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Exploring the Application of a Co-Creation Model in Archaeological Tourism: Two Case Studies Developed Under TURARQ's Project Within the Frame of Link Me Up - 1000 Ideas Project

Explorando a Aplicação de um Modelo de Cocriação no Turismo Arqueológico: Dois Estudos de Caso Desenvolvidos no Âmbito do Projeto TURARQ Sob a Égide do Projeto Link Me Up - 1000 Ideias

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Abstract

This paper discusses two projects that revolve around the conceptualization of tourism development instruments within the framework of interpreting and understanding archaeological sites through a sustainable approach as part of TURARQ's initiative. The primary objective was to explore the application of a co-creation model, specifically the 'Project Based Learning' methodology of the "Link me Up" project in the field of archaeological tourism. The first case, 'Show Me the Past', involved the development of a mobile app that utilized an agile requirement analysis to create a prototype. The second case, 'Showcasing Prehistory', focused on entrepreneurship, inclusion, heritage, and sustainability, using a diagnosis of the social issues affecting the Mação territory. The outcomes of the first case included the creation of a Mobile Augmented Reality (MAR) application, which allows users to visualize virtual objects in the real environment of discovery. In the second case, empathy maps were developed, encompassing archaeotourism, the local community, theme parks, and special needs. The findings indicated that these programmes generated high levels of participant satisfaction and positively impacted competency development. However, further studies are required to ascertain the number of participants who have transitioned into entrepreneurs because of their involvement in these projects.

Keywords: Territorial Valorization; Augmented Reality; Heritage and Tourism; Work-based Programmes; Open Innovation Platform.

JEL Codes: R11, R58; L86, Z83; Z32, L83; J24, J29; O31, O32.

Resumo

Este artigo discute dois projetos que giram em torno da conceptualização de instrumentos de desenvolvimento turístico no âmbito da interpretação e compreensão dos sítios arqueológicos através de uma abordagem sustentável como parte da iniciativa do TURARQ. O objetivo principal foi explorar a aplicação de um modelo de cocriação, especificamente a metodologia 'Project Based Learning' do projeto "Link me Up" na área do turismo arqueológico. O primeiro caso, 'Show Me the Past', envolveu o desenvolvimento de um aplicativo móvel que utilizou uma análise ágil de requisitos para criar um protótipo. O segundo caso, 'Mostrar a Pré-história', centrou-se no empreendedorismo, na inclusão, no património e na sustentabilidade, recorrendo a um diagnóstico das questões sociais que afetam o território de Mação. Os resultados do primeiro caso incluíram a criação de uma aplicação Móvel de Realidade Aumentada (MAR), que permite aos utilizadores visualizar objetos virtuais no ambiente real de descoberta. No segundo caso, foram desenvolvidos mapas de empatia, abrangendo o arqueoturismo, a comunidade local, os parques temáticos e as necessidades especiais. As descobertas indicaram que esses programas geraram altos níveis de satisfação nos participantes e impactaram positivamente o desenvolvimento de competências. No entanto, são necessários mais estudos para determinar o número de participantes que transitaram para empreendedores devido ao seu envolvimento nestes projetos.

Palavras-chave: Valorização Territorial; Realidade Aumentada; Património e Turismo; Programas Baseados no Trabalho; Plataforma de Inovação Aberta.

Códigos JEL: R11, R58; L86, Z83; Z32, L83; J24, J29; O31, O32.

INTRODUCTION

TURARQ's project is founded on several principles, among them the notion that the essential aspect of archaeological tourists' experiences is the cognitive acquisition by visitors of an archaeological site, facilitated through identification with the site's nature and functionality. In contextualizing this, it can

be said that the project serves as a testament to human journeys in the past and as a marker of the territory's distinctiveness. Thus, when its researchers were challenged to help students develop their entrepreneurship skills in the field of archaeological tourism within the context of project 'Link me Up' project, they immediately accepted and embraced the challenge. This enthusiasm was particularly strong because implementing co-creation is also a central objective of the TURARQ's project. On the other hand, the concept of co-creation and empirical studies that demonstrate how organizations and individuals interact and exchange resources and ideas to co-create value in tourism are still emerging, especially regarding the co-creation of value linked to new technologies (Payne *et al.*, 2008; Rihova *et al*., 2015; Mijnheer & Gamble, 2022).

In response to our initial question – how a co-creation model such as the Problem-Based Learning (PBL) methodology, supported by the 'Link me Up' project, can be successfully applied in the field of archaeological tourism – we believe that having students co-create experiences and shared situations with the guidance of experts is the most effective way to build trust and a shared understanding. This approach is strong enough to encourage students to move beyond their familiar interfaces and explore new ideas and solutions as they develop. Additionally, it facilitates the creation of new and distinct tourism development strategies and may even inspire students to consider becoming entrepreneurs.

The 'Link me Up' is a project co-funded by 'COMPETE 2020', 'Portugal 2020' and by the European Social Fund (ESF) and it seeks to promote entrepreneurship through the training of young students and/or entrepreneurs aiming to increase the quality of employment and the creation of innovative companies. In addition, this project was created having in view (Link me Up – 1000 ideas, 2023):

1. The creation of ideas and business plans.
2. The co-creation of innovation based on multidisciplinary teams of young students and/or entrepreneurs of Higher Polytechnic Education in Portugal.

In the present paper, we demonstrate how this approach was implemented in practice with the support of researchers (experts) from the Polytechnic Institute of Tomar (IPT), who are responsible for the development of the project TURARQ.

Different projects emerge to bridge the gap between tourism and archaeological sites. Such as the TURARQ project. TURARQ aims to contribute, protect and enhance archaeological heritage in low density areas, as a vehicle for a harmonious integration between the cultural and natural environments, around the notion of landscape and from a perspective of co-construction and dissemination of scientific knowledge for the sustainability of Middle Tagus territory area in Portugal, articulating different stakeholders and combining experiences related with the archaeological site through digital resources (e.g., augmented reality) using the experimentation and reconstruction of prehistoric ways of life to understand the past.

This article aims to highlight two projects implemented using 'Link me Up' support. The projects relate to the idealization of tourism products that can be framed within the logic of interpretation and understanding of archaeological and interpretative sites within a sustainable logic: i) The 'Show Me the Past' case study and ii) the 'Showcasing Prehistory' study case. The first one devises the planning of a technological method for envisioning archaeological sites, more precisely, the Vale do Junco site. The second structures an economically sustainable business model to recreate prehistoric ways of life in an 'ArchaeoPark' which is being built in the Mação Municipality (Middle Tagus region) as part of a project by the Instituto Terra e Memória that counts with the support of TURARQ's project experts.

Concerning the structure, in addition to this introduction, which describes the general perspective of the article, as well as the objectives, in the background section, one provides a literature review, with broad definitions and discussions concerning the use of co-creation initiatives aiming the territorial valorisation. In the methodology section, one exposes and describes the research procedures of the two case studies, as well as the process of the case studies' project development and future ongoing implementation. In the results and discussion section, the results of the first achievements of both case study projects are presented and discussed regarding the data collected, and researchers' interpretation, based on the literature review. One ends the paper with the conclusions that have emerged regarding the proposed plan to enhance archaeological heritage sites.

1. BACKGROUND: THE TERRITORIAL VALORISATION AND THE TURARQ PROJECT

Archaeology also creates cultural heritage and participates in its management (Oosterbeek, 2017), and archaeology while a tourism resource implies its commodification through a very well-planned process that orientates the tourist gaze towards pre-chosen features (Hubbard & Lilley, 2000; Ross & Saxena, 2019). According to Lopes and Mota (2021), innovation has become central when addressing current territorial dynamics, but also in analysing the performance of organisations. In the same line of thought, the UN's (UN, 2020) 2030 Agenda: Sustainable Development Goals (SDGs), reinforces actions aimed at protecting and safeguarding cultural and natural heritage. In this way, archaeological tourism emerges as an important product of the territory, being able to provoke territorial tourism demand and attractiveness.

Archaeotourism or tourism in archaeological sites it is not a new term or concept, many have written about this subject. For example, Ramsey & Everitt (2008), Pacifico and Vogel (2012), Willems and Dunning (2015), Ross *et al.*, (2017), and Erdogan (2021), all tried to clarify the term of archaeotourism saying that it is a significant component of heritage tourism and can be defined as tourist visits or touristic activities at recognisable areas including excavation sites. Others like Thomas and Langlitz (2019:77) express that" archaeotourism raises interest in archaeological sites and cultural heritage and can be a powerful tool for increasing awareness of and support for the conservation and protection of sites".

In Central Portugal, the Tagus River is one of the most relevant territorial assets of the Middle Tagus region and an aggregating element of the territory's heritage. This is one of the reasons why one intends to promote a valorisation work around this important resource. In the context of the last Community Support Frameworks, initiatives of economic valorisation of the territory were developed around this resource, which should be continued. The strategy presented here foresees a set of works to be accomplished, which includes the elaboration of a territorial contextualization, and a strategic vision for the Tagus River. One that identifies the critical success factors, establishes guidelines, objectives, and anchor projects, presents a global programme of action and defines a model of governance, without obliviating the monitoring and follow-up of the project, among other foreseen works around archaeological heritage assets.

The National Programme for Territorial Cohesion (PNCP, 2017:126) seeks "the promotion of Tourism with a view to the enhancement and sustainability of the natural, cultural and landscape heritage of the inland regions" adding that (PNCP, 2017:3):

> "(…) it is urgent to affirm positively the country's interior, (...) to promote and valorise endogenous resources, identify and stimulate structuring projects, align competencies and investments, invest in intelligent economic development and the reinforcement of network activities, (...) thus creating the environment and the conditions favourable to the settlement of people and ensure a new vitality and a sustainable prosperity in the interior regions".

The Tourism National Strategy (ET2027, 2017), known by the acronym ET27, defines five strategic axes and for each one several lines of action were established, some of them extremely important for inland territories. The ET27 also expresses that the local authorities must consider (when drawing up their Local Strategic Tourism Plans) to adapt what the plan advocates to their own local reality. For the inland territories, when considering the development of archaeological tourism and TURARQ's project objectives, one highlights the following lines of action predicted in the ET27:

- Preserve, add value to and use historic-cultural heritage.
- Value and preserve its authenticity.
- Economically leverage natural and rural heritage and ensure its conservation.
- Promote urban regeneration of the cities, regions, and sustainable tourism development of the territories/destinations.
- Structure and promote offerings that meet tourism demand.

- Ensure the transfer of knowledge from educational institutions and research centres to businesses.
- Disseminate knowledge and statistical information.
- Ongoing training of entrepreneurs and managers to lead the tourism of the future – technological, inclusive, and sustainable.
- Mobilise networking and joint promotion between the various sectors.
- Actively involve society in the process of tourism development in the country as a whole and in the regions.
- Promote "tourism for all," from an inclusive point of view, incorporating the various tourism markets/segments.

Portugal has, a clear and consistent strategy for Tourism development, and it is up to the municipalities to study it and adopt it in their respective local strategies. This strategy is already giving excellent results in the metropolitan and coastal areas and needs to be generalised to the rest of the territory, namely to the country's interior.

With the fabulous tourism resources that inland regions and municipalities have, both natural and built, municipalities and all those who are (or may become) directly and indirectly involved in the tourism sector should have the commitment to look at those resources with more ambitious and competent eyes, to value them internally and externally, and to take from them the benefits that their territories and populations need to improve their well-being.

This sectoral exercise should be carried out within the framework of a more comprehensive and planned approach to both territorial tourism planning and marketing, and not in a haphazard and individualised manner, as Martins (2018) says the issue of policy implementation is crucial for the tourism sector, since many strategic tourism plans and policies or are not or are just partially applied, creating a gap between what was intended and what was really accomplished. It makes no sense, for example, to promote tourism initiatives with quality and glamour in unhealthy, degraded, or unsafe urban spaces. Just as it also makes no sense to waste resources (or not save them) on superfluous or redundant initiatives, which is why the National Programme for Territorial Cohesion (PNCP, 2017:4) proposes a "new, more collaborative and more local-based approach that promotes active participation and a committed involvement of local authorities, inter-municipal communities, associations, companies and people in the construction of a more cohesive, more competitive and more sustainable interior".

Taking all this into consideration, the TURARQ's project starts from the observation and identification of a basic error in the dominant practices in the sector: the use of similar strategies for both archaeological and other sites and monuments. By knowing the core of both archaeology and tourist experiences, the cognitive appropriation by the visitor of an archaeological site is, most of the time, very distinct, because it cannot be based on an identification with the nature and functionality of the place. In this sense the TURARQ's project is much aligned with the idea of Goudswaard *et al.*, (2021) that suggested that archaeological knowledge produced in developer-funded archaeology contexts can be built on a locally inspired character that amplifies the spatial quality of the projected development as well as the sites touristic attractiveness. Several researchers underline for example how scientific knowledge, local memory and values associated to historical remains and emotions that they evoke in individuals, or be, intangible elements of archaeological heritage, are kept alive in the collective memory (Carboni & Luca, 2016; Ross *et al.*, 2017; Oosterbeek, 2017).

The TURARQ project is developed in the Middle Tagus (Portugal), in five municipalities (Mação, Tomar, Abrantes, Constância and Vila Nova da Barquinha) on an axis that follows the A23/A13 road and railway axes and the Beira-Baixa/Ramal de Tomar Line. Its mission is to contribute to the protection, amplification, and promotion of archaeological heritage in areas of low density, enhancing it as a vehicle for integration between the cultural and natural environments, around the notion of landscape and from a perspective of co-construction and dissemination of scientific knowledge for the sustainability of the territory of the Middle Tagus, always bearing in mind that "transitions to more sustainable landscapes require that actors change their thinking about using the landscape and act

collectively to implement a shared view on the future" (Opdam, 2020:2629). The goal is to articulate strategies with national entities that manage the territory, heritage, and tourism (CIMT - Intermunicipal Community of the Middle Tagus area; DGPC - Directorate-General for Cultural Heritage and Tourism Centre), with the business sector (NERSANT - Santarém Region Business Association; and PME - Small and medium-sized enterprises) and with UNESCO (United Nations Educational, Scientific and Cultural Organization). Its course of action consists mainly in:

- Securing funding for the project management and development.
- Analysis of existing inventories and developing new ones.
- Management of archaeological landscapes and tourism resources.
- Specialised training and education (tourism products, models of good practices in the preservation of archaeological landscapes) and,
- Marketing and communicating the territory integrated into a systemic logic of a relationship with the stakeholders with interests in the territory.

Therefore, the project has a team gathered with the support of the UNESCO Chair and the three IPT (Polytechnic Institute of Tomar) research centres that integrate the network supported by the FCT – Foundation for Sciences and Technology – (Geosciences Centre, Techn&Art and Ci2). The mission aims to work as an umbrella to integrate different projects applied to archaeological tourism development, combining experiences related to archaeological landscapes through digital resources (for instance, augmented reality) using the experimentation and reconstruction of prehistoric ways of life to understand the past. That is being and was implemented, without forgetting that the way one interprets heritage when aiming to understand its meaning to different groups is a very important task because heritage occurs in different spheres and it is revested of a special significance to political, cultural, educational, and entrepreneurial ends, among other (Nilson & Thorell, 2018).

2. WORKED-BASED PROGRAMMES AND OPEN INNOVATION PLATFORMS: THE 'LINK ME UP' PROJECT.

The 'Link me Up' project (Link me Up – 1000 ideas, 2023) aims at strengthening the interaction with the business and/or organisational community through the participation of Micro-Enterprises, SMEs, Business Associations, Non-profit Organisations (NGOs) and other entities in the processes of co-creation of innovation and entrepreneurship. One of the main objectives is to enhance the training of young higher education students and/or entrepreneurs in the process of creating ideas and co-creating innovation to improve the quality of employment and to help creating their own business or create new ones, or significantly improve, products, processes, and services.

Thirteen polytechnics operate through the stimulation of idea creation, co-creation of innovation and quality entrepreneurship therefore creating value and increasing competitiveness in the territories. The project stimulates an entrepreneurial ecosystem for the economic and social development of each territory through the creation of self-employment, entrepreneurship, and business creation. The diversified involvement of companies and sectors with potential for interaction and creation of differentiated value is an important aspect of the project, and it involves access to international networks with the possibility of involving international companies and students in the process of co-creation of innovation, enhancing opportunities for international contacts and at the same time promoting labour mobility.

In the case studies developed with the help of TURARQ 'experts', one of the most important aspects was the transfer of innovation co-creation knowledge from territories with greater business dynamism to low-density territories (in the Mação municipality). The two study-cases collaborated with the Earth and Memory Institute (ITM) - Mação Polytechnic Study Centre (CEPMAC), where two projects took place related to the idealization of tourist products that fit the logic of interpretation and understanding of archaeological landscapes aiming for sustainable and local development. The two projects were named "Show me the past" project and "Showcasing Prehistory" project. The first one devised the

planning of a technological method for envisioning archaeological landscapes, more precisely, the Vale do Junco archaeological area. One agrees with Opgenhaffen (2021:353) when expressing that "visualization techniques (…) changed archaeological visual literacy and the ways archaeologists create knowledge", furthermore, it was intended to show students that this meaning-making process follows an extended practice of "enhancement" or "pointing out" visual evidence, a practice that clearly demonstrates that visualizations without a context do not speak for themselves. The second project structured an economically sustainable business model to recreate prehistoric ways of life in the Mação ArchaeoSocial Park. This second project was a dauting task for TURARQ's researchers because one of the greatest challenges that experts around the world face is to design archaeological tourism products that will serve the need of introducing and informing their audience about prehistoric life. Nevertheless, literature emphasizes how crucial are creative, engaging, interactive and participatory ways of transmitting knowledge through history-based recreations (Kalogirou et al., 2016). The underlined idea was to give emphasis to this type of archaeotourism experiential products constructed with the help of TURARQ's specialists, such as archaeologists, by providing the opportunity to students to create new products, interpretations, and narratives by themselves, and with that gaining an insight into prehistoric cultural life and the practices therein. The 'Link me Up' project mentors agreed that the best way to develop the students' ideas was to follow Donna R. Braden's frame on how to recreate historical environments. According to Braden (2019) historical environments (including pre-historical), the ones that evoke the lives and activities of people from the past generally:

- Involve a physical setting or space, not a space completely simulated through media or virtual reality.
- Can be of any size.
- Are situated in the context of human habitation, normally in a determined time and space. Although actual past can never be completely known, and these environments can never truly recreate the past, rigorous historic research will ensure the best accuracy. Natural materials and even animals can be added to recreate historical environments.
- Contain a purposeful assemblage of artefacts (and/or replicas) that represent human activity, meant to reinforce the context and the story, to that effect sounds can also be used.
- Tell a compelling story using one or more interpretative techniques. Ideally this story ignites the imagination through drama, narrative, multisensory components, and a good understanding of the target audience(s).

3. METHODOLOGY

In this paper a case study methodology was employed, integrating principles of project-based learning to enhance the investigative approach. This decision was guided by several factors, which we now outline. Qualitative researchers such as Denzin and Lincoln (2017) have recognized the case study methodology as an independent qualitative approach. Moreover, case study research offers a level of flexibility not typically available in other qualitative methods, making it particularly suited to the dynamic, hands-on nature of project-based learning (Hyett *et al.*, 2014). This methodology is deeply connected to core values and intentions and is characterized as "particularistic, descriptive, and heuristic" (Merriam, 2009, pp. 46).

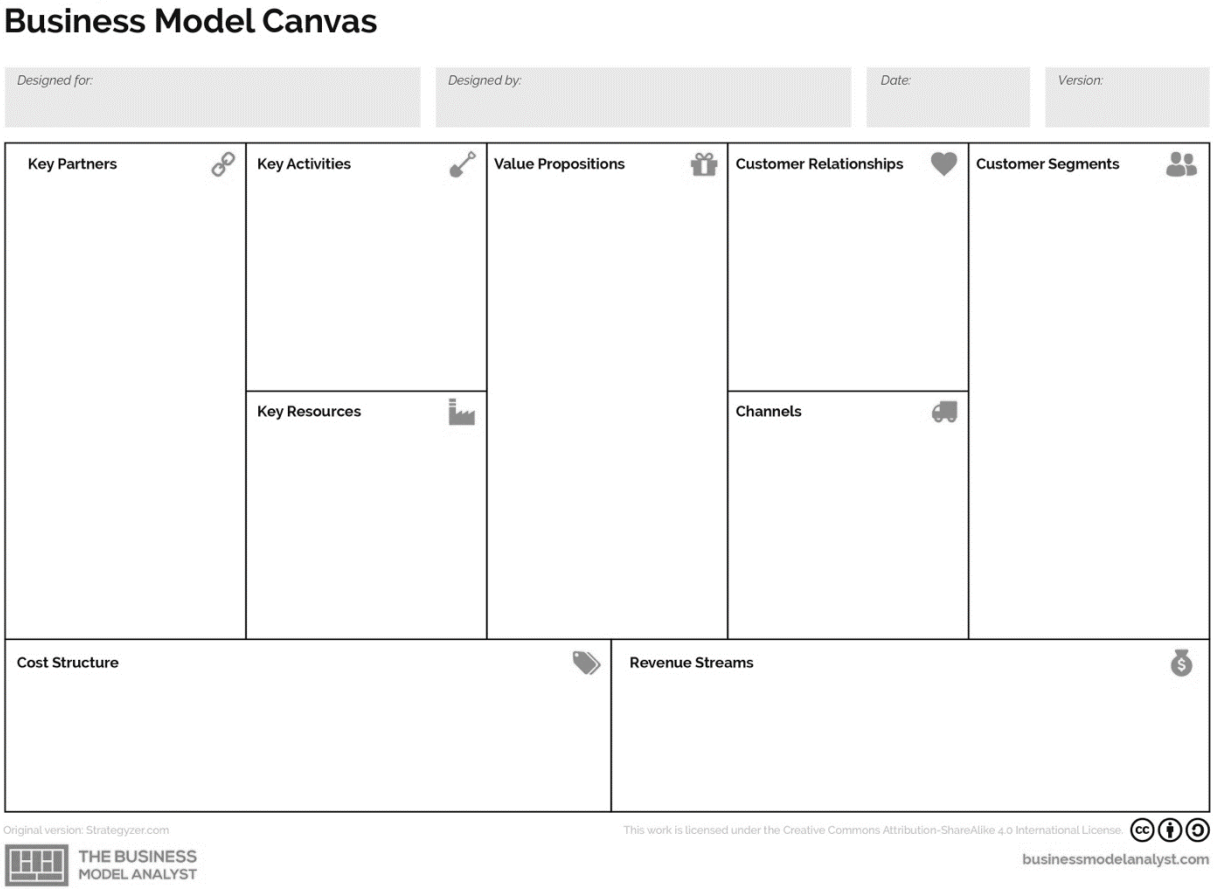
Our case study designs are further informed by Creswell's (2013, pp. 97) definition of a qualitative approach, which "explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information.". This framework is ideally suited to project-based learning, which emphasizes real-world application and the development of solutions over time. The integration of this educational methodology allows for a richer exploration of the cases, encouraging active learning and engagement with the material.

3.1. The use of the Business Model Canvas

As a methodological tool the 'Link-Me-Up' project proposes the use of the Business Model Canvas (BMC). This is a strategic management instrument that allows sketching or developing business models (new or pre-existing), constituting in practice a visual map containing nine blocks to be filled in (Robinson and Lock, 2016).

The attractiveness of the BMC resides in the fact that this provides support to entrepreneurs. It is a tool known for pressuring entrepreneurs to consider each of the business elements individually and as a whole; furthermore, they will have to take on oneself an exercise of constant reflection, that will result in a stimulation of business creativity and innovation (Trimi and Berbegal-Mirabent, 2012). On the other hand, it allows the improvement of a business by the creation of a shared language, supported brainstorming, team building, collaboration, and creating a structure upon which new ideas and innovations can be implemented (Stenn, 2017).

Figure 1. The Business Model Canvas.



Source: https://businessmodelanalyst.com/downloads/business-model-canvas-template-pdf/

3.2. The Augmented Reality Application for Archaeological Tourism – Methodological Procedures

The *Show Me the Past* project consists of an app product, following an agile requirement analysis, until the end of the prototype creation: definition of customer segment, problem, solution, revenue stream, unique value proposition, channels, key metrics, cost structure and competitive advantage. Later, a method of sustainable economic exploitation was applied to the development of tourist structures and local products in association with the second project described in this paper.

The project *Show Me the Past* project aims to create a way to visualize the archaeological landscapes by applying Augmented Reality technology. The app was thought to be applied in Vale do Junco roman area. In Vale do Junco there are a few remains of Roman bath structures. According to some authors, technology has had huge effects on the managing and marketing of tourism areas over the last decades (Gibson & O'Rawe, 2018). Due to new developments in technology, the capabilities of smartphones have expanded greatly and have led to the use of AR in the tourism industry (Han *et al.*, 2018, 2019; Kim *et al.*, 2017; Vert & Vasiu, 2014). Another main reason is that mobile AR is suitable for allowing location-aware applications and services (Vert & Vasiu, 2014) due to its conjunction with the real world. Therefore, destination marketing organisations (DMOs) are placing much greater emphasis on increasing the quality of tourists' experiences, considering AR as a tool to satisfy the needs of tourists in tourism destinations.

Digital technologies are gaining worldwide prominence in various fields, such as cultural and archaeological heritage, with emerging technologies like virtual and augmented reality. For example, Georgopoulos (2018) presents technological advances regarding cultural heritage, such as image-based three-dimensional models and laser scanning techniques to gain three-dimensional information from objects. In addition, some examples related to virtual reality applied to monuments and museums are granted. Peinado-Santana *et al.*, (2021) describes 3D model data capture, information processing and optimization, regarding the 3D digitization of heritage works to make them accessible to the public. As an example, the case study of Ariza Bridge in Spain was presented, where an application that features geo-referencing was developed. The same authors sustain that this can be a suitable instrument for the sustainable study, valorisation, and dissemination of cultural heritage assets. Regarding museums, in general, the artefacts are protected from being manipulated by visitors, so that they cannot be damaged. This fact makes it difficult to promote engagement provided by interaction with the exposed materials. Digital technologies can help solve this problem by reproducing these artefacts, making visits to museums more interesting and interactive (Pretto *et al.*, 2020).

Although the advancement and development of AR in the tourism sector is still in the early stages, it is predicted that it will become the definitive technology of the future (Han, Jun & Gibson, 2013). AR refers to the idea of incorporating 2D images or 3D models into a perception of reality (Woods *et al.*, 2004). Smart glasses with transparent displays or handheld mobile devices, such as iPhones or tablets, can be used to install a camera on the user's head. When using AR, the camera is tracked by a computer that also takes images from a screen on a display. This allows the user to see large objects while also seeing through the visor. AR works when the visor is worn over the camera. Through artificial components, the AR application tricks the user into thinking they are looking through the device into the real world. This is achieved by sending visual data from the artificial components back to the display screen (Neuburger, Neck & Egger, 2018).

3.3. A Business Model applied to Archaeological Tourism – Methodological Procedures

The *Showcasing Prehistory* project follows concepts of entrepreneurship, inclusion, heritage, and sustainability methodology, that starts from the diagnosis of the social problems affecting the territory and the population of Mação. Most territories of low density are structured around three vectors: the low density and demographic dispersion and inhabitants ageing and isolation, the low diversity of economic activities and reduced employment opportunities, and finally, the loss of sociocultural cohesion, which in turn decreases the territorial attractiveness for external investments (PNCC, 2017).

Although this project proposes to contribute to lesser social problems in a transversal and intergenerational way, the focus is related to the multiple dilemmas arising from the ageing population, its dispersion and isolation in Mação's territory, framed in three categories: the construction of a park to recreate prehistoric ways of life (ArchaeoPark), the revolution 4.0 in reducing social risks (Community) and the integrated awareness of entrepreneurship.

The construction of the ArchaeoPark intends to materialize an experience of technological path throughout the History of Humanity, based on a programme of social innovation that promotes intergenerational encounters through activities of social origin anchored in the encounter between

primitive, traditional, and digital technologies and by the combination of old and traditional know-how to pass this knowledge on to younger age groups.

The team's work went through the conceptual framework of a dynamic business model that aimed to prove the financial viability of the business, including its purpose, goals, and its present plans to achieve them. To build this business model, several questions had to be answered: who is the customer? what does it values? how do you deliver value at an appropriate cost? By using Business Model Canvas (*see* Business Model Generation by Alex Osterwalder & Yves Pigneur, 2010), the team found a way to clarify the vision, to review what their value proposition is, what their target audience(s) and partners are, their revenue sources, their distribution channels, among other aspects. Thus, it was possible to structure a clearer idea of the infrastructure itself (key activities; key resources, partner networks), of the offer (value proposition), of the customers, that is, to whom to direct the products and services of the ArchaeoPark; the channels to be used for offering products, the connection that can be established with customers (park visitors) and its management process and a structure of costs and revenue streams to make the park a sustainable structure in the medium to long term.

4. OUTCOMES

The participants in this project were divided into two groups of five elements in each one. Both groups had a multidisciplinary background and the organisation sought not to put in the same team individuals with a similar background.

Furthermore, the organisation scheduled several trips to the sites in way to provide the necessary knowledge about those to the participants. On the other hand, before choosing the groups and their constituents, care was taken to ensure that in the end both groups managed to acquire similar skills, although at first glance this seemed unlikely. Thus, the following competences to be attained were defined for each group:

AR Application for Archaeological Tourism Group

- Develop teamwork skills.
- Develop entrepreneurial capacity.
- Be able to address concepts related to archaeological landscapes.
- Know how to classify the Historical, Cultural and Natural heritage
- Know how to design strategies for the exploitation/use of archaeological landscapes in tourism activities, specially making use of new technologies
- Know how to promote heritage resources as possible virtual tourist attractions.
- Training young higher education students and/or entrepreneurs in the process of creating ideas and co-creating innovation.
- Contribute to the transfer of knowledge and innovation to low-density territories.

Showcasing Prehistory Group

- Develop teamwork skills.
- Develop entrepreneurial capacity.
- Be able to address concepts related to archaeological landscapes.
- Know how to classify Historical, Cultural and Natural heritage.
- Understand the importance of preserving/conserving archaeological landscapes.
- Know how to design strategies for the exploitation/use of archaeological landscapes in tourism activities.
- Know how to promote archaeological landscapes as tourist attractions.
- Training young higher education students and/or entrepreneurs in the process of creating ideas and co-creating innovation.
- Contribute to the transfer of knowledge and innovation to low-density territories.

4.1. Case Study - AR Application for Archaeological Tourism

In the context of 'Link me Up' project (Fernandes & Amante, 2022), one of the challenges proposed to the participants in partnership with Earth and Memory Institute (ITM) was the development of an AR Application for Vale do Junco archaeological area (Figure 2). This is an archaeological area situated in Ortiga parish – Mação, that contains roman remains that were described by many specialists in the area, including M.A.H. Pereira (1970, L. Oosterbeek and S. Cura (2005), J. d'Encarnação and F. Coimbra (2022).

Figure 2. Remains of the roman *villa* of Vale do Junco. © Instituto Terra e Memória.

Until today, only a small area has been excavated, revealing the existence of private baths with similar characteristics to those found at other archaeological sites of the same type: *caldarium* (hot water area), *frigidarium* (cold water area) and a possible *laconicum* (sauna). However, its architecture is unknown because excavation campaigns are at the beginning and only some artefacts were found.

After the programmed trips to the archaeological site the team got the notion that these remains were in a place that was difficult to access and, on the other hand, even on accessing the site, the ordinary citizen might mistake the ruins for an ordinary pile of stones. Therefore, the challenge proposed was to understand how to disseminate this rich heritage and how to make it accessible to the public. Bearing that in mind, every week for three months the team met with the experts of the Instituto Terra e Memória, besides the archaeological experts there were also technological experts.

The result was the development of a Mobile Augmented Reality (MAR) application to display the artefacts found in the excavations. This application allows to visualize virtual objects (artefacts) in the real environment where they were found (captured by the mobile device camera). Moreover, the artefacts can be observed without having to be moved from the museum or laboratory and, above all, without being damaged by human handling. Figure 3 shows some artefacts found at different Roman *villae* and the AR application that was developed to disseminate the archaeological heritage of Vale de Junco.

Figure 3. Roman artefacts and Mobile Augmented Reality application. © Instituto Terra e Memória.

In the future, it is planned to reproduce the thermal baths building to provide the experience of viewing its architecture, as well as its interior, which will include the artefacts.

In addition, it is intended that this application will be used by visitors to this region, to make known its past heritage and make it more attractive, aiming to down the road making it profitable and sustainable. In this regard, the application can be used by several stakeholders. In a first stage, the partner ITM will be the first to use it. In a second stage, other organisations can acquire this resource to preserve and disseminate this and other archaeological heritage all the artefacts found.

4.2. Case Study – Showcasing Prehistory

The Showcasing Prehistory team took into consideration the site of the park, in the municipality of Mação, a municipality in the interior of Portugal, with serious problems of low population density and little economic development. The Municipality of Mação has about 6,402 inhabitants (2021) distributed in an unbalanced way over an area of 399.98 km^2 thus having a population density of 16 inhabitants/km^2.

The team started by identifying potential stakeholders at the local, regional, and national levels: communities, local businesses, structures for the interpretation of the past (museums, interpretative centres, cultural centres), higher education structures with specialised teaching in history, archaeology and conservation and restoration, travel and tourism agencies, interpretative guides, school nuclei and cultural organisations in general. Empathy maps (*see* Bratsberg, 2012) were created. Those were related to a theme, in this case, Tourism, Local Community, Theme Parks, and Special Needs. The Empathy Map is a visual tool that analyses and describes specific aspects of the context of the product to be developed. Design Insights related to experimental research, benefits of both projects' innovation as well as stakeholder profiles, and ideal future solutions (Maguire, 2022).

The work also included visits to the field (archaeological landscapes and theme parks) as well as meetings with experts in the field of business models creation. In the case of the *Showcasing Prehistory* project, concepts of business creation models (using Canvas methodology), sustainability, knowledge,

and the use of local products for boosting the local economy were discussed at the meetings with experts. In the end, that allowed the development of a completely new and innovating tourism product – The ArchaeoPark of Mação

4.3.Competences Outcomes

In the closing meeting between experts and participants, the competences previously defined by the ITM experts were discussed with each group separately, and it was clear to all, experts and participants alike, that all competences were achieved to a greater or lesser degree.

Furthermore, the participants agreed amongst themselves that this experience of co-creation of innovation, creativity and entrepreneurship, will help them in their future employment and some even demonstrated the intention of applying the knowledge that they gained in this project in the creation of their own business.

5. DISCUSSION

The major goal of this article was to highlight two projects related to the idealization of archaeotourism with the assist of 'Link me Up' as a support system and to answer the question about how a co-creation model can be applied in the field of archaeological tourism with success. 'Link me Up' support system brought new insights and strategies to co-creation and innovation, regarding creativity and entrepreneurship projects that aims to join archaeological culture heritage and tourism development with the needs of citizens while involving the whole community in this social innovation (Einarson & Lundblad, 2014). In fact, both case studies presented in this paper reflects how young students while entrepreneurs and experts can work to propose new products/services and even businesses that could create employment. It also investigates the role that higher education can play in enhancing tourism in low-density areas, taking advantage of archaeological landscapes, without disregarding the needs of all stakeholders with interests in the territory, including local communities and visitors. In the case of the *Showcasing Prehistory* group, the team had to learn the way of working with BMC (Business Model Canvas). According to Robinson and Lock, early in the decade of the 2010s, Alexander Osterwalder and Yves Pigneur created the Business Model Canvas as a shared language for describing, visualizing, assessing, and changing business models. It describes in a clearly, simply, and unbureaucratically way business models. Additionally, it helps the organisation establish a common understanding of the business model, which in turn encourages discussion about the business model and ongoing improvement.

The Business Model Canvas upholds the corporate value generation idea. The four most crucial sectors of the business are divided into the nine transformational steps from the value development process. More important, it was necessary to research on features like who is the customer? What does he value? How do you deliver value at an appropriate cost? In the case of the work regarding the business model of the experimental ArchaeoPark of Mação, this work was important because besides being an original project in Portugal, it is difficult to calculate the value connected to it.

The important aspect for both study-cases was the opportunity to bring together experts and students in the co-creation of a project that helped both sides to explore the future impacts and driving forces. Both experts and students were able to understand the future requirements for products, services and explored changes in consumer behaviour, and discovered new technology needs. Teams from diverse backgrounds learned how to work together, how to co-create together considering each member skills, learning wants and motivations. In the end, the inter and multi-disciplinary teams also learned how to apply their own knowledge and competences in the service of the team in a way to find solutions to solve the problem(s). Final reports indicate that this programme leads to high levels of participant satisfaction and has a significantly positive impact on the development of competences. Nevertheless, studies must be made to understand if the participants have become entrepreneurs and whether they have used the competences acquired in this project in developing their entrepreneur skills.

6. CONCLUSION AND FUTURE RESEARCH AVENUES

In this regard, 'Link me Up' concept creates a hub for collaboration between businesses and universities (as well as other groups), with facilitators and guidelines, suggesting using an agile development approach to create projects (Ghimire & Charters, 2022), allowing that students and entrepreneurs learn how to work with BMC (Business Model Canvas), which helps the organisation to establish a common understanding of the business model, and encourage discussion about the business model and ongoing improvement (Osterwalder & Pigneur, 2010).

Further research must still be made related with AR application for archaeological tourism, one that aims to reproduce other parts of the archaeological heritage, to allow visitors to have a deep understanding of past ancestors' daily routines (like the thermal baths in a way to provide the experience of viewing its architecture, as well as its interior, which will include the artefacts). The application of virtual and augmented virtual tools in archaeological sites will hold an immense importance in the field. These technologies when developed properly allow for enhanced visualization, interpretation, and preservation of cultural heritage, enabling researchers and visitors to engage with archaeological sites in new and immersive ways. Virtual tools provide realistic reconstructions of ancient structures and artefacts, facilitating virtual tours and educational experiences that transcend physical limitations. This integration of technology within archaeology enhances understanding, documentation, and accessibility of cultural heritage, fostering broader public engagement and contributing to the preservation and interpretation of our shared human history.

This paper describes an innovative project that was made in a co-creation model environment, i.e., presentation of a challenge-issue by an institution to students from different backgrounds having training and co-creation tools, entrepreneurship, business models, development of digital applications to a certain area (archaeology) and a good dose of creativity.

REFERENCES

Bellini, Heather, Chen, Wei, Sugiyama, Masaru, Shin, Marcus, Alam, Shateel, Takayama, Daiki. (2016). Virtual & Augmented Reality: Understanding the Race for the Next Computing Platform (Goldman Sachs). *Profiles in Innovation*, 1-30. Retrieved from: https://www.gspublishing.com/content/research/en/reports/2016/01/13/eb9acad9-3db9-485c-864d-321372a23726.pdf

Braden, Donna R. (2019). *Spaces that Tell Stories: Recreating Historical Environments*. Lanham, Maryland: Rowman & Littlefield Publishers.

Bratsberg, Hanne M. (2012). *Empathy Maps of the FourSight Preferences*. Creative Studies Graduate Student Master's Projects. Paper 17. Retrieved from: https://digitalcommons.buffalostate.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1180&context=creativeprojects

Carboni, Nicola & de Luca, Livio (2016). Towards a conceptual foundation for documenting tangible and intangible elements of a cultural object. *Digital Applications in Archaeology and Cultural Heritage*, 3(4),108-116. https://doi.org/10.1016/j.daach.2016.11.001

Creswell, John W. (2013). *Qualitative inquiry and research design: Choosing among five approaches*, 3rd edition, Thousand Oaks, CA: Sage.

D'Encarnação José & Coimbra Fernando (2022). Estatueta de Bronze de Vale do Junco (Ortiga, Mação). *Antrope*, (14), 177-190. Retrieved from: https://estudogeral.uc.pt/bitstream/10316/100278/1/Estatueta%20de%20bronze%20de%20Vale%20do%20Junco%20%28Ortiga%2C%20Ma%C3%A7%C3%A3o%29.pdf

Denzin Norman, K.; Lincoln Yvonna S. (2017). *The SAGE handbook of qualitative research*, 5th edition. Thousand Oaks, CA: Sage.

Einarson, Daniel & Lundblad, Henrik. (2014). "Demola - The upcoming win-win relationship between university and industry". [Conference Paper]. Proceedings of the 10th International CDIO Conference, Universitat Politècnica de Catalunya, Barcelona, Spain.

Erdoğan, Hasan Ali (2021). *A Key to Various Opportunities for the Development in Culture, Economy and Integration in Asia Minor: A Successful Archaeotourism Planning*. Yaşar Üniversitesi E-Dergisi. Special Issue on Managing Tourism Across Continents, 30-39. https://doi.org/10.19168/jyasar.807404

ET2027 (2017). Estratégia de Turismo. Retrieved from: http://www.turismodeportugal.pt/SiteCollectionDocuments/estrategia/estrategia-turismo-2027.pdf

Fernandes, Rosina & Amante, Susana (2022). *From Teachers Innovative Practices to Students Co-Creation: A Glimpse of the Project Link Me Up–1000 Ideias*. [Conference Paper]. European Conference on Innovation and Entrepreneurship. Proceedings of the 17th European Conference on Innovation and Entrepreneurship, ECIE 2022. Retrieved from: https://papers.academic-conferences.org/index.php/ecie/article/view/396

Georgopoulos, Andreas (2018). Contemporary Digital Technologies at the Service of Cultural Heritage. In Chanda, B., Chaudhuri, S., Chaudhury, S. (eds), *Heritage Preservation* (pp. 1-20). Springer, Singapore. https://doi.org/10.1007/978-981-10-7221-5_1

Gibson, Alex, & O'Rawe, Mary (2018). Virtual Reality as a Travel Promotional Tool: Insights from a Consumer Travel Fair. In T. Jung & M. C. tom Dieck (Eds.), *Augmented Reality and Virtual Reality: Empowering Human, Place and Business* (pp. 93-107). Springer International Publishing. https://doi.org/10.1007/978-3-319-64027-3_7

Ghimire, Dipendra & Charters, Stuart (2022). The Impact of Agile Development Practices on Project Outcomes. *Software*, 1, 265-275. https://doi.org/10.3390/software1030012

Goudswaard, Boudewijn, Bos, Jolanda, van Roode, Sigrid, Pape, Harry (2012). Forward with reverse archaeology. *Heritage & Society*, 5(1), 101-115. https://doi.org/10.1179/hso.2012.5.1.101

Han, Dai-In Danny, Dieck, Tom, M. Claudia, & Jung, Timothy (2019). Augmented Reality Smart Glasses (ARSG) visitor adoption in cultural tourism. *Leisure Studies*, 38(5), 618–633. https://doi.org/10.1080/02614367.2019.1604790

Han, Dai-In Danny, Jung, Timothy & Gibson, Alex (2013). Dublin AR: Implementing augmented reality in tourism. In Z. Xiang, & Tussyadiah, I. P. (Eds.), *Information and communication technologies in tourism 2014* (pp. 511-523). Cham: Springer Nature International.

Han, Dai-In Danny, Dieck, Tom, M. Claudia, & Jung, Timothy (2018). User experience model for augmented reality applications in urban heritage tourism. *Journal Heritage Tourism*,13, 46-61. https://doi.org/10.1080/1743873X.2016.1251931

Hyett, Nerida; Kenny, Amanda & Dickson-Swift, Virginia (2014). Methodology or method? A critical review of qualitative case study reports. International Journal of Qualitative Studies on Health and Well-being, 9(1), 23606. https://doi.org/10.3402/qhw.v9.23606

Hubbard, Phil & Lilley, Keith (2000). Selling the past: Heritage-tourism and place identity in Stratford-upon-Avon. *Geography*, 85(3), 221-232. http://www.jstor.org/stable/40573703

Kim, Hayun, Matuszka, Tamás, Kim, Jea-In, Kim, Jungwha, & Woo, Woontack (2017). Ontology-based mobile augmented reality in cultural heritage sites: Information modeling and user study. *Multimedia Tools and Applications*, 76, 26001-26029. https://doi.org/10.1007/s11042-017-4868-6

Kalogirou, Konstantina, Sarwar, Sian & Trimmis, Konstantinos (2016). 'Let's meet the Red Lady of the Paviland': Delivering the Prehistoric Narratives in Museum Education. *Drama Magazine*, 22(2), 9-15.

Link me Up – 1000 ideas (2023). *Support System for the co-creation of innovation, creativity and entrepreneurship*. Retrieved from: https://www.cocreationportugal.com/

Lopes, Raul & Mota, Bruno (2021). Innovative local policies in Portuguese low-density rural areas. *European Countryside*, 13(2), 388-409. https://repositorio.iscte-iul.pt/bitstream/10071/23300/1/article_83422.pdf

Maguire, Martin (2022). A Framework for User-Requirements Analysis and Development of Creative Design Concepts. In *HCI International 2022 - Late Breaking Papers. Design, User*

Experience and Interaction. HCII 2022. Lecture Notes in Computer Science, 13516. Cham: Springer. https://doi.org/10.1007/978-3-031-17615-9_7

Martins, Marco (2018). Tourism Planning and Tourismphobia: An Analysis of the Strategic Tourism Plan of Barcelona 2010-2015. *Journal of Tourism, Heritage & Services Marketing*, 4(1), 3-7. https://doi.org/10.5281/zenodo.1247519

Merriam, Sharan B. (2009). *Qualitative research: A guide to design and implementation*, 3rd edition. San Francisco, CA: Jossey-Bass.

Mijnheer, Cristina & Gamble, Jordan (2022). Innovating with stakeholders to co-create value in cultural tourism experiences: a case study of Schokland in the Netherlands. *Journal of Marketing Management*. https://doi.org/10.1080/0267257X.2022.2139284

Neuburger, Larissa, Beck, Julian & Egger, Roman (2018). The 'Phygital' tourist experience: The Use of augmented and Virtual reality in Destination Marketing. In M. A. Camilleri (eds), *Tourism Planning and Destination Marketing* (pp.183–202). Emerald Publishing.

Nilson, Tomas & Thorell, Kristina (2018). *Cultural Heritage Preservation: The Past, the Present and the Future*. Halmstad: Halmstad University Press.

Oosterbeek, Luiz (2017). Dilemmas of archeology in-between society and territory, in a century in which almost nothing will remain as before but nobody knows how it will be in the future. In L. Oosterbeek (Eds.), *Cultural Integrated Landscape Management: A Humanities Perspective* (pp.19-31). Arkeos, 43. Mação: Instituto Terra e Memória.

Oosterbeek, Luiz (2019). *Resilience and Transformation in the territories of low demographic*. Studies in Honnour of Prof. José Bayolo Pacheco de Amorim, on occasion of the establishment of the UNESCO-IPT chair on Humanities and Cultural Integrated Landscape Management. Instituto Terra e Memória.

Oosterbeek, Luiz and Cura, Sara (2005). O Património Arqueológico do Concelho de Mação. *Zahara*, 17-32.

Opdam, Paul (2020). Navigating the space between landscape science and collective action for sustainability: identifying key factors in information processing. *Landscape Ecology*, 35, 2629–2639. https://doi.org/10.1007/s10980-020-01028-2

Opgenhaffen, Loes (2021). Visualizing Archaeologists: A Reflexive History of Visualization Practice in Archaeology. *Open Archaeology*, 7(1), 353-377. https://doi.org/10.1515/opar-2020-0138

Osterwalder, Alexander and Pigneur, Yves (2010). *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. John Wiley and Sons.

Payne, Adrien, Storbacka, Kaj & Frow, Pennie (2008). Managing the co-creation of value. *Journal of the Academy of Marketing Science*, 36, 83-96. https://doi.org/10.1007/s11747-007-0070-0

Pacifico, David & Vogel, Melissa (2012). Archaeological sites, modern communities, and tourism. *Annals of Tourism Research*, 39(3), 1588-1611. https://doi.org/10.1016/j.annals.2012.04.002

Peinado-Santana, Sara, Hernández-Lamas, Patricia, Bernabéu-Larena, Jorge., Cabau-Anchuelo, Beatriz, & Martín-Caro, José António (2021). Public works heritage 3D model digitisation, optimisation and dissemination with free and open-source software and platforms and low-cost tools. *Sustainability*, 13(23), 13020. https://doi.org/10.3390/su132313020

Pereira, Maria Amélia da Horta Pereira (1970). *Monumentos históricos do concelho de Mação*. Mação: Câmara Municipal de Mação.

PNCP (2017). *Programa Nacional para a Coesão Territorial*. Retrieved from: https://www.portugal.gov.pt/pt/gc21/governo/programa/programa-nacional-para-a-coesao-territorial-/ficheiros-coesao-territorial/programa-nacional-para-a-coesao-territorial-pdf.aspx

Pretto, Niccoló; Micheloni, Edoardo; Gasparotto, Silvia; Fantozzi, Carlo; Poli, Giovanni & Canazza, Sergio (2020). Technology-enhanced interaction with cultural heritage: an antique pan flute from Egypt. *Journal on Computing and Cultural Heritage*, 13(2), 1-20. https://doi.org/10.1145/3355395

Ramsey, Doug, & Everitt, John (2008). If you dig it, they will come! *Tourism Management*, 29(5), 909–916. https://doi.org/10.1016/j.tourman.2007.11.002

Rihova, Ivana; Buhalis, Dimitrios; Moital, Miguel and Gouthro, Mary-Beth (2015). Conceptualising Customer-to-customer Value Co-creation in Tourism. *International Journal of Tourism Research*, 17, 356-363. https://doi.org/10.1002/jtr.1993

Robinson, Mark and Lock, Sara (2016). Introduction: Introducing the Business Model Canvas. Culturehive, 10p.

Ross, David; Saxena, Gunjan (2019). Participative co-creation of archaeological heritage: Case insights on creative tourism in Alentejo, Portugal. *Annals of Tourism Research*, 79, 102790. https://doi.org/10.1016/j.annals.2019.102790

Ross, David; Saxena, Gunjan; Correia, Fernando & Deutz, Pauline (2017). Archaeological tourism: A creative approach. *Annals of Tourism Research*, 67, 37-47. https://doi.org/10.1016/j.annals.2017.08.001

Stenn, Tamara L. (2017). Focus on the Business Model Canvas. In: T.L Stenn (Eds.), *Social Entrepreneurship as Sustainable Development* (pp. 55-89). Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-48060-2_4

Thomas, Ben, & Langlitz, Meredith (2018). Archaeotourism, Archaeological Site Preservation, and Local Communities. In Douglas C. Comer and Annemarie Willems (Eds.), *Feasible Management of Archaeological Heritage Sites Open to Tourism* (pp.69–78). https://doi.org/10.1007/978-3-319-92756-5_7

Trimi, Silvana and Berbegal-Mirabent, Jasmina (2012). Business Model Innovation in Entrepreneurship. *International Entrepreneurship and Management Journal*, 8(4), 449–465. https://doi.org/10.1007/s11365-012-0234-3.

Turismo de Portugal. (2017). *Turismo de Portugal*. http://travelbi.turismodeportugal.pt/pt-pt/Paginas/HomePage.aspx

UN (2020). *Global Indicator Framework for the Sustainable Development Goals and Targets of the 2030 Agenda for Sustainable Development*. UNSD. Retrieved from: https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%202020%20review_Eng.pdf

Vert, Silviu, Vasiu, Radu (2014). Relevant Aspects for the Integration of Linked Data in Mobile Augmented Reality Applications for Tourism. In: Dregvaite, Giedre, Damasevicius, Robertas (eds), *Information and Software Technologies. ICIST 2014. Communications in Computer and Information Science*, vol. 465. Springer, Cham. https://doi.org/10.1007/978-3-319-11958-8_27

Willems, Annemarie and Dunning, Cynthia (2015). Solving the puzzle: The characteristics of archaeological tourism. In: Monique H. van den Dries, Sjoerd J. van der Linde & Amy Strecker (Eds.), *Fernweh: Crossingborders and connecting people in archaeological heritage management* (pp. 68–71). Leiden: Sidestone Press.

Woods, Erik; Billinghurst, Mark; Looser, Julian; Aldridge, Graham, Brown, Deidre, Garrie, Barbara, & Nelles, Claudia (2004). Augmenting the science centre and museum experience. (Conference Paper]. *Proceedings of the 2nd international conference on computer graphics and interactive techniques*, Australasia and Southeast Asia.

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