Chapter 6
Comparative Analysis of Immersive Collaboration Platforms:
Multi-Criteria Evaluation for the AEC Industry

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ABSTRACT

This chapter presents a structured comparative analysis of thirteen immersive collaboration platforms using a multi-parametric analytical framework derived from a systematic review of scientific literature. Through a mixed methodology that integrates computational lexicometric analysis with empirical evaluation, eight critical dimensions are examined to assess the effectiveness of immersive technologies in AEC contexts: industry compatibility, content representation, scalability and interoperability, support and community, collaborative features, personalization, user experience, and privacy and security. The analysis reveals the emergence of three distinct categories of platforms, each defined by specific priority configurations and implementation trade-offs. This classification enhances the understanding of the immersive technology ecosystem in the AEC, promoting a paradigm shift from

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a monolithic view of solutions toward a model of complementarity and functional specialization aligned with the complexity of contemporary design and construction practices.

INTRODUCTION

Although the extensive scientific literature on digitalization tends to focus on its positive impacts, the systemic gaps that still exist are often overlooked. The AEC sector, as highlighted by (Eastman et al., 2018) has historically been plagued by significant information and communication fragmentation, which translates into operational inefficiencies, interdisciplinary misunderstandings and difficulties in coordination between heterogeneous stakeholders. In this scenario, immersive technologies emerge as tools with transformative potential, but at the same time catalysts and amplifiers of these issues that still exist. If on the one hand they can facilitate a shared spatial understanding and improving communication effectiveness between professionals with different backgrounds and technical languages, on the other hand they can create new forms of digital isolation or accentuate existing disparities.

The adoption of these technologies, in fact, can introduce significant barriers related to hardware and software implementation costs, the need for specific training for their effective use and the lack of consolidated interoperable standards. This last aspect risks generating new information silos, where the data produced or displayed within an immersive ecosystem struggle to communicate with BIM platforms or other management systems already in use, replicating, in fact, the fragmentation that was intended to overcome. Furthermore, the learning curve and the potential resistance to change by some professionals can slow down their integration into consolidated workflows, limiting their benefits to specific niches or experimental phases, without real operational pervasiveness. Added to this is the complexity in managing large amounts of geospatial data and high-definition 3D models, which raises questions about security, privacy and the technological infrastructure needed to support fluid and high-performance collaborative experiences. The issue of interoperability is particularly critical in a sector characterized by heterogeneous and specialized software ecosystems. As highlighted by (Abbasnejad et al., 2022), the connection between immersive platforms and existing BIM tools presents frequent discontinuities that compromise information integrity and require duplication of efforts. From the point of view of accessibility, (Ekici et al., 2019) underline how hardware requirements, interface complexity and economic barriers continue to represent significant obstacles to widespread adoption. The tension between technical sophistication and immediate usability generates problematic compromises,