Proyecto INTERPRETATIC : "Un proyecto de conexión entre el conocimiento científico y el visitante del Parque Arqueológico de Segóbriga (Saelices, Cuenca)"

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Resumen

Las excavaciones realizadas en el yacimiento arqueológico de *Segobriga* han generado un importante volumen de hallazgos arqueológicos, dados a conocer en diferentes publicaciones científicas. Gracias a ellas, hoy sabemos que el origen de la ciudad corresponde a un *oppidum* indígena transformado en un *municipium* en época *augustea* y sede episcopal durante los siglos VI y VII. La creación y apertura pública del Parque Arqueológico de Segóbriga en 2002 permitió dotar de las infraestructuras y medios expositivos necesarios para facilitar al visitante la interpretación del yacimiento arqueológico en su propio entorno histórico y natural. El proyecto INTERPRETATIC con un periodo de ejecución: 2018-2021, pretende la implementación de las TIC a la interpretación actual del patrimonio y la naturaleza en *Segobriga*, desarrollando una nueva herramienta que sirva como recurso social, turístico y patrimonial del Parque Arqueológico. La incorporación de nuevos recursos virtuales, recreativos y lúdicos facilitará a los diferentes tipos de usuarios el acceso al conocimiento arqueológico. En el proyecto participa un equipo multidisciplinar que cuenta con una amplia experiencia previa en patrimonio arqueológico, creación de contenidos interpretativos y

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divulgación didáctica, así como en proyectos de investigación y desarrollo.

La experiencia generada en INTERPRETATIC está siendo aplicada además al proyecto POLIRURAL, un proyecto de Desarrollo Rural europeo financiado a través de los fondos de innovación Horizonte2020. En él participa el Grupo Tragsa en representación de España junto con los siguientes países: República Checa, Eslovaquia, Letonia, Grecia, Portugal, Israel, Reino Unido, Italia, Noruega, Bélgica, Norte de Macedonia, Austria, Finlandia, Polonia e Irlanda.

Palabras Clave: interpretación, nuevas tecnologías, turismo, yacimiento arqueológico, reconstrucción virtual.

INTERPRETATIC: a project to connect scientific knowledge and visitors in the Archaeological Park of Segóbriga (Saelices, Cuenca)

Abstract

Excavations carried out in the archaeological site of Segobriga have generated a significant volume of archaeological finds, disclosed in different scientific publications. Thanks to those finds, today we know that the city has its origins in an indigenous *oppidum*, which became a municipality in the August era and, later, an episcopal see in the sixth and seventh centuries. The creation and public opening of the Archaeological Park of Segobriga in 2002 allowed to provide the site with the necessary infrastructure and exhibition facilities to enable visitors to achieve their own interpretation of the archaeological site in its own historical and natural environment. The INTERPRETATIC project, to be executed in 2018-2021, aims to implement ICTs to the current interpretation of heritage and nature in Segobriga, and to develop a new tool that serves as a social, touristic and heritage resource of the Archaeological Park. The update of new virtual, recreational and gamification resources will enable different types of users to access archaeological knowledge. The project involves a multidisciplinary team, which has extensive previous experience in archaeological heritage, creation of interpretive content and educational dissemination, as well as research and development projects.

INTERPRETATIC's experience is in turn serving as a cornerstone for another European project financed by means the Horizon2020 innovation funds: the POLIRURAL project, in which TRAGSA and TRAGSATEC participate and of which the following countries are also partners: Czech Republic, Slovakia, Latvia, Greece, Portugal, Israel, United Kingdom, Italy, Norway, Belgium, Northern Macedonia, Austria , Finland, Poland and Ireland.

Keywords: interpretation, new technologies, tourism, archaeological site, virtual reconstruction.

1. BACKGROUND FOR THE INTERPRETATIC PROJECT

The INTERPRETATIC project was born as a solution to the need of continuously improving the tools that Grupo Tragsa has been developing over the last years for interpretation purposes, both with regard to I+D projects and Innovation and with regard to productive projects. Tragsa intends to capitalize the opportunity represented by the demand of this type of tools to develop new technological niches devoted to the interpretation of nature, landscape and heritage, whose aim is to complement interpretation by traditional means.

The Archaeological Park of Segóbriga, Grupo Tragsa, Universidad Carlos III and the European Union have collaborated in the development of this tool through the programme H2020 POLIRURAL, which partially funds the project.

The location chosen to carry out the tests and its valuation has been the archaeological park of Segóbriga. This archaeological site constitutes a tourist attraction, which brings together such relevant factors as heritage, archaeology, history, natural environment and landscape. This makes it an ideal setting for research projects, which include the development of new interpretation tools based on Information and Communication Technologies (ITCs).

1.1 Archaeological Park of Segóbriga

Act 14/2001, of 10 May, on Archaeological Parks in Castile - La Mancha, enabled the Regional Government to open five Archaeological Parks, one in each province. Its purpose was to open the fine archaeological heritage of the area, in its own historical and geographical environment, in order to enable visitor to understand this heritage by admiring it and receiving the relevant explanations on site. On 10 July 2002, the first of such sites, the Archaeological Park of Segóbriga, was opened to the public. The archaeological site had been declared a historical national monument by means of a decree dated on 3 June 1931, and therefore, since that date, it is a site of Heritage of Cultural Interest.

Opening the Park assured protection, conservation and research of the archaeological site, but also allowed that archaeological finds to be publicly exposed. At the same time, it has managed to transfer scientific knowledge on this ancient Roman town to visitors in a didactic manner, especially by means of the guided tour programme, which is active throughout the year.

Since then, the park has developed a dynamic cultural project, both at a county and province level, which includes the design of cultural, educational and environmental activities included in different informative programmes. The positive response of visitors to this tourist attraction has made this park a national reference for archaeological sites tourist interest in rural areas.

The excavated monument ensemble constitutes a tourist attraction, which is visited by

60,500 persons every year. This Park is the most visited archaeological site in Castile-La Mancha. This figure places it in the Top 30 Roman Archaeological sites in Spain, next to emblematic sites such as Mérida, Tarragona or Empúries.

1.1.1 Geographical and historical location of Segobriga

The Roman town of *Segobriga* stands on a hill called Cabeza de Griego (Spanish for Greek's Head), 857 m over sea level and is located in the municipality of Saelices (Cuenca). To the south runs the River Gigüela, a tributary of River Guadiana, which served as natural moat. This elevated site, with a surface of 10.5 ha, was, in ancient times the main communications hub of inland Hispania. The road that went from the Ebro Valley towards *Hispania Lusitania* and *Hispania Betica*, crossing La Mancha through *Ercavica;* and the road that went from *Toletum* to the Eastern Mediterranean coast through *Valeria* entered the town from the North. To the west, very close to the urban centre, ran the road to *Carthago Nova-Complutum,* which joined *Segobriga* with the see of its corresponding *conventus*.

In his *Naturalis Historia* (36, 160), Pliny described *Segobriga* as *caput Celtiberiae* or the first town of Celtiberian territory, and stated as well that it was a city obliged to pay taxes to Rome and which belonged to the *conventus* -administrative and legal district- of *Carthago Nova*, within the province of *Tarraco*. Further reference will be made to this city when referring to *lapis specularis* or translucent gypsum used to cover windows and decorate floors and walls. From Pliny's description it can also be deduced that the town was the centre of the *lapis* mining areas, which was exported from the port of *Carthago Nova* to the rest of the Empire (Cebrián, 2014a).

Benefits obtained by *lapis specularis* trade promoted a significant urban development between mid-1st century, which coincided with the first coins issued from in the town's mint. A Roman inscription (*CIL* VI, 1446a) shows that between 50 and 27 BC the town send a delegation to the *urbs* in order to pay homage to *L. Livius Ocella*, the grandfather of the future Emperor Galba, as the *quaestor provinciae Hispaniae citerioris* and patron of *Segobriga*.

The transformation of the old Celtiberian *castro* of *Segobriga* in a Roman *civitas* sitting on the Cabeza de Griego hill (Saelices, Cuenca) involved a deep urban reform which saw the creation of large terraced areas and the destruction and levelling of former structures. However, the occupation sequence evidenced by the archaeological site evidences that a pre-Roman population settlement already existed in this site since the 4th century BC. (Figure 1).

Figure 1. Aerial view of the Archaeological Park of Segóbriga as seen from the north (Image: scientific team of *Segobriga*).

Our knowledge of its urban reality before the town was granted *municipium* status is limited to the town walls and the existence of thermal facilities, a temple with three *cellae* and a dwelling ensemble in the northern side of the hill (Cebrián, 2014b). Its monumental architecture, built from the Augustan era, involved a significant modification of the road network of the late Republican age, as well as the transfer to public property of certain *insulae* which until then were used for housing until then. The reurbanisation, during the reign of Tiberius, of the area located between the northern wall and the Forum was determined by the re-use of pre-existing domestic structures and punctual modification of road tracing (Abascal et al., 2010). Simultaneously, this process of transformation of old constructions extended to the houses that formed the *insulae* located next to the back side of the forum basilica, which, at that time, were definitely demolished and levelled.

In his travel to *Hispania* in 15 BC; August granted *Segobriga* the status of *municipium*; in this trip he would have visited the city accompanied by his personal scribe, *M. Porcius M. f. Pup.,* a statue of whom, as patron of the city, stood in the forum (Abascal et al., 2011). At this time, a deep urban reform was started, the result of which was the transformation of a small Celtiberian settlement into a full Roman city. This provided the town with a

monumental public space, which started by the construction of the forum, which consisted on a large cobbled square, surrounded by arcades and by the most significant administrative buildings, such as the *curia* and the *basilica.* Later, a second square was added, with a triple portico to the north of the forum, which occupied the spare space up to the wall.   The process of providing the city with appropriate monument ended in the last decades of the 1s century AD, when works in the theatre, the amphitheatre and the monumental *thermae* were completed (Abascal&Almagro-Gorbea, 2012).

In the second half of the 2nd century AD, the city even built a new public facility, a circus, maybe with the active participation of the mining procurator, *C. Iulius Silvanus Melanio*, of Greek descent and who had a house on the city, next to the monumental *thermae*, between years 198 and 211 (Cebrián et al., 2017).

The occupation of *Segobriga* continued during the 4th and 5th century, although already transformed into a classical Roman city, with a society built over the early Empire, which were abandoned and used as quarry for construction materials. The process of Christianization undergone in that age is evidenced in *Segobriga* by the construction of a large basilica dedicated to Christian martyrs, a building known today as the Visigoth basilica (Cebrián&Hortelano, 2016). Between centuries VI and VII, *Segobriga* was still an important town, as evidenced by the fact that it was an episcopal see whose bishops attended the Councils of Toledo between years 589 and 693 AD:

In the years of Arab domination, it gradually lost relevance until it became a rural town dependant of Uclés. The archaeological finds of that age evidence an urban landscape with a certain degree of spatial planning, with large open-air rectangular open-plan premises, which were possibly used as barns, plus rooms intended for domestic uses, which have been documented to have occupied the space of the ancient forum.   While in the most elevated area of a hill, a large, square-plan watchtower stood surrounded by a moat, whose remains are still visible today (Sanfeliu&Cebrián, 2008).

In 1228, the former *Segobriga,* now called Cabeza de Griego, was still inhabited, since a document dated on that year establishing the assignment of part of the hill to the Order of St. James of the Sword is still conserved (Almagro Basch, 1983). From the 16th century, the site of the old Roman town was abandoned and we only have written references to the existence of a shrine built over the *caldarium* of the monumental *thermae*. The Visitors of the Order of St. James of the Sword inspected the area on the 25 August 1500 and reported the existence of a very old whitewashed shrine. In a new visit, on 26 March 1508, they stated that they had visited the Saint Bartholomew shrine, and found that it was in a very bad state, although the altar showing the images of the Blessed Virgin Mary and Saint Bartholomew had been spared.

1.1.2 Public visit to the Archaeological Park of Segóbriga

Scientific excavations in *Segobriga* began in the second half of the 20th century and have continued since. From 1961, Martín Almagro Basch managed the archaeological site with the support of Francisco Suay, from Cuenca, and carried out the excavations and restoration of the main monuments of the Roman town, theatre and amphitheatre (Almagro Basch, 1983). Over the next decade, the State bought the entire ensemble, assuring its legal status and establishing an archaeological site covering 104.5 ha. In 1975, the Museum of Segóbriga opened. Its premises were small and functioned as Site Museum until the Archaeological Park of Segóbriga opened (Almagro Basch, 1984).

Research in the archaeological site over the period 1995-2010 was financed by the Regional Ministry for Education, Culture and Sport of the Regional Government of Castile - La Mancha and the Public Service for Employment of Castile - La Mancha (Sepecam), which provided a large series of data regarding history and excavated buildings.

The works for refurbishment of the archaeological site and its immediate environment for the purposes of opening the Archaeological Park to the public were carried out with the help of several school-workshops, which enabled the valuation of archaeological finds and the appropriateness of accesses and leisure areas to the surrounding landscape. The archaeological site was provided with a fencing system, which established the limits of the excavated archaeological remains, defined paths and signalled itineraries in an established order and enable the site to be visited safely. An interpretation itinerary was designed along the archaeological site which, at first, included the visit to nine buildings. In each monument open for visits, an explicative panel was installed, featuring a short text describing the building, an identifying image and a location map within the city.

Currently, a visit to the archaeological site is divided in two parts: spaces, mostly public, excavated within the perimeter walls, and the monuments located outside the city walls. The interpretative visit of the Park includes 18 buildings and interest points.
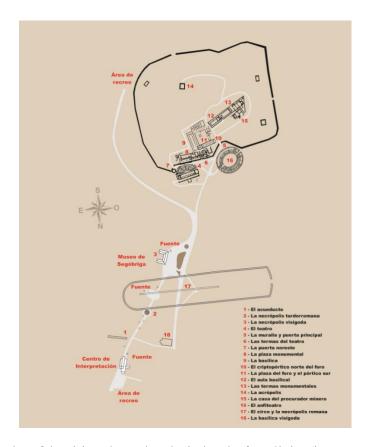
Figure 2. Plan of the visit to the Archaeological Park of Segóbriga (image: R. Cebrián).

The visit to the archaeological site follows a circular plan, and has a duration of 1.30-2 hours. The starting points is the Interpretation Centre, a facility provided with exhibition means to offer visitors a reading into and an interpretation of the archaeological site. This centre has an Exhibition hall, an audio-visual room and an open-plan reception area, which includes a lounge explaining the origin and history of the city, lockers and a shop. It also has an office, a warehouse, and toilets. The basic infrastructures for visitors are complemented by the car park and the cafeteria.

In the Exhibition Hal, the museographic discourse is structured in several scopes that include the most relevant aspects of *Segobriga* in Roman ages: its society, its economy as a mining city, its main monuments, daily life and religion (Cebrián 2003). Exhibited archaeological objects are original that come in their entirety form excavations in the site. Especially noteworthy are the architectural elements, sculptures and inscriptions, coins, ceramics and metal objects, all of which provide information about how was the daily public and private life in Segobriga.

Meanwhile, in the Audiovisual Hall, a documentary is shown explaining both the history

and the monuments to be visited in Segobriga, mixing real-life images with animation and virtual recreations, and which has been recently renewed in collaboration with the company Balawat in order to include new data obtained from the latest excavations.

In the years to come, a visit to the archaeological site shall be complemented by the to-be-opened Museum of Epigraphs, which shall add a second exhibition hall to the Park. The adaptation of expositive spaces in the Museo de Segóbriga shall enable the public exhibition of one of the finest collections of pedestal, plinths, stelas, and shrines, with more than 700 pieces obtained from the excavations in the Roman town and its surroundings.

1.2 Interpretive experiences of Grupo Tragsa.

Grupo Tragsa constitutes one of the references regarding the interpretation, as well as management and appreciation, of nature and heritage. Pursuant the above, the development of INTERPRETATIC is born from the need to give continuity to this project and, at the same time, go further than other innovative projects performed by Grupo Tragsa, both in the framework of the I+D+i (INAMREVI, IdeAR), as in productive projects from different Administrations that appeared as a results of the previous ones (Nature Trails, Urdabai Oka App or River Ucero).

The tools that constitute the technological and methodological bases for the infrastructure of this project are born from previous experiences of Grupo Tragsa (Figure 3) and from innovation and improvement initiatives which have been included over the years to new technologies. They may be classified in 4 general categories:

1. Research and development of an autonomous vehicle. With the support and assistance of Universidad Carlos III of Madrid, specifically of the Instituto ISVA. A prototype of electrical autonomous vehicle is being developed; once developed, it will be tested in *Segobriga*.
2. Implementation of an augmented reality spotting scope. The first prototype was implemented in the hill area of El Pardo (Madrid) and included contents covering different topics. The second prototype is installed in the Archaeological Park of Segóbriga, although it is to be removed due to the fact that its provisions have been overpassed by the app under development.
3. Research and development of interpretation apps for smartphones and tablets. Grupo Tragsa, and, specifically, the team that is working on this project, has developed interpretive apps that run on smartphones and tablets. Those apps, besides the interpretive contents of traditional field guides, include other noteworthy aspects such as location of Points of Interest by means of Augmented Reality, geolocation of users, self-guided itineraries, multimedia contents, thematic layers and possibility of functioning without data coverage by pre-downloading contents.
   An example of the above are:

a. HábitatsAR (2009 – 2013): INAMREVI Project ("Environmental education and interpretation in open spaces by means of virtual reality"), which was the first approach by Grupo Tragsa to using Augmented Reality for interpretation of open-air spaces.

b. IdeAr – (2013 - 2015): IDEA Project ("Research and development in natural environments"), in which several improvements were implemented, taking as a starting point the results of the previous project.

c. Naturaleza - Magrama (2012- 2013): entirely developed by the Ministry of Agriculture and the Environment (MAGRAMA) for geo-localising points of interest and interpretation of natural spaces.

d. Urdaibai Oka App (2013- 2014): developed for the Government of the Basque Country and the Urdabibai Biosphere Reserve (Bizkaia). which constitutes the first productive order of an interpretive app with augmented reality and self-guided itineraries.

e. Nature Trails– (2014 - 2016): developed for MAGRAMA, it has been updated twice in order to implement new functions and itineraries. The current version offers the interpretation of 17 of such itineraries, and it is provided that, in the future, it is able to include all itineraries within this programme.

f. Natural Fluvial Reserves – (2016 - 2017): developed for the Directorate General for Water of MAPAMA to promote the appreciation of natural environments.

g. Riverside Path by the River Ucero - (2018) developed for the Directorate General for Water of MAPAMA. Besides INTERPRETATIC, this is the most recent development. It included sound alarms that went off when approaching a place of interest.

4. Development of tools to perform virtual visits. Though a website, they enable virtual journeys through predetermined locations thanks to sphere photography and other tools that provide a user-friendly and intuitive use.

Figure 3. Technological tools previous to INTERPRETATIC. (Image: Tragsa)

2. THE INTERPRETATIC PROJECT

As stated before, INTERPRETATIC pursues the development and implementation of a set of tools based on new Information and Communication Technologies (ICT) to the interpretation of nature, landscape and heritage. To this end, a series of attractive and innovative solutions are being developed at the Archaeological Park of Segóbriga; their goal is to offer a new interpretive experience to users in a manner that is respectful with the environment and complements traditional interpretive tools.

2.1 Involved agents.

In order for this type of projects to succeed, they require the implication of different actors, which range from technological companies to public companies that allow to make experiments in natural parks throughout the national territory, in compliance with the relevant laws and regulations and ensuring to obtain beneficial results for all users of protected spaces and the population in general, and to Universities, which contribute to carry out experiments and special development. Thus, in the INTERPRETATIC there are four involved agents:

- Grupo TRAGSA, and specifically the Sub-Directorate General of Support and Management of New Technologies, is in charge of coordinating and managing the main line of development of the project.

- The Archaeological Park of Segóbriga, managed by Grupo Tragsa, which is the site and environment where the project INTERPRETATIC is being developed.

- Universidad Carlos III of Madrid, which participates by means of a test route in a movable autonomous device in the chosen environment.

- The European Union, through the H2020 Programme and the POLIRURAL project, in which several European countries are involved. POLIRURAL is a research and innovation project designed with the purpose or proposing a solution for jointly creating policies for rural development which are reliable, adaptable and transferable and which serve the purpose of highlighting the attractions of rural environments for the resident population, as well as for potential new resident and tourists. Different tools are being used in order to develop this model, among which the design of pilot projects in the different regions of participating members is especially noteworthy, since they will be used to test the implementation of rural development policies. In Spain, the pilot projects will be supported by INTERPRETATIC, since it is located in the county in which the Archaeological Park of Segóbriga stands. This park is testing the first activities in order to assess the influence of the appreciation of natural and heritage resources in the social and economic emergence of the area where the site is located.

2.2 Goals of the INTERPRETATIC Project.

The goals of the Project may be classified into different types, which include scientific and technical, strategic and industrial, and which may be summarised as follows:

- Integral development and implementation of new technologies designed for the interpretation of nature, landscape and heritage.

- Creating a new resource for raising awareness with regard to the Natural and Archaeological Heritage, which may be used as social, tourist, educational, and heritage resource.

- Improving existing tools by implementing new functions and utilities.

- Introducing the possibility of creating new technological platforms that support and help space interpretation.

- Considering the possibility to integrate recreational or entertainment resources to the interpretation of spaces using gamification techniques.

- Improving those aspects related to visitors' monitoring and safety.

- Enabling access to scientific knowledge to different types of users.

2.3 Methods. Creation of an interpretive strategy

The premises at the time of addressing the development of the project has been establishing an interpretation strategy consisting in using the chosen spaces as a giant sandbox for new technologies and it is supported in the fact that, as of today, mobile devices such as smartphones and tables are increasingly present in everyday lives of persons and communities, regardless of their age or knowledge.

In order to complete a consistent interpretive strategy, it is indispensable to interconnect the different general lines with the specific contents of the space to be interpreted, and subsequently to disseminate them. In order to build this synergy, besides designing and developing specific interpretive contents for the Archaeological Park of Segóbriga, a series of points for interpretation have been chosen in accordance with the scientific directors of the site, on which testing shall be carried out related to the different interpretation strategies, intended to disseminate the aforementioned scientific knowledge.

Once this stage is completed, in order to achieve implementation both of the contents and of interpretation points, a general proposal on thematic contents for interpretation, which would include the possible ICTs to be used together with the user profiles of Park visitors (Figure 3).
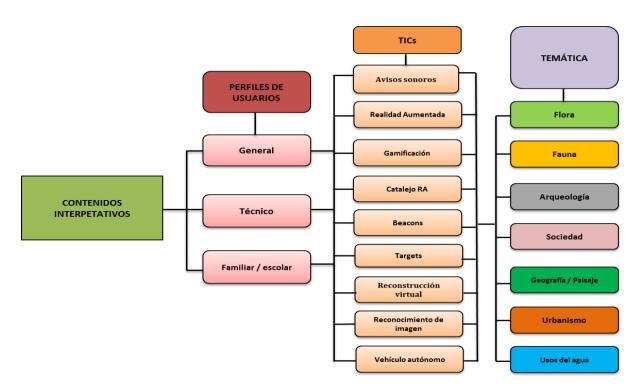
Figure 4. Summary of the general proposal on thematic contents including ICTs.

Therefore, this interpretation proposal intends to enable users to access information by using new technologies such as educational, recreational, touristic and environmental management means. The purpose of this is achieving an integral interpretation (comprising nature, territory, landscape and heritage) of the relevant space that allows all users to interpret and enjoy it.

The most remarkable element used to achieve this degree of integration would be using

new technologies for interpreting spaces. It allows to unite the different elements involved in a single guiding thread, which helps the different potential users to successfully achieve a new interpretation of the places they may find themselves in, and in which, thanks to the action of new technologies, real spaces may be combined with virtual spaces, enhancing the current reality with artificially added information.

2.4 Use of new technologies in the dissemination of natural and archaeological heritage of *Segobriga*.

In order to develop an interpretation strategy which helps to disseminate the natural and archaeological heritage of the Park, different tests with different pre-selected innovative technologies selected after performing monitoring and testing actions such technologies in order to assess their potential integration within the INTERPRETATIC project.

These tests are of an integral and interpretive nature, and have succeeded in aggregating all agents involved in the project together with their corresponding proposals; they are being carried out in different individual points considering the information to be disclosed and needs of the Park as required.

These different technological tools used may be summarized in the following: image recognition, targets, beacons, geolocation, alarms, sound alarms, Virtual Reality goggles, different Augmented Reality apps, Head UP-Display technologies, virtual visits through websites, etc., obtaining different results : some offered high quality and many possibilities, such as virtual technologies, image recognition and beacons, and while others have not yielded satisfactory results and its implementation in the INTERPRETATIC project has been dismissed.
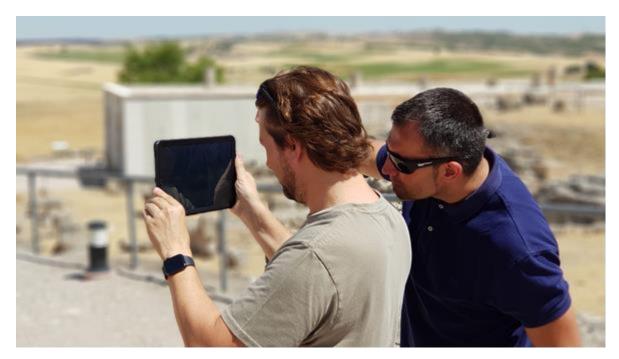
Figure 5. Technological testing in the Park (Image: Tragsa).

Therefore, as of today, the project is capable of including a wide range of contents regarding the dissemination of nature and heritage by means of many state-of-the-art technique, which will enhance the visit of different Park users.

After completing these technological tests, the true development of a specific interpretive strategy was started, with the aim of enabling all complements and utilities adding interest to space interpretation through different technological or mobility devices to be used in the Archaeological Park of Segóbriga.

Such ICTs are usually accessed through applications installed in mobile devices, ready to be used. Such utilities are, quite simply, a program that, after being installed in a device, is integrated in the features of such devices, such as the camera or global positioning system (GPS). In this way, ICTs become part of the daily activity of persons and users, since they are easily accessed and visible at all times, and they remind users of the possibility of using them at any time and immediately.

2.5 An autonomous vehicle to visit the Archaeological Park

The INTERPRETATIC project includes, in its design, an autonomous mobility infrastructure by which visitors may be transferred across the points in the park deemed relevant and display different interpretive contents. Besides, this autonomous vehicle may be used as a mobile link for the necessary communications for immersive view elements that

are a part of this project.

In order to achieve completion of this system, the following tasks are behind developed:

- Design and development of an autonomous mobility infrastructure for INTERPRETATIC: feasibility of solutions at a practical level.

- Design and development of a tester for an autonomous mobility infrastructure in Segóbriga which includes the following components:

  o A transformed general-purpose vehicle, including necessary sensors and actuators, for having autonomous mobility capabilities.

- Definition of the routes which may be accessible to such autonomous vehicle, establishing the different pre-defined stops and the restrictions which need to be contemplated to transfer this service in Segóbriga.

- Design and development of a software allowing to control and monitor the autonomous vehicle which is to be operative vin the Archaeological Park of Segóbriga.

- Design and development of a route definition system that allows to establish stops for the autonomous vehicle or to visualize different contents depending on the location.

As of today, the status of development is in a stage of supervision of the future route.

3. THE NEW INTERPRETATION APP FOR VISITING THE PARK

3.1 Smartphone and tablet application.

This project, throughout its duration, intends to be a step forward in the design and development of this type of apps by including new functionalities, which, in this case, shall be research and tested according to the principles of the INTEPRETATIC project.

Therefore, works on the development of an app with the intention of providing it with a structure and an appropriate design in order to provide different types of users with interaction modes adapted to the visit they are to make. Each of such profiles shall be assigned one or more types of visit, each adapted to their needs and expectations. Besides, the different types of interaction shall be provided with contents fully adapted to each of them.

The app utilities are to be developed throughout the park and the interpretation centre. Aspects such as augmented Reality, Image Recognition, sound alarms, reconstruction of locations and virtual elements, photogrammetry, gamification, beacons, invitation to and use of the autonomous vehicle, etc.

Up to this moment, three modules or versions of this app have been produced, each of them has been subject to different essays and testing, and all which include new technologies and techniques such as implementation of Augmented Reality, Image Recognition,

photogrammetry, gamification, and inclusion of 3D objects in real environments.

This app intends to enable different users to access all informative contents which may be obtained through a visit to the Archaeological Park, displayed according to their needs, and which, in its final version, structures the visit both to the interpretation centre and to the environment, based on the different user profiles that are currently being defined. In this line, three initial profiles have been considered: general users, schools/families and experts.

Interpretive contents, both scientific and virtual, created and inserted are fully dynamic and allow a personalized user experience: users may choose how to receive the relevant information according to their interests. These contents use history as a guiding theme for a visitor the park. As stated before, their goal is to share scientific knowledge through new technologies.

Scientific accurateness plays an essential role of such, and it is being carried out through the creation of individual records for each point of interest (Figure 6)

Figure 6. Model record for access to interpretive contents (contents carried from archaeological data provided by the research team).

3.1.1 Expositive contents on the app

This app implements new digital contents in the Interpretation Centre and along the visit

of the archaeological site of *Segobriga*. The Interpretation Centre Halls display the finest pieces in the collection, from the epigraphic plinth dedicated to the personal secretary of the Emperor August, or one of the statues found in the *forum*, which are complemented, for visitors' sake, with the virtual insertion of the parts which have been lost. For these actions, photogrammetric techniques have been used to develop the objects to be shown and beacons and image recognition techniques enable users to access information.

Additional contents, other than those displayed in the information panels along the route, have been created; the augmented reality elements, which are intended to be superimposed to the actual elements and enable users to understand some archaeological spaces in a very special way, are .

Transference of knowledge about archaeological site of *Segobriga* to society by means of this App considers the different types of visitors to the site. Therefore, students, families, the elderly, etc., may use the app adapting the interpretive contents to the different profile of each visitor.

3.1.2 Technological development of the interpretive app

During the first year of development of the INTERPRETATIC project, the software development and programming stages were carried out until optimal results compliant with the intended aforementioned results were obtained.

Therefore, the development of an app for smartphones and tablets has been launched to be ran in Android OS; this app has been developed in JAVA and in the Android Studio development environment.

For the augmented reality module, the following complements have been used:

- For visualizing 3D objects and video in AC, the ARCore Google Library is used.

- In the 360º portal of the amphitheatre the ViroCore library has been integrated.

- Classical Augmented Reality, present in the visualization of labels for interpretive points, is based on a library entirely developed by Tragsatec.

Development of the app interface and web frame has been modified several times, always in search of a more intuitive, more attractive and more user-friendly for all types of users (Figure 7).
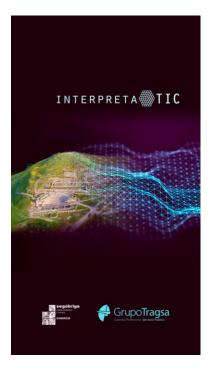
Figure 7. Current app interface. (Image: Tragsa).

3.1.3 Selection of interpretation points, insertion of virtual images, on-site virtual resolutions and 3D augmented reality

Developing or realizing interpretation strategies and proposals previously explained under INTERPETATIC required selection the exact points or locations with which it will be possible to interact through the app. To this end, coordination between the different agents involved in the project was absolutely necessary.

Thus, a total of 27 points of interpretive intervention (Figure 8) have been defined, on which the different strategies, tests and interpretation proposals related to ICT shall be carried out, and which include, as mentioned before, inserting virtual images.

The criteria for selecting points is based on the coordination of the different agents involved considering their needs and their compliance with the project's goals. This, together with the interpretation strategies and proposals as submitted, establishes a single direction or guiding thread for sharing scientific knowledge. Thus, for this purpose, appropriate creative contents for each strategy are being prepared for each selected point.
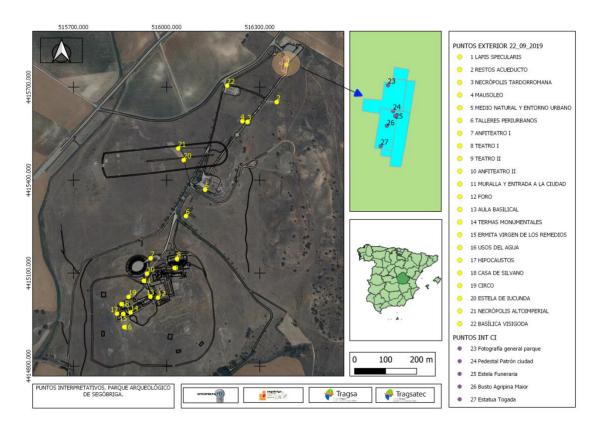
Figure 8. Location of interpretation points in which app interaction is possible (Image: Tragsa, based on plans provided by the research team).

Since the opening of the Archaeological Park, dissemination of the *Segobriga* heritage has included the development of virtual images. This work has always been carried out by the company Balawat based on the information provided by the site research team, from the topography deducted from excavations. The resulting images are very close to what could be the actual appearance of the old site. The image of the urban setting is especially remarkable, since it allows to appreciate the actual volumes of the Roman city and to admire the *forum*, the theatre and the monumental *thermae*. The same principles underlie to the creation of new virtual images for the INTERPRETATIC project, which are, by themselves, a scientific document resulting of archaeological research and a top-notch tool for disclosing or disseminating knowledge about this open-air archaeological site.

Spaces chosen were archaeological sites which had not been subject to formal interpretation and about which research has been developed thanks to the latest excavations. With these premises, the amphitheatre was chosen among the buildings excavated in the Roman town (Almagro&Almagro-Gorbea, 1995) as well as the funerary monuments exhumed in the main necropolis at the foot of the northern road.

In the specific case of the amphitheatre, the front view of the *porta triumphalis* has been re-created, and now serves as a portal for the 360ºC of the building for spectacles from the *arena*. This resource helps visitors to visualize and understand the amphitheatre, since they can admire the building as it was in Roman times (Figure 9).
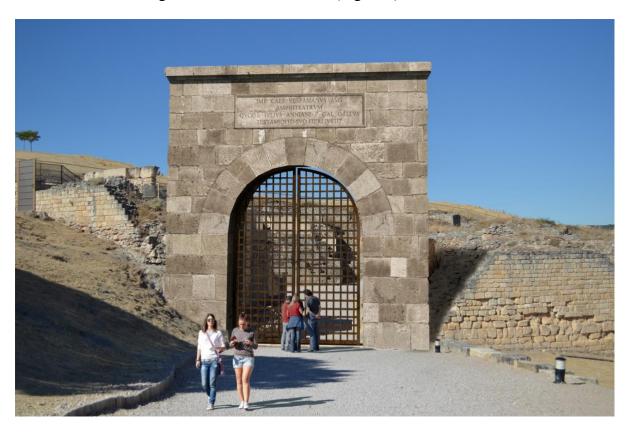

Figure 9. Re-creation of the entrance gates towards the 360ºC reconstruction of the amphitheatre. (Image obtained from archaeological data provided by the research team).

On the other hand, the re-created formal aspects of funerary monuments documented in the northern burial ground is a result of the archaeological finds and of the studies about architectural decorations (Cebrián, 2019). Currently, visitors cannot see them on site because they are covered with dirt due to the exhumation process; therefore, the purposes of sharing these contents is to enable access to scientific knowledge of an archaeological space which is not open to visit. The technological resource users was the virtual *anastylosis* of two mausoleums, based on a video which recreates these mausoleums rising from their foundations at the exact place where they are located within the necropolis (Figure 10).

Figure 10. Re-creation of funerary elements. View of funerary elements in their original locations. (Image from the app; recreations based on archaeological data provided by the research team).

On top of these actions, a photogrammetric re-creation was carried out on the robed statue found in the *forum* and described above (Figure 11). However, the most important aspect is the transfer of knowledge by means of the Augmented Reality records in each selected interpretation points, which, through HTML, sound, video, or photography technologies, facilitate access to scientific knowledge.

Figure 10. App photogrammetric re-creation of robed statue (Image: Tragsa, based on archaeological data

provided by the research team).

3.2 Advancing new contents

The project is currently developed according to its different strategies and development lines, trying to implement the transmission of scientific knowledge through new technologies.

At this moment, the app is in its phase 3 of development; more specifically, the different types of information that may be accessed from each selected interpretation point throughout the park are being precisely defined, in order to be able to adapt a visit to the park to the different user types or profiles considered. All contents shall be adapted to those profiles, including general users, experts and families.

In the following version, different manners of displaying informative contents through testing new ICT shall be implemented. The results obtained by means of implementation of the different involved technologies will be used as additional information for users from different categories and in different environments, enabling a reasonable and sustainable use of natural and archaeological elements.

The subsequent phase of the project will consist on providing the app and the project itself with active gamification resources, achieved through ICTs and Augmented Reality. This gamification will consist on an escape game, in order to avoid the typical treasure hunt, so frequently implemented in countless heritage sites throughout Spain, and to take advantage of the scoring-prize-target systems typical of the latter to significantly increase user satisfaction and the degree of knowledge acquired in the visit. The challenge is to successfully adapt the characteristics of the interpretive gamification system to the specificities of the space where it is to be implemented, in this case the Archaeological Park Segóbriga, in order to ensure that it is appropriately adapted to the context of the visit. Special care must be taken to ensure that neither the game nor the technology overshadows the archaeological site, but remain an original and motivating complement to any visit or interpretation of this space.

4. CONCLUSIONS

Currently, any knowledge transmission methods implemented in INTERPRETATIC are being used in a very wide array of contexts linked to research, dissemination and preservation of cultural heritage. For this reason, over the first months of project development, efforts were made to achieve the highest possible number of targets; particularly, much work was devoted to rapidly advance on the founding principles of the project.

The development framework of this type of projects, with multiple milestones, pilot testing and continuous improvements on experimentation on each phase, has shown that the work developed to this point enables implementation of the different techniques, as well as the design and development of tests, prototypes and multiple experiments, from which we have obtained resoundingly positive conclusions about the development and direction of the

project.

Thus, in these months, the project has succeeded in starting to develop a tool that will promote dynamic incorporation of new systems which are to complement and implement existing systems for the purposes of improving space interpretation. Besides, the project is intended to favour educational and awareness raising purposes among the populations, is informative with regard of our natural and cultural heritage, and raises awareness with regard of our ecological treasures and with a rational use of our natural and archaeological spaces.

The works developed have evidenced that it is possible to carry out an interpretation of such spaces from anywhere in the world from different types of technology, as well as an observations, from platforms of those spaces, which will become a highly positive advance from a social point of view.

From this moment, the line of work to be followed must continue the line established by the results obtained to date. That is, it is indispensable to follow the already established line of work, which has proved so fruitful, and the aforementioned results must be used as a starting point for every line of work and for the different involved technologies. Besides, it is necessary that tests for new technologies start to be applied in different scopes, such as environmental surveillance, user information, space management, logistic and operational aspects of visitor management, user profiles, etc.

REFERENCES

Abascal, J. M., Alberola, A., Cebrián, R., & Hortelano, I. (2010). *Segobriga 2009. Resumen de las intervenciones arqueológicas*. Cuenca: Consorcio Parque Arqueológico de Segobriga.

Abascal, J. M. & Almagro-Gorbea, M. (2012). *Segobriga*, la ciudad hispano-romana del sur de la Celtiberia. In G. Carrasco (coord.), La ciudad romana en Castilla-La Mancha, Cuenca (pp. 287-370). Cuenca: Ediciones de la Universidad de Castilla-La Mancha.

Almagro, A. & Almagro-Gorbea, M. (1995). El anfiteatro de Segobriga. In J. Mª Álvarez & J. J. Enríquez (coords.), Bimilenario del anfiteatro romano de Mérida. Coloquio internacional El anfiteatro en la Hispania romana (pp. 139-176). Mérida: Junta de Extremadura, Consejería de Cultura.

Almagro Basch, M. (1983). *Segobriga I. Los textos de la antigüedad sobre Segobriga y las discusiones acerca de la situación geográfica de aquella ciudad. Excavaciones Arqueológicas en España* 123. Madrid: Ministerio de Cultura, Diputación Provincial de Cuenca.

Almagro Basch, M. (1984). *Segobriga (Ciudad celtibérica y romana). Guía de las* excavaciones *y Museo.* Madrid: Museo Monográfico de Segobriga.

Bellido Grant, M.ª L. (2001). *Arte, museos y nuevas tecnologías*. Gijón: Trea.

Cebrián, R. (2003). Musealización y apertura del Parque Arqueológico de Segobriga. In J. Beltrán de Heredia & I. Fernández del Moral (coord), II Congreso Internacional sobre musealización de yacimientos arqueológicos. Nuevos conceptos y estrategias de gestión y comunicación (pp. 32-34). Barcelona: Ayuntamiento de Barcelona, Museu d'Història de la Ciutat.

Cebrián, R. (2014a). *Segobriga. Municipio romano, Serie Arqueología*, 18. Cuenca: Diputación Provincial de Cuenca.

Cebrián, R. (2014b). Segobriga, civitas stipendiaria (Plin. HN 3.25). Nuevos datos arqueológicos sobre el urbanismo inicial de la ciudad. *Gerión*, 35 (2), 471-489

Cebrián, R. (2019). Las viae sepulcrales de Segobriga. Arquitectura y rituales funerarios. *Onoba,* 7, 21-36.

Cebrián, R. & Hortelano, I. (2016). La reexcavación de la basílica visigoda de Segobriga (Cabeza de Griego, Saelices). Análisis arqueológico, fases constructivas y cronología. *Madrider Mitteilungen*, 56, 402-447.

Cebrián, R., Hortelano, I., & Ruiz de Arbulo, J. (2017). El circo romano de Segobriga (Saelices, Cuenca). Carreras sobre las lápidas. In J. López (ed.), La glòria del circ. Curses de carros i competicions circenses. In memoriam Xavier Dupré i Raventós, Actes 3r

Congrés Internacional d'Arqueologia i Món Antic (pp. 167-173). Tarragona: Universitat Rovira i Virgili, Institut d'Estudis Catalans.

Coma, L. (2014). *Investigación en didáctica del patrimonio: la propuesta de modelos y nuevas líneas de actuación con dispositivos móviles*. Actas I Congreso Internacional de Educación Patrimonial. Mirando a Europa: Estado de la Cuestión y Perspectivas de Futuro. Comunicaciones. Línea 5: Investigación en Educación Patrimonial. Madrid: Ministerio de Educación, Cultura y Ciencia, 609-621.

Ibáñez, A. (2014). *Tendencias emergentes de integración de TIC en educación patrimonial. Educación, Clave de Futuro del Patrimonio*. Fundación del Patrimonio Histórico de Castilla y León.

Rascón Marqués, S. y Sánchez Montes, A. L. (2008). *Las nuevas tecnologías aplicadas a la didáctica del patrimonio*. Pulso, 31, 67-92.

Santacana i Mestre, J. y Masriera Esquerra, C. (2012). *La arqueología reconstructiva y el factor didáctico*. Gijón: Trea.

Sanfeliu, D. & Cebrián, R. (2008). La ocupación emiral en Segobriga (Saelices, Cuenca): evidencias arqueológicas y contextos cerámicos. 27, 199, -211.