

**CULTURAL HERITAGE & SUSTAINABLE DEVELOPMENT WITHIN
THE FRAMEWORK OF DIGITAL TECHNOLOGIES EDUCATION.
CASE STUDY: THE IRSCHEN PROJECT**

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Abstract

This article delves into the concepts of cultural heritage and its relationship to sustainable development. Many theoretical theories support Cultural Heritage's function as the fourth pillar of Sustainable Development, alongside the economy, society, and environment. Furthermore, cultural heritage must be disseminated and preserved as our common European culture. For this reason, the use of digital technology educational tools is emphasized.

This is demonstrated more clearly by the Irschen (Interdisciplinary Resilience through Science and Education Network) project, which created the Irschen Application. This is a smartphone application that uses the most common digital educational technologies to encourage digital learning while also fostering cultural heritage. It is operated by CMS and employs Augmented Reality, 3D graphics, and serious games to present the findings of the Burgbühl hilltop settlement. Furthermore, the program provides users with a variety of options for presenting their Points of Interest.

More importantly, it is useful for a wide range of people, including students, visitors, and tourists. This is how cultural heritage can use digital technologies to enhance heritage education, tourism, and, ultimately, sustainable development.

Keywords: *cultural heritage, sustainable development, digital technology, heritage education, heritage tourism*

Introduction

Cultural heritage and its preservation can greatly contribute to achieve the goals of sustainable development, as evidenced by the numerous studies and research projects conducted worldwide. Nowadays, the lack of the structured environment's uniqueness and identity is the primary issue in the pursuit of sustainable community development. Therefore, protecting cultural heritage must be seen as a way to promote cultural variety, a feeling of place, and sustainable economic growth in addition to maintaining the natural resources and cultural values. Cultural heritage and its preservation can yield several economic benefits. Historic buildings and sites help cities differentiate out from other cities by creating jobs,

revenue, and training opportunities. Heritage tourism, city center revitalization, import substitution, and property value increases are all influenced by the preservation of cultural heritage. Historic buildings support the growth of small businesses and are in line with the changing demands of contemporary society. (Grazuleviciute-Vileniske, 2006).

In this framework, numerous options and methods (mostly based on digital technologies) that allow visitors to experience new forms of communication and interactive visualization are currently available in many traditional museums and sites due to the advancements in technology. In particular, users/tourists have utilized virtual reality (VR) and augmented reality (AR) on multiple occasions to explore and learn about cultural heritage. (Navarrete, T. 2019 & Vaz, R.I.F.; Fernandes, P.O.; Veiga, A.C.R. 2018). These applications essentially combine interactive technologies that require users to act and make decisions with visual technologies that rely on the picture in the communication. The types of technology, the user's workplace, and the levels of presence, interaction, and immersion provided, differentiate the various potential manifestations. VR has been used to generate complex reality-based 3D models (Bruno, F.; Bruno, S.; De Sensi, G.; Luchi, M.L.; Mancuso, S.; Muzzupappa, M. 2010), explore digital copies of archeological relics [10], and develop immersive and interactive museum experiences to increase visitor engagement and education (Fernández-Palacios, B.J.; Morabito, D.; Remondino, F. 2017).

As a result, digital technologies have also had a significant impact on heritage education. People are now able to access heritage resources online, including digitized museum collections, historical documents, and other materials (Mendoza, Baldiris & Fabregat, 2015). This has made it much easier for people to learn about heritage from a distance, without having to physically visit a museum or other heritage site (Ott & Pozzi, 2011). Digital technologies have also made it possible for heritage educators to create more interactive and engaging learning experiences (Mendoza, Baldiris & Fabregat, 2015). For example, many museums and other heritage organizations now offer online exhibits and interactive resources that allow visitors to learn about heritage in a more immersive and hands-on way (Ott & Pozzi, 2011). In addition, digital technologies have made it easier for heritage educators to reach a wider audience. With the use of social media and other online platforms, heritage educators can share information about their work and resources with a global audience (Mendoza, Baldiris & Fabregat, 2015). Overall, digital technologies are having a decisive impact on heritage education, offering the potential for more interactive, accessible, and engaging approaches.

Specifically, in this paper Irschen Erasmus Plus project (Interdisciplinary Resilience through Science and Cultural Heritage Education Network) is presented. Irchen project refers to the digitization of cultural heritage and its promotion through digital tools to a wider audience both in the field of education and in the field of tourism as well as the wider society. The trigger for the birth of Irschen was the archaeological excavation site on the Burgbühl hilltop settlement, which dates back to the 3rd century AD and therefore refers to the era of the Late Antiquity. Specifically, the archaeologists Prof. Gerald Grabherr and Dr. Barbara Kainrath brought to light very important findings, buildings and objects that have outlined the socio-economic and religious characteristics of that period. In order for these important findings to be part of our Common European Cultural Heritage and e-learning material, the team digitized them and used them for an educational game (Astara, O., 2023).

1. Cultural Heritage and Sustainable Development

Cultural heritage includes artefacts, monuments, a group of buildings and sites, museums that have a diversity of values including symbolic, historic, artistic, aesthetic, ethnological or

anthropological, scientific and social significance. While tangible heritage include movable, immobile and underwater sites monuments artefacts, several objects and tools, intangible cultural heritage (ICH) is embedded into cultural, and natural heritage artefacts, sites or monuments. Cultural heritage is valued by communities, groups, or societies and often considered to be valuable. As a result, they are preserved in the present and passed on to for the benefit of future generations. The importance of cultural heritage as a source of historic evidence and memory serves as a repository for memories and sources of inspiration while fostering national and local community identity, which is crucial for the feeling of belonging and social cohesion (Unesco, 2009: Roders & Van Oers, 2011).

The United Nations Environment Programme (UNEP), the World Wildlife Fund (WWF), and IUCN (International Union for Conservation of Nature) mainstreamed the notion of sustainable development after the 1972 United Nations Conference on the Human Environment in Stockholm Sweden, which focused heavily on the issue of sustainability. In the Brundtland Report (Brundtland,1987), the necessity of preserving genetic variety, ensuring the sustainable use of species and ecosystems, and upholding fundamental ecological processes and life support systems was underlined by the World Conservation Strategy (1980). The main takeaway from this research was that, in order to provide future generations the resources to pursue development, economic expansion without causing environmental harm was both feasible and necessary. Rio de Janeiro UN Conference on Environment and Development in 1992 saw the adoption of Agenda 21. The World Summit on Sustainable Development in Johannesburg in 2002 saw the issuance of the United Nations Millennium Declaration, which listed sustainability as one of the eight MDGs. The United Nations Millennium Summit in 2000 took place before the release of the Millennium Declaration.

The three major conventions of UNESCO's Universal Declaration on Cultural Diversity—the 1972 Convention concerning the Protection of the World Cultural and Natural Heritage (also known as the World Heritage Convention), the 2003 Convention for the Safeguarding of the Intangible Cultural Heritage (also known as the Intangible Heritage Convention), and the 2005 Convention on the Preservation of Intangible Cultural Heritage—serve as cornerstones in the protection, conservation, and management of tangible and intangible cultural heritage.

A link between intangible cultural heritage and sustainable development was established by the 2003 Convention for the Safeguarding of the Intangible Cultural Heritage, which also acknowledged the significance of intangible elements such as various layers of identity in tangible manifestations of cultural heritage. In addition to language, performing arts, social customs, rituals and celebratory events, knowledge and customs about nature and the universe, culinary arts, and traditional craftsmanship, among other things, it advocates for the consideration of oral traditions and expressions not just as manifestations from the past that can be recorded and documented, but with the goal of securing their viability and creative continuity as an essential component of cultural diversity for present and future generations. This Convention outlined the roles that States Parties must play in protecting intangible cultural heritage at the national and international levels, including creating a Representative List of Intangible Cultural Heritage of Humanity, in recognition of the intangible heritage's vulnerability to processes of globalization and social transformation (UNESCO, 2003).

The 1972 World Heritage Convention and the 2003 Intangible Heritage Convention are linked by the Yamato Declaration on Integrated Approaches for Safeguarding Tangible and Intangible Cultural Heritage (UNESCO, 2004). Because of this, more and more cultural heritage sites have been recognized by the 1972 World Heritage Convention for their associative values. This recognition of the interdependence between intangible and tangible

cultural heritage calls for creative, comprehensive, and inclusive approaches to their preservation, management and development.

Following the adoption of the Convention on the Protection and Promotion of the Diversity of Cultural Expressions (UNESCO, 2005) and the Universal Declaration on Cultural Diversity (UNESCO, 2001), the significance of cultural diversity was acknowledged, and methods for managing the social, economic, and cultural effects of globalization on both contemporary cultural expressions and cultural heritage were developed and put into practice. It is noteworthy that the only UNESCO normative document that specifically discusses the role of culture in sustainable development is the 2005 Convention. In addition to these, a plethora of relevant charters, recommendations, memoranda, and other tools have been developed over the years to direct the management of cultural heritage. These have been primarily developed by the International Council on Monuments and Sites (ICOMOS), but they have also been developed by other governmental and non-governmental organizations (UNESCO, 2010).

Further from the institutional approach, numerous scholars have examined the connection between sustainable development and cultural heritage and have published their findings. As mentioned by Soini & Birkeland (2014), current models of environmental, social, and economic sustainability recognize culture as a critical component. One approach to this theory is to include culture with the idea of sustainable development in three capacities:

The first is supportive and self-promoting function (characterized as culture in sustainable development), which adds culture as a more or less self-standing fourth component, so simply and definitely expanding the conventional sustainable development discourse. While distinct environmental, social, and economic elements are linked to culture, it remains autonomous from them.

The term "culture for sustainable development" refers to the second role, which provides an evaluation of culture as a more potent force that can function outside the bounds of sustainable development. This function shifts culture into a style of framing, contextualization, and mediation that can maintain equilibrium. In this approach, the process of sustainable development is between economic, social, and ecological constraints by producing a variety of demands that result from cultural goals and behaviors. These three pillars currently in place drive this process.

According to D. Rypkema 1999, thinking in a broader context, the role of heritage striving for sustainable development is absolutely clear, preserving cultural heritage provides environmental sustainability, cultural and social sustainability and economic sustainability.

In line with the above, Keitumetse (2011) as well Astara (2014) underline that preserving cultural heritage helps mitigate hazards from natural and man-made disasters. Natural resource deterioration, neglected rural regions, urban development, and low-quality new structures all contribute to community vulnerability and disaster risk, especially in low-income nations. A well-preserved natural and historical environment, along with a strong cultural capital-based society, can greatly minimize catastrophe risk factors, increase community resilience, and save lives (World Cultural Heritage & Sustainable Development, 2015). Additionally, cultural heritage management practices are "by design" environmentally sustainable, reflecting centuries of constant adjustment between societies and their environment. The World Bank recognizes that investing in cultural heritage preservation can help cut CO₂ emissions and address climate change (Astara, 2014).

Moreover, cultural legacy is inextricably tied to the foundational elements of inclusive social development. Cultural legacy is critical for people's spiritual well-being in the most profound sense since it conveys values and identity while also organizing communities and their interactions through its tremendous symbolic and aesthetic qualities. The recognition and

preservation of cultural heritage diversity, combined with fair access to it and equitable sharing of benefits derived from its use, fosters a sense of place and identity, as well as respect for others, a sense of purpose, and collective capacity for maintaining the common welfare. All of these factors help to strengthen communities while eliminating inequality (Astara, 2014).

Last but not least, cultural heritage can drive economic development by attracting investment and creating sustainable jobs in fields like conservation, construction, food production, traditional treatments, pharmacy, crafts, and heritage tourism. These jobs require local resources that cannot be relocated. Furthermore, unlike other sectors, they provide economic opportunity for all societal groups, including women and young people (Astara, 2014). Therefore, sustainable development encompasses four pillars (Mitoula, Astara & Kaldis, 2008):

- economy,
- society,
- environment
- culture

It is clear that the definition of culture expands and calls for a methodical approach that takes into account elements from both the natural and human worlds. This is because culture is now seen as an equal pillar of sustainable development.

2. Digital Technologies in Heritage Education

Digital technologies can be extremely useful for heritage education in several ways. Some examples of how these technologies can be used include the following.

Virtual field trips: Virtual reality (VR) and augmented reality (AR) technologies can be used to create immersive educational experiences that allow students to explore historical sites and landmarks from the comfort of their classrooms (e.g., Garrido, Jiménez, Baldiris & Fabregat, 2015; Hain & Hajtmanek, 2019). For example, a student might be able to put on a VR headset and visit Irschen or use AR to see what a historical building would have looked like in its prime (Hu, Ng & Lee, 2019).

Digital exhibits: Museums and cultural institutions can use digital platforms to create virtual exhibits that allow students to explore historical artifacts and learn about the stories behind them. These exhibits can include interactive elements such as videos, games, and quizzes to keep students engaged (Argyriou, Economou & Bouki, 2017).

Online resources: Many museums and cultural institutions have begun making their collections and resources available online, allowing students to access historical artifacts, documents, and other materials from anywhere with an internet connection. These resources can include digital versions of primary sources, such as letters and documents, as well as educational materials and activities.

Digital simulations: Digital simulations can be used to recreate historical events or environments, allowing students to explore and interact with them in a virtual setting. For example, students might be able to use a digital simulation to explore a historical battlefield or participate in a virtual re-enactment of a significant event.

In this section an effort will be made to focus on five specific technologies to support the heritage learning. More specifically the discussion will focus on learning management systems, extended reality technologies (augmented, virtual and mixed reality), 3D digital models, holograms and artificial intelligence, and digital educational games.

There are many ways that you can use a LMS (learning management system) and digital technologies to teach heritage education. By incorporating a variety of interactive and collaborative activities such as:

- Create interactive lessons
- Use online discussion forums
- Incorporate virtual field trips
- Use digital storytelling
- Assign research projects
- Encourage collaboration

someone can create engaging and meaningful learning experiences for your students.

Extended reality (XR) refers to a range of technologies that enhance or augment a person's perception of the physical world. These technologies include virtual reality (VR), which completely immerses a person in a digital environment, and augmented reality (AR), which superimposes digital information onto a person's view of the real world (Garrido, Jiménez, Baldiris & Fabregat, 2015; Hain & Hajtmanek, 2019).

3D digital models are an important part of heritage education because they allow us to preserve and share a cultural heritage in a way that is more accessible and interactive than traditional methods (Skublewska-Paszowska, Milosz, Powroznik & Lukasik, 2022). 3D models can be created from a variety of sources, including laser scans, photographs, and drawings, and they can be used to create virtual exhibitions, virtual reality experiences, and educational materials (Ismaeel & Al-Abdullatif, 2016).

3D digital models can be a powerful tool for heritage education because they allow students to explore and interact with cultural heritage in a way that is not possible with physical artifacts (Vicent, Ibáñez-Etxeberria & Asensio, 2015). 3D digital models have already been used in heritage education in the following ways:

1. Virtual reality experiences: 3D models have been used to create immersive virtual reality experiences that allow students to "visit" cultural heritage sites or artifacts from around the world (Hain & Hajtmanek, 2019).
2. Interactive exhibits: 3D models have been used to create interactive exhibits that allow students to explore and learn about cultural heritage more engagingly.
3. Educational resources: Educational resources: 3D models have been used to create educational resources such as video games, simulations, and interactive websites that help students learn about cultural heritage in a fun and interactive way.
4. Virtual tours: 3D models have been used to create virtual tours of cultural heritage sites or artifacts, allowing students to explore and learn about them from the comfort of their own homes.

Holograms can be a useful tool in digital heritage education because they allow people to experience and interact with historical artifacts and places in a more immersive and realistic way. For example, a holographic exhibit at a museum might allow visitors to explore a recreated ancient city or interact with virtual representations of historical objects (Ismaeel & Al-Abdullatif, 2016). Artificial intelligence (AI) can be used in heritage education to enhance the learning experience and make it more interactive and engaging for students. By leveraging digital technologies, such as virtual and augmented reality, AI can help bring historical events and artifacts to life in a way that is more immersive and engaging for learners (Ismaeel & Al-Abdullatif, 2016). In addition, AI can be used to analyze and interpret large amounts of historical data, such as documents and artifacts, and present it in a more easily digestible and interactive format. This can help students to better understand and appreciate the complexity and significance of historical events and the context in which they occurred.

Serious games are interactive educational games that are designed to teach or train players on specific topics or skills. They are typically used in a variety of settings, including education, corporate training, and military training (Dagnino, Ott, Pozzi & Yilmaz, 2015; Ye, Wang & Zhao, 2021). In the context of heritage education, serious games can be used to engage and educate players about historical events, cultural practices, and other aspects of heritage.

There are many different types of serious games that can be used in heritage education (Ye, Wang & Zhao, 2021). Some examples include:

Historical simulations: These games allow players to experience historical events or periods in a simulated environment. Players may be asked to make decisions and interact with other characters to learn about the historical context and consequences of their actions.

Cultural exploration games: These games allow players to learn about different cultures and their traditions, customs, and beliefs. Players may be asked to complete tasks or engage in activities that are specific to a particular culture.

Archaeological simulations: These games allow players to experience the process of archaeology and learn about ancient civilizations and their cultures. Players may be asked to excavate sites, analyze artifacts, and piece together the history of a civilization.

These digital technology applications offer a unique and radical learning experience. This experience not only enhances students interest and knowledge but moreover provokes citizens and visitors to attend and use these tools and in this way to create their own memory and sense of history without being in person but in a distance manner chronologically and/or locally.

3. The Irschen Project

The scientific project Irschen (Interdisciplinary Resilience through Science and Cultural Heritage Network) took place from March 2021 to March 2023 in the frame of Erasmus+ and specifically of the KA2 Action that promotes cooperation between Institutions and Organizations.

Six partners from four countries participated in the project: Austria, the birthplace of the Irschen idea, offered the Leader Partner, i.e. the University of Innsbruck, as well as the Municipality of Irschen; Slovenia, with the Slovenian Academy of Sciences (ZRC SAZU); Italy with the innovative company 3D Mobile; and last but not least, Greece with Solidarity Tracks (NGO) and the Ionian University.

The Intellectual Outputs (IOs) of the project were the following:

IO1 related to the collection and research of Cultural Heritage Data (analog and digital in 3D, available in English and German) led by UIBK in collaboration with ZRC SAZU and the municipality of Irschen.

IO2 on a good-practice guide for digital applications in cultural heritage by Solidarity Tracks.

IO3 on Digitization processes for innovative & inclusive education: Transformation of finds from archaeological sites into e-learning materials (available in 5 languages: English, Italian, Greek, German, Slovenian) under the guidance of the Ionian University in close collaboration with Solidarity Tracks.

Specifically, the objective of the project was the digitization of cultural heritage and its promotion through digital tools to a wider audience both in the field of education and in the field of tourism as well as the wider society. The trigger for the birth of Irschen was the archaeological excavation site on the Burgbihl hilltop settlement, which dates back to the 3rd century AD and therefore refers to the era of the Late Antiquity. Specifically, the

archaeologists Prof. Gerald Grabherr and Dr. Barbara Kainrath brought to light very important findings, buildings and objects that have outlined the socio-economic and religious characteristics of that period. In order for these important findings to be part of our Common European Cultural Heritage and e-learning material, the team digitized them and used them for an educational game.

3D Mobile, which specializes in digital applications for highlighting cultural monuments (archaeological sites and mainly galleries and museums), undertook the creation of the application, via the digitization of the route to the archaeological site and, with the collection of technical data and scientific data for the findings, so as to highlight them with the use of analog and Augmented Reality.

To make the story behind the digital application more interesting for the students and the

general public, as well as to enable its use as an e-learning material in a course, it was decided to create it at the Meeting in Ljubljana, Slovenia, in April 2022. The Co-Creation Seminar during this meeting helped all partners to structure the story of the digital application Irschen. It included an interface with modern reality, which was made possible through time travel to rescue the settlement's inhabitants from a disaster brought about by



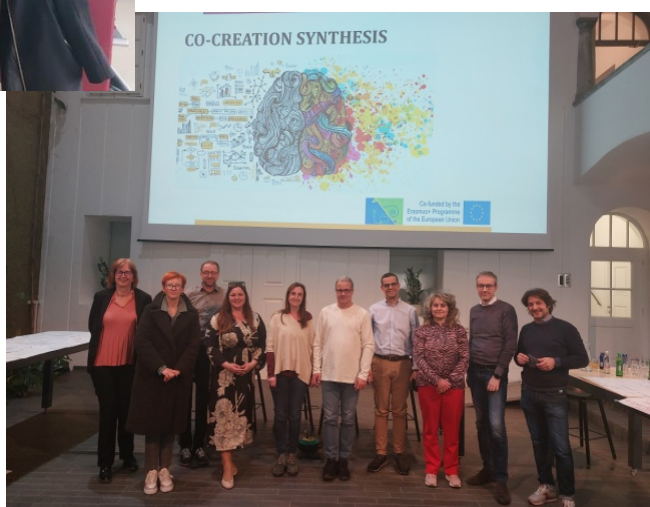
climate change. Moreover, after each part of the overall story, quizzes follow that help students and citizen/visitors to gain knowledge.

During the last scientific camp, students from all the partner countries participated. The Ionian University participated with two students from the Department of History and the Department of Environment, specialization of Preservation & Management of Cultural Heritage) who

showed a special interest in the archaeological excavation and its findings. In addition, the educational game-application created by the company 3D Mobile was also tested.

Subsequently, at the next transnational meeting of the project in Irschen and Kobarid (Slovenia), the partners carried out a field test - evaluation of the functionality of the app of the educational game. In addition, an effort was made to transfer the know-how and the good practices from the development of the app and educational game to Tonovcov Grad (archaeological site in Kobarid).

The next meeting, together with a Multiplier Event, was held in Udine, Italy and hosted by 3D Mobile. In this meeting the importance of Irschen's Educational Digital App was highlighted. In addition, a Digital Readiness Seminar was held for understanding the possibilities of using the CMS which was used to create the application. The contribution of



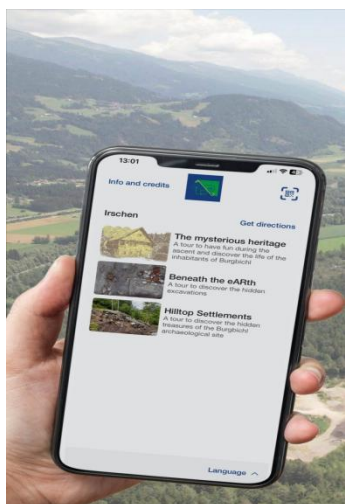
the Ionian University was presented through the Module for Education, Cultural Heritage and Learning with digital technologies, authored by the Assistant Professor of the Ionian University Dr. Spyridon Doukakis and presented by the Assistant Professor Dr. Naoum Mylonas (deputy Principal Investigator for Irschen).

The International Conference for the dissemination of the Intellectual Outputs of the project took place on March 21, 2023, in Corfu, Greece. It was an important event that attracted the attention of many members of the academic staff from the Ionian University and other Universities. It also attracted many students and the press who covered this event. The title of the Conference was “Digital Technologies, Common European Cultural Heritage and Sustainable Development” and it had four sessions representing the main Intellectual Outcomes of the Project. The First Session: Sustainable Development & Promotion of Culture, The Second Session: Historical Value of Late Antiquity: Challenges and Future Directions. The Third Session: Digital Tools & Transformation of Cultural Heritage and the Fourth Session: Special Topics of Cultural Heritage.

Last but not least, the completion of the project required the delivery of the Project’s evaluation file named **"Digitization processes for innovative and inclusive education: Transforming finds from archaeological sites into e-learning material. In the context of Irschen"**. It was written by the Assistant Professor Olga Eleni Astara (Principle Investigator for Irschen) and Assistant Professor Naoum Mylonas. All partners contributed to its editing, namely Mr Demis Corvaglia & Mr Lucas De Marco (3D Mobile), Dr. Zvezdana Modrijan, Research Associate, ZRC-SAZU, Institute of Archaeology, Ljubljana, (ZRC SAZU), and Mr. Mohamed Chaabouni (Solidarity Tracks).

3.1 The Irschen Digital Toolkit: The Irschen Application Game example

Mobile 3D was responsible for IO2. In particular, the Italian partners, created the Irschen digital toolkit. According to Mobile 3D presentation, various components were created that make up the "IRSCHEN" Digital Toolkit. They are a set of tools (digital and methodological) that can be used to create educational and cultural entertainment content and experiences. The toolkit contains two main software products:



- The CMS, acronym which stands for "Content Management System": is a portal publicly available at the web address <https://irschen.mobile3d.info>. The CMS allows you to add, organise and make content available in different formats. The tool provides a basic "framework" for structuring data content, driving the user in the correct organisation of the contents.
- The "IRSCHEN" APP: is a mobile app (available for iOS and Android) which allows you to create visiting and learning experiences drawing on the contents of the CMS. The Digital Toolkit collects also a lot of video tutorials that exemplify the phases of content creation and the usage of these technologies.

CMS allows the insertion of textual and multimedia contents to describe points of interest (Point of Interest, POI) of any type (for example, paintings, statues, archaeological finds, etc...) defining basic information such as:

- Category (customisable, for example "painting")
- Title (multilingual) • Preview image

- Text description (multilingual)
- Associated multimedia content such as images, audio, video and 3D
- Other linked/contained POIs
- Metadata (also customizable by application sector, for example, in the case of artistic works it is possible to define the author metadata).

The basic information can be extended with advanced information, such as:

- Association to a QR Code
- 3D Models for Augmented Reality
- Text variants aimed at speech synthesis on iOS and Android mobile platforms.

CMS offers you a variety of options. For example you can add a quiz to a POI. This is possible by opening a POI, and entering “modify mode”. Then you modify Quiz section and select a Quiz, you then add a content as prize. A More advanced option in CSM which can only be made by the administrator is adding a QR code. This QR code has a mnemonic name and the code suggests a naming convention that guarantees uniqueness. In addition you can add advanced parameters in POI. These are a QR code and a GPS position.

The Irschen application game for mobiles is the best way to demonstrate the CMS functions and the excellent work done by 3D Mobile.

It is an implementation of the above analysis. You choose the preferred language among the options given. You have 5 option: German, Slovenian, Italian, Greek and English and then you select the Mysterious Heritage.

The game Itenary has a lot of locations and you can enter the map icon to see your location. You must note that the game should be played in Irschen, but it is possible to go though the content everywhere. . The map has red pins which are the legs of the game, while the pins with the “puzzle” icon have a question for the participants!

In the map you can see the approach path. The archaeological site is on the top of the hill Burgbihl (late antiquity), but the story starts from the valley. There is a steep portion of the path where the

player can't do anything but climb (and gasp, no content or quizzed here!). When you reach the Archaeological site follow the path and you'll see:

- The Gate
- The Craftsmen's quarter
- The Cistern
- The Church on the hilltop
- The House
- The Big Church

There is a story connected to four of the POI where each leg is connected to a question/quiz. There is also a prize for almost every answer. The game also offers the option to skip the quiz and just enjoy the encounter with the archaeological remains. This becomes quite important given the fact that the application uses **Augmented Reality 3D** graphics that let us virtually reconstruct buildings and artefacts from the past which are now ruins or no longer standing.

Discussion - Conclusions

It is apparent that the Irschen project incorporates the digital technology tools for the enhancement and promotion of cultural heritage and Sustainable Development. Specifically the main idea behind Irschen was shedding light on the archaeological site of Burgbihl through the preservation and digitization of the archaeological site and its findings in order to transform it into common European culture and also help the city acquire cultural aspects and consequently cultural tourism. This is in line with the theoretical approach that supports that

Cultural heritage is the fourth pillar of Sustainable Development and thus, contributes to the other three pillars economy, environment and society (D. Rypkema 1999, Astara, 2014). In addition the digitization of cultural heritage according to Grazuleviciute-Vileniske, I. 2006 help cities to create their own identity and brand name and thus create jobs, revenue, and training opportunities.

The Irschen application utilizes many of the technological tools for heritage education mentioned at the above subchapter. Firstly, Augmented reality (AR), which superimposes digital information onto a person's view of the real world (e.g., Garrido, Jiménez, Baldiris & Fabregat, 2015; Hain & Hajtmanek, 2019) helps the ruins/findings of Burgbühl take shape and size creating a very identical image to their initial condition in the minds of the visitors. Furthermore, virtual field trip in Irschen helps students to see what a historical building would have looked like in its prime (Hu, Ng & Lee, 2019). Additionally, Irschen application uses 3D digital models which allow us to preserve and share cultural heritage in an accessible and interactive way, far more than traditional methods.

Moreover, Irschen game relates to serious games which are interactive educational games that are designed to teach or train players on specific topics or skills. In addition, according to Dagnino, Ott, Pozzi & Yilmaz, 2015; Ye, Wang & Zhao, 2021 serious games are typically used in a variety of settings. In the context of heritage education, serious games can be used to engage and educate players about historical events, cultural practices, and other aspects of heritage which is actually what the story presents about Burgbühl site and its findings while teaching important aspects about the life of the citizens in late antiquity. Furthermore, the game and quizzes connected to POI educate and test the students/visitors better comprehend and learn the concepts and findings they interact with. This is in line with Argyriou, Economou & Bouki, 2017 who argue that digital exhibits allow students to explore historical artefacts and learn about the stories behind them. These exhibits can include interactive elements such as videos, games, and quizzes to keep students engaged.

Last but not least, heritage culture of Irschen as preserved by archaeological excavations and digitized by Irschen application, fosters economic benefits, together with environmental preservation and social cohesion. As it is indicated by World Cultural Heritage & Sustainable Development, (2015) a well-preserved natural and historical environment, along with a strong cultural capital-based society, can greatly minimize catastrophe risk factors, increase community resilience, and save lives. In advance, cultural heritage management practices are environmental friendly, reflecting centuries of constant interaction and adjustment between societies and their environment. It is also stated by The World Bank that investing in cultural heritage preservation can help cut CO₂ emissions and address climate change (Astara, 2014).

Moreover, the Irschen application is freely distributed which favours the recognition and preservation of cultural heritage diversity, combined with fair access to it and equitable sharing of benefits derived from its use. Consequently, it offers a sense of place and identity, as well as respect for others, while it helps to strengthen the community while eliminating inequality (Astara, 2014).

Last but not least, the Irschen project served a unique purpose because it helped academics, researchers, students, entrepreneurs and members of a Nongovernmental organization cooperate and produce, though from a different discipline each one, a Network which promoted Cultural Heritage Resilience and Sustainable Development.

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