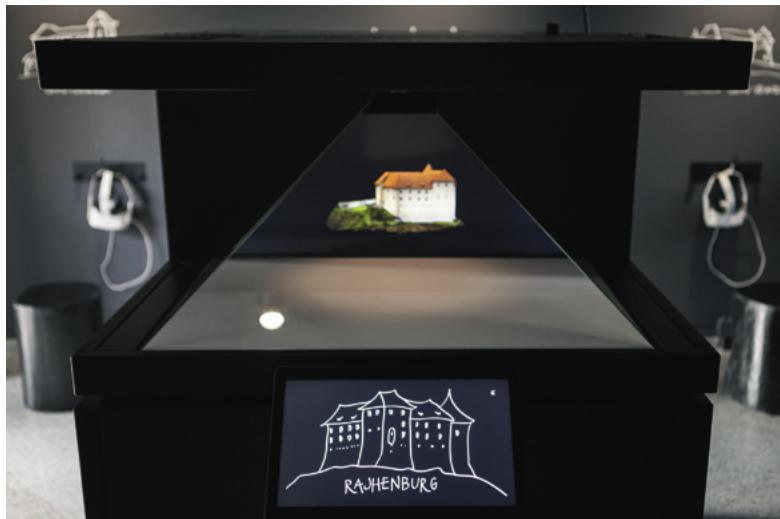
Read this educative article by Marina Rakhatskaya, a creative technologist, on communicating complex ideas in an engaging way.

Read the article here:

www.medium.com/design-voices/5-ingredents-for-immersive-storytelling-with-technology-and-space-2a-4c8f73bc83

Case study #1: Digital room e-Castles of Posavje

The region of Posavje is well-known for many castles that have through centuries been established along the Sava river and its confluences. Castles are one of the main tourist attractions, present in all municipalities and due to its architecture a visible and remarkable element of cultural landscape. The main wish of the RRA Posavje as the regional development agency was to develop digital content and digital experiences, involving 7 locations (all castles) spread across the region of Posavje.



The idea

The main idea behind the solution was thus to reach target group in their environment – we decided to work in the Čatež Spa resort, the largest tourist attraction in the region with the most overnight stays. The aim was first to attract visitors to the digital room for a short visit, there present them the magnificent castles through interpretation technologies, and only then motivate them to plan a half day trip to any of the castles.

Inspiration

Inspired by the dark cellars of castles, interpreted in a modern way, we designed the dark room with hand-drawn pictures of castles, spot lightning and wooden stools. Special attention was given to background music, a modern interpretation of Medieval music. The intended emotion was surprise as one steps from the world of pools and hotels into a dark, medieval-ish world of castles.

The app

In addition to the room, we have developed a web-app "Magnificent 7" that accompanies the visitor on their trip to castles and guides them using gamification (collecting legendary artefacts, putting the user in the role of alchemist)

Trailer for the Digital Room e-Castles of Posavje:
youtu.be/KNC-Ohlmt3U

Case study #2: Winemaking and winegrowing of Banovina Virštanj

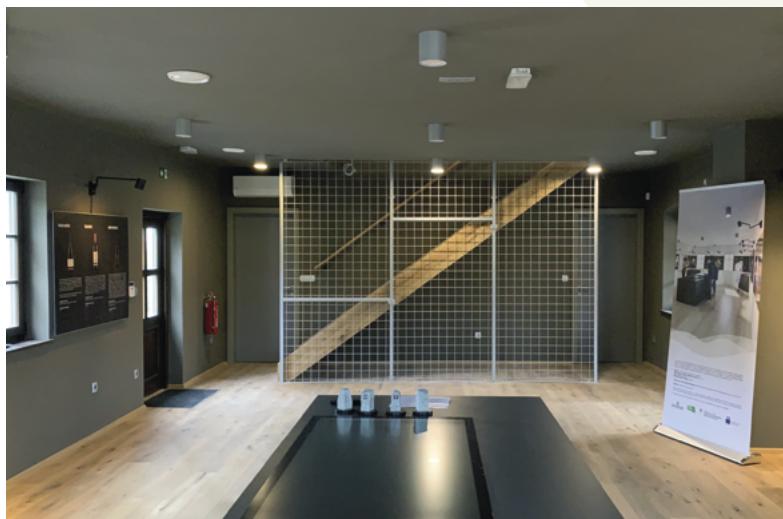
Newly renovated Banovina Virštanj near Podčetrtek presents and invites one to experience the rich winemaking and wine-growing traditions in Virštanj. The building comprises of a wine cellar with winetasting offerings, ground floor as a common space with object recognition table and exhibition that serves also as a venue for wine-related events, and a VR room in the attic with several VR glasses, offering an insight into the life of vine and vineyard.



The idea

The main idea behind the project is to position and present the Virštanj winegrowing region to the visitors – thus the technology is incorporated into the wider experience of winetasting and wine-tour.

Through technology we deliver the information and stories that provide the context and general information (about vines, wines, traditional gastronomy, main attractions nearby) and offer a dive-in experience into the vineyard. A VR-360-degree video takes one through the four seasons, being among the vines, learning about the care that needs to be invested to produce quality grapes and quality wine.



Case study #3: Submerged villages of Velenje lake

Deep in the lakes of Šaleška dolina near Velenje are hidden and almost forgotten villages – Slovenian Atlantida. A tourist product, incorporating digital technologies, takes one on an exploration. Šaleška Dolina Tourism Board wished to create a new tourist product that involves all the main attractions (a tourist mine and a museum, lake with a new viewing platform, gastronomy ...), yet in a new and attractive way.



The background

The product builds on a history of lakes that have been created as a consequence of coal mining in the area. These artificial lakes grew to a current size in only 100 years and thus several villages needed to make space for this rapid growth. People needed to evacuate, leave their homesteads and move to either the city or other villages.

The experience

Within the tourist experience we take the visitor to the mine where she gets to know the history of mining and especially its effects on the surface. Through an animated video she learns about the quick growth of lakes and stories of the people above-ground.

Following that red-thread, we take the visitor to the lake. With an electric boat we travel to the centre of the lake, observing the locations of former villages. There, using VR glasses, she virtually descents to the bottom of the lake and observes 3D digitally reconstructed village of Škale. The hyper-reality of 3D reconstruction connects the visitor with the stories of the former inhabitants – and the price some needed to pay for the progress of the local community.

The experience ends at the shores of a lake, on a viewing platform. There one observes the impact of coal mining in the region – and the new future that lies ahead with the coming closure of the mine and coal power plant.





... From Castles to archaeological sites

With the aim of developing new digitally enriched experiences of cultural heritage numerous locations of Slovenian cultural heritage have been 3D digitised, digitally interpreted and launched as tourist products in 2020 and 2021.

Heritage+ DIKD after video: youtu.be/xsolD55IdoY

Respect for the law

During any activity connected to digitising cultural heritage, it should be mandatory to respect the existing laws (for example regarding the use of drones) and use any software and copyrighted or otherwise protected materials only with the right licences, permissions and certifications.

Creativity is very important for the creation of high-quality tourist experiences. In the long term, the most fruitful collaborations are always those in which contributions from every stakeholder are respected, and every stakeholder respects the law.

Using licenced software

Legislation has been somewhat slack in the past where new technologies and digital content were concerned but rules have become increasingly precise. It is important to keep up with changes in legislation and to choose stakeholders that behave responsibly. When collaborating with various contractors they should be committed to acting in accordance with the law and using licensed software.

Author's rights

Some basic explanations which can help you understand the area of copyright law.

An author's **original work** is an individual literary, scientific or artistic work, which is expressed in any particular way (spoken, written, musical or theatre performances, puppet shows etc.).

An **author** is a natural person who created the work. The author is typically someone whose name, pseudonym or brand is included in the original work or accompanies its publication.

Author's rights or copyright is the common term for a number of conventions that protect the author's economic and moral rights related to the use of the original work. The authorship right belongs to the author merely from the creation of the work, so no particular procedure is required for the work to be copyrighted. For example: when an author writes a novel, their work is already protected and they have the copyright to it. In EU countries, copyright lasts for the duration of the author's life and expires 70 years after their death.

The right to use another person's original work is generally achieved through an author's contract, signed directly with the author or with the appropriate organisation that represents the authors of a certain kind of creative work.

Other fields

When digitising cultural heritage, various tools can be used per existing legislation and guidelines. An example would be the use of drones for digitally scanning cultural heritage. On the 13th of August 2016, the Regulation of Unmanned Aerial Vehicles came into force. This regulation determines the general technical and operative conditions for the safe use of drones, unmanned aerial vehicles systems and model planes and determines the conditions for the users of these vehicles. The regulation is in force in the Republic of Slovenia for all systems of unmanned aerial vehicles of up to 150kg of weight.

More on: www.pisrs.si/Pis.web/preglejPredpisa?id=UR ED7317&0.5806895639579236

Storing digitised cultural heritage files

To ensure public access to the digitised assets of immovable cultural heritage and create opportunities for further use (in creative industries, for research, for national promotional activities...) all the files containing digitised assets of cultural heritage (3D models etc) must be saved at several backup locations and forwarded to national aggregator of 3D digitised cultural heritage.

Saving and archiving the files

Storing and securely archiving files of 3D models of digitised assets of cultural heritage is of utmost importance for the preservation of a digital documentation of the unit in a certain time point. With the advance of technologies, the guidelines for preparing 3D files are changing quickly. Thus we advice consulting with the T4.0 Technical guidelines: Digitisation of Cultural Heritage, also available at: <https://tourism4-0.org/articles-papers-and-guidelines/>.

In the time of preparation of this publication, the following instructions are in place:

- the model should be at a 1:1 scale
- the model should not require or include 3rd party plug-ins
- a preview of the render of a size of 1200x1200 pixels should be included
- it is recommended to export the file in several supported 3D formats (see below)
- optimised textures should be included in .jpg, .png or .tif formats (When using the Wavefront (.obj) format, it is recommended to include the (.mtl) material library file)
- it is recommended to include as few textures as possible
- it is recommended to optimise the wireframe by reducing the number of polygons
- the model should have a mesh structure

Storing a digital 3D model

- the recommended formats are: 3DS (.3ds), Alias Wavefront (.obj), Autodesk Filmbox, FBX (.fbx), Blender (.blend), Stereolithography, Standard Tesselation Language (.stl, .sta)
- files can be archived using: zip, rar or 7z.

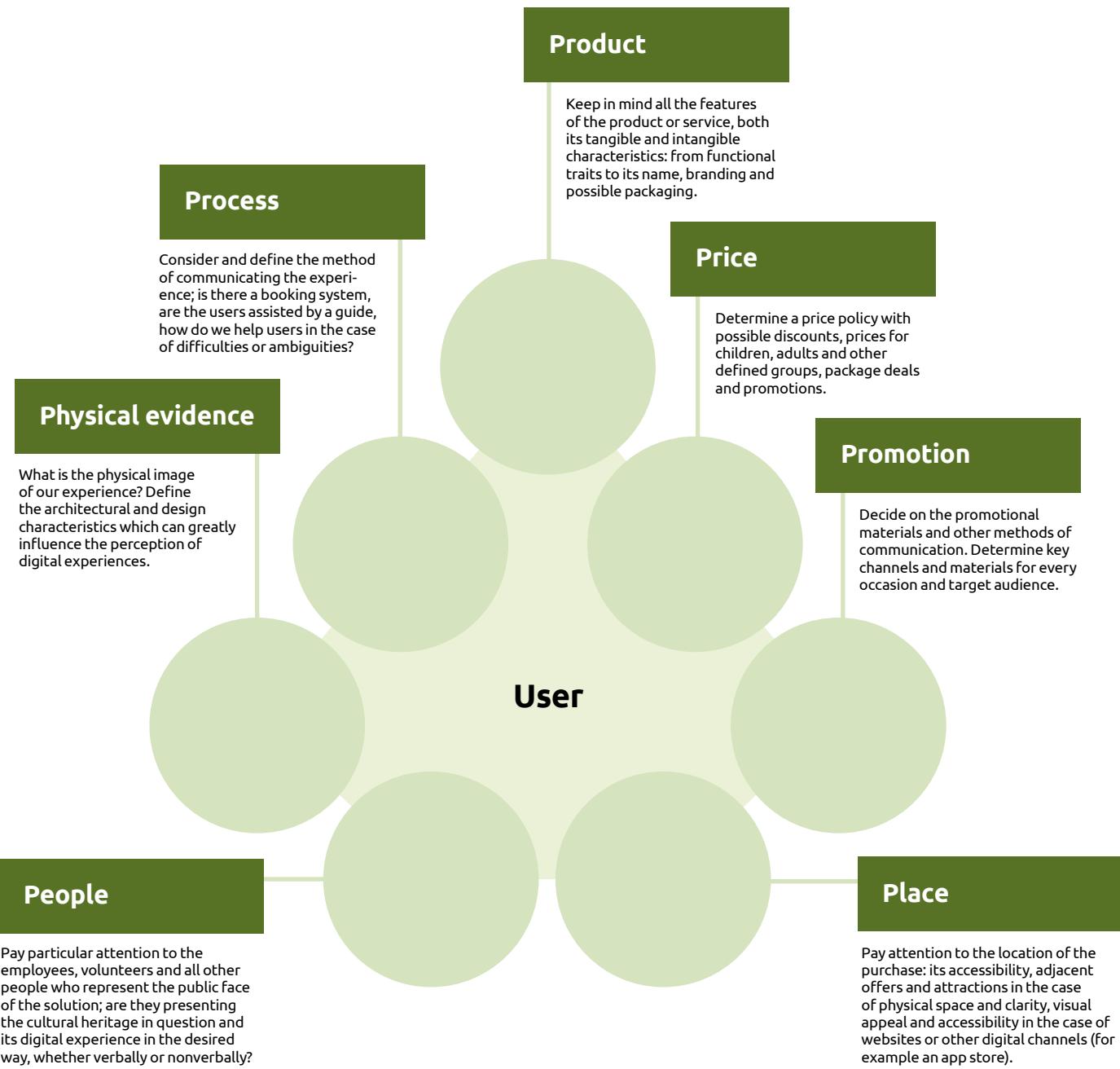
GNSS-RTK measurement, i.e. measurement of starting points and control points in the national coordinate system for georeferencing needs has to be made for all a digitised 3D immovable objects of cultural heritage. A GNSS-RTK measurement report is also needed.

When scanning cultural heritage sites, the scanning accuracy should be 18 mm when using photogrammetry and 8mm using laser scanners. When scanning urban and cultural landscape up to 10 ha, the recommended accuracy is up to 60 mm. A report on the measurement of accuracy (both for photogrammetry and laser scanning) has to be made.

LAUNCH AND PROMOTION

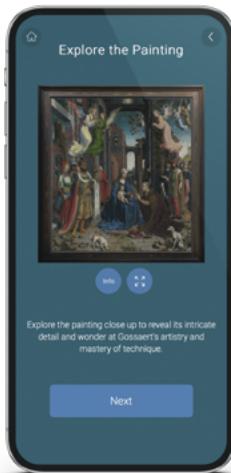
Marketing network – 7P

Before launching your project it is recommended to thoroughly consider your marketing network and address your target audience in a structured and purposeful way, using the right messaging and the right channels. Each of the following seven points poses questions that require concrete answers.



Summarised from: McCarthy E. J. 1960. Basic Marketing: A managerial approach.

Get inspired



The National Gallery, UK

The National Gallery of London is one of the world's most virtuous examples when it comes to immersive cultural experiences. It offers several **free virtual tours that can be enjoyed right from home**. From Google tour to tours dedicated to the Renaissance or particular artistic selections.

The most innovative example, however, is the "Sensing the Unseen" tour. The experience **is designed to be enjoyed on smartphones** and it allows to visit six scenes from Gossaert's "Adoration of the Kings," **zooming in on details and actually entering the artwork accompanied by interactive sounds**. A real dive into art!

teamLab Borderless of Shanghai, China

Is it possible to break down the frame boundary to allow art roaming freely in space? Yes, and that's what they did in Shanghai!

Through the **use of technology**, art has been brought to a new dimension, immersive and experiential, where the **visitor enters** in all respects **inside the work, feeling enveloped, actively participating and feeling part of the artistic concept**. teamLab Borderless is an example of how cultural and artistic heritage can be completely transformed and enjoyed in a new and more engaging way for the visitor, becoming a real experience to be shared.

Arcimboldi Museum, Italy

With the initiative "Claude Monet - The Immersive Experience", the Arcimboldi Museum in Milan is an excellent example of a highly successful **immersive experience linked to culture**. Through the use of both non-technological building blocks, such as furniture, **and technological ones** such as video panels and sounds, **the exhibition allowed the visitor to enter - literally - inside an impressionist painting**.

An alternative and innovative way of using an artistic heritage, which has **allowed the museum to increase visits and raise its profile** and offer the opportunity to enter the world of one of the greatest Impressionist artists of all time.

References

WWW sites and blogs:

- **World Tourism Organization**
www.unwto.org/
- **Wonderful Copenhagen, Localhood for everyone marketing strategy 2020**
www.cutt.ly/kn7zwmK
- **Artshub 2018, Feeling the impact of cultural tourism beyond the majors**
www.cutt.ly/3nTl7zr
- **Peak + Skift 2014, The Rise of Experiential Travel**
www.cutt.ly/WnTczBa
- **Tripadvisor, 2019 Experiential Travel Trends: New Skills, Health & Wellness, Family Activities Come Into Focus**
www.cutt.ly/4nTc8MU
- **Wikipedia**
en.wikipedia.org/wiki/Main_Page
- **INSIDER, Ultraviolet - a multi-sensory, immersive dining experience in Shanghai**
www.businessinsider.com/immersive-restaurant-ultraviolet-shanghai-high-tech-michelin-starred-2018-10
- **Why immersion matters**
www.cladglobal.com/architecture-design-features?codeid=31267&ref=n
- **Humans have more than 5 senses**
www.weforum.org/agenda/2017/01/humans-have-more-than-5-senses/
- **Usability, Design and Content Issues of Mobile Apps for Cultural Heritage Promotion: "The Malta Culture Guide Experience"**
www.arxiv.org/ftp/arxiv/papers/1207/1207.3422.pdf
- **How to Use Augmented Reality in Museums: "Examples and Use Cases"**
www.jasoren.com/how-to-use-augmented-reality-in-museums-examples-and-use-cases/
- **Palace of Versailles Official Website: "The Palace is Yours": (virtual tours)**
www.youtube.com/watch?v=PJRHUC0xa8&t=122s
- **Louvre Museum Official Website (virtual tours)**
www.louvre.fr/en/online-tours#virtual-tours
- **Ullastret3D. Walking through an Iberian town from 2.200 years ago**
www.heritageinmotion.eu/himentryl/slug-7b0593e03133f6bbab3b1245c16f4bde4
- **Experience Machu Picchu in Virtual Reality. YouVisit**
www.youvisit.com/tour/machupicchu
- **5 Ingredients for immersive storytelling with technology and space**
www.medium.com/design-voices/5-ingredients-for-immersive-storytelling-with-technology-and-space-2a4c8f73bc83
- **Atmospheres: Architectural Environments. Surrounding Objects, by P. Zumthor**
www.goodreads.com/book/show/327717.Atmospheres
- **5 best storytelling Ted Talks**
www.allgoodtales.com/5-best-storytelling-ted-talks/
- **Storytelling - How can we engage all the senses?**
www.senseoflearning.com/2017/11/29/storytelling-how-can-we-engage-all-the-senses/
- **7 Of The Best Examples Of Digital Storytelling**
www.thatsnovel.co.uk/2019/03/19/best-examples-digital-storytelling/
- **7 digital storytelling tips for the cultural heritage sector**
www.medium.com/digital-storytelling-festival/7-digital-storytelling-tips-for-the-cultural-heritage-sector-8e701a439dd6
- **Virtual tours of the National Gallery**
www.nationalgallery.org.uk/visiting/virtual-tours
- **Google virtual tour of the National Gallery**
www.nationalgallery.org.uk/visiting/virtual-tours/google-virtual-tour

- **The National Gallery: "Sensing the Unseen", At home, An experimental, interactive experience designed for mobiles (link to a mobile App)**
www.nationalgallery.org.uk/visiting/virtual-tours/sensing-the-unseen-at-home
- **Claude Monet - The Immersive Experience**
www.monet-experience.it/
- **teamLab Borderless Shanghai**
www.borderless.teamlab.art/shanghai/

Video:

- **Van Gogh Alive Wellington Exhibition**
www.youtube.com/watch?v=0_ij1d8Lvb0
- **The Story of Senses Through Natural History**
www.youtube.com/watch?v=5IOiKR3fvlS&t=60s
- **Bluecadet museum interactives for "Native American Voices" exhibition at the Penn Museum**
www.vimeo.com/89925565/c61857150f
- **Bygone: Scents in Colors – Introduction**
www.youtube.com/watch?v=3HaeVZCuMmQ&list=TLGGkXBzOrFbF8UxMjEyMjAyMQ
- **NAUSICAA - Immersive room about global warming**
www.youtube.com/watch?v=rfq3aClnelU&t=11s
- **The starry night Stereo VR experience**
www.youtube.com/watch?v=G7Dt9ziemYA
- **Barry C Smith: "We Have Far More Than Five Senses"**
www.youtube.com/watch?v=zWdfpwCghlw
- **The differences between AR, VR & MR**
www.youtube.com/watch?v=lFgGzOpjlUM
- **Chinese museums roll out VR, AR exhibitions**
www.youtube.com/watch?v=_l_bsuTv0P8
- **Google Cultural Institute - Mobile Apps Demo:**
www.youtube.com/watch?v=hOngqriHQI&t=2s
- **What is AR?**
www.youtube.com/watch?v=j9BY1tBmv8
- **Mobile Augmented Reality: Web vs App**
www.youtube.com/watch?v=OgmUjDMpphc
- **VARS - Augmented Reality for Tourism, Cultural Heritage and History**
www.youtube.com/watch?v=ZdWeYBBtxZA
- **Augmented Reality (AR) Applications for Museums**
www.youtube.com/watch?v=hDRVLYsCxgA
- **Exploring Cultural Heritage in Augmented Reality with GoFind!**
www.youtube.com/watch?v=W14e8SRZGkA
- **What is VR?**
www.youtube.com/watch?v=ULdt1rEgldc
- **Resonant: An Immersive Game for Connecting People to Cultural Heritage**
www.youtube.com/watch?v=Q1kXcQMAsEk
- **Hold The World | Rift**
www.youtube.com/watch?v=nr3l980mm-0&t=47s
- **Pleito VR Concept**
www.youtube.com/watch?v=PJRHUcC0xa8&t=122s
- **Interactive Table with Object Recognition**
www.youtube.com/watch?v=ELlqqgKEy8M
- **Planes of Fame Air Museum Interactive Touch Table Exhibit**
www.youtube.com/watch?v=0fU9Z6svUFA&t=16s
- **Wildlife Interactive Exhibition 2017**
www.youtube.com/watch?v=TdUo4yK8wj8
- **ARTLENS Gallery: Create, Engage, Connect | The Cleveland Museum of Art**
www.youtube.com/watch?v=XYRjaZl08lQ&t=85s
- **Cleveland Museum of Art, Gallery One (12/12/12 – 6/21/17)**
www.youtube.com/watch?v=qWJqd6lyJ-E&t=55s
- **10 Most Advanced Holograms that are CRAZY!**
www.youtube.com/watch?v=f7fffZ_k9ow
- **Build a 3D Hologram Projector**
www.youtube.com/watch?v=z9OEpAsosFw

- **How to Make 3D Hologram Projector with Resin (Super Clear) - Resin DIY:**
www.youtube.com/watch?v=qNceVquu0zo
- **A unique tourist experience of Posavje Castles**
www.youtube.com/watch?v=vouxDoHx6al
- **German Circus With Hologram Technology 2019**
www.youtube.com/watch?v=bR_By2jEEcw
- **Da Vinci Museum Rome 3D Hologram**
www.youtube.com/watch?v=BVym6-BJ78c
- **REAL holograms are finally here! (And they look very cool):**
www.youtube.com/watch?v=7oGtgbsmmg8&t=103s
- **Van Gogh, Atelier des Lumières, PARIS:**
www.youtube.com/watch?v=INXzwzyo9xE
- **Da Vinci Experience Multimedia Room**
www.youtube.com/watch?v=UjFOQhiOMM
- **How to create immersive storytelling experiences - Gamification in Tourism Case Study:**
www.youtube.com/watch?v=CwLkqlLkuSo
- **Getting to "Wow!" | John Nottingham | TEDxAsburyPark**
www.youtube.com/watch?v=jupM4Nc0Y_k
- **5 best storytelling Ted Talks**
allgoodtales.com/5-best-storytelling-ted-talks/
- **teamLab Borderless Shanghai, Digest Movie**
www.youtube.com/watch?v=jRjLBK9-ZZ0

Audio

- **TE MET, To See the King (audio)**
www.soundcloud.com/metmuseum/505-the-king?utm_source=clipboard&utm_campaign=wtshare&utm_medium=widget&utm_content=https%253A%252F%252Fsoundcloud.com%252Fmetmuseum%252F505-the-king
- **Inside the Circle of Fire: A Sheffield Sound Map by Chris Watson (2020 stereo version)**
www.youtube.com/watch?v=5hfoEDTn_fQ&t=434s

Canvas examples

- **User Centered Design Canvas**
www.cutt.ly/jnTvcjG
- **Persona Canvas**
www.cutt.ly/2n7bpgn
- **Storytelling Canvas**
www.cutt.ly/BnTbfPZ

Thanks

This handbook could not have been made without the thoughtful ideas and content contributed by tourist workers and decision-makers, for which we give them our sincere thanks!

Ministry of Economic Development and Technology

Ministry of Culture

Interregional association for blind and weak sighted persons Nova Gorica

National and univeristy Library

Slovenian Tourism Organisation

Destination Makers and Giorgia Laudate

A regularly updated version of the handbook where you can find answers to frequently asked questions, additional information about the T4.0 technical guidelines for digitising cultural heritage and general information about the Partnership for Tourism 4.0 initiative can be found at:

www.tourism4-0.org/ and www.tourism4-0.org/heritage/

Contact: info@tourism4-0.org

turizem 4.0

