# Chapter 2
# Experiential Learning With Augmented Reality for Cultural Heritage

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## ABSTRACT

*Augmented reality is a consolidated technology that allows the integration of the real world with digital elements, creating an interaction between the physical environment and computer-generated information. The case study presented has as its object the ancient Borgo Castello of Andora (SV), winner of the PNRR call for the redevelopment of historic villages. The project saw the study and application of redevelopment interventions for the recovery of the Borgo Castello area. Using laser scanner equipment, drones and Structure from Motion algorithms, the result was a vast database of point clouds and accurate 3D models, useful for understanding the historical evolution of the building. The investigations revealed how the existing walls were derived from the reuse of other pre-existing structures. The chapter presents how starting from three-dimensional models and accurate archaeological investigations it is possible to create augmented reality applications to involve the public and make them participate in the discoveries found.*

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## INTRODUCTION

In the context of the progressive digitization of cultural heritage, immersive technologies are assuming an increasingly strategic role as innovative educational mediation and valorisation tools. In particular, augmented reality (AR) and virtual reality (VR) stand out for their ability to profoundly transform the cultural fruition experience, activating experiential, situated and multisensory learning modes (Dunleavy & Dede, 2014; Di Serio, Ibáñez & Kloos, 2013). These technologies not only support the transmission of content, but also foster active interaction, shared construction of meanings and the emotional and cognitive engagement of the visitor.

The growing interest in AR and VR reflects a broader epistemological and methodological transformation in the way heritage is communicated, interpreted and experienced. There is a shift from a transmissive and conservative logic to a participatory and transformative approach, in which the user becomes co-author of the cultural experience. This change is part of the theoretical framework of new museology, which promotes the democratisation of access to culture and the enhancement of relational, affective and narrative dimensions in the enjoyment of heritage (Vergo, 1989; Parry, 2007).

In this scenario, immersive technologies not only amplify the communicative capacity of cultural institutions, but also contribute to redefining the very concept of heritage, understood no longer as a static object to be preserved, but as a dynamic experience to be lived, explored and reinterpreted (Giaccardi, 2012). AR, in particular, allows digital content to be overlaid on real contexts, creating an 'augmented reality' that enriches the user's sensory and cognitive perception, fostering a deeper and more personalised understanding of cultural heritage (Panciroli & Macauda, 2018; Damala et al., 2007). Thanks to its ability to integrate virtual elements into physical space, AR stimulates cognitive and interpretative processes that bring the user closer to cultural content in an immersive and contextualised way.

Similarly, VR allows immersion in fully simulated environments, offering evocative and immersive experiences that can reconstruct historical contexts, lost environments or complex narrative scenarios (Champion, 2016; Economou & Meintani, 2011). These immersive reconstructions not only support situated learning (Lave & Wenger, 1991), but also make possible the exploration of otherwise inaccessible spatio-temporal dimensions, fostering a more empathetic and reflective cultural enjoyment.

As Panciroli and Macauda (2018) point out, AR fits significantly into the relationship between technologies and learning, supporting augmented learning through the reproduction of scenarios that go beyond the theoretical dimension and stimulate experiential and contextualised learning. In line with constructivist theories, such experiences are more meaningful when embedded in authentic contexts, where