

Transforming the urban environment into knowledge: surveying, mapping and digital navigation of the Ex OGM-site in Turin

Original

Transforming the urban environment into knowledge: surveying, mapping and digital navigation of the Ex OGM-site in Turin / Vozzola, M., Semis, L.. - ELETTRONICO. - (2026), pp. 130-135. (IDEA. International Congress on Innovation design and Application Motosinhos (Portugal) 2 - 3 ottobre 2026).

Availability:

This version is available at: 11583/3016460 since: 2026-10-09T12:59:12Z

Publisher:

esad—idea, Research in Design and Art

Published

DOI:

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

Transforming the urban environment into knowledge: surveying, mapping and digital navigation of the Ex OGM-site in Turin

ABSTRACT

This paper investigates urban surveying as a process of translation through which the experience of space is progressively converted into structured knowledge. Moving beyond the conventional conception of surveying as a simple data acquisition activity, this research interprets it as a cognitive practice capable of mediating between perception, representation and understanding of the built environment. From this perspective, the transition from physical reality to digital representation involves a continuous transformation of information aimed at making the characteristics, relationships and persistent features of urban space legible. Using a case study of the Ex OGM-site in Turin, this paper examines the contribution of digital technologies in the construction and organization of knowledge. The results highlight how interactive maps and immersive digital navigation systems are not only tools for heritage communication and dissemination, but also effective cognitive devices capable of supporting new approaches of exploration, interpretation and comprehension of historic urban environments.

SURVEY
URBAN REPRESENTATION
DIGITAL NAVIGATION
DISSEMINATION OF BUILT HERITAGE
ARCHITECTURAL HERITAGE

INTRODUCTION

The regeneration of industrial heritage is now one of the central themes of academic debate in the field of contemporary urban transformation. The gradual decommissioning of large industrial complexes has created numerous urban voids which, on the one hand, represent points of discontinuity in the established urban fabric, but on the other hand preserve historical, architectural and identity-related values that make their conservation and reuse a strategic priority. Within this context, the development of a reliable knowledge base is a fundamental prerequisite for guiding the conservation, management and sustainable regeneration of the built heritage. Recent studies highlight how the quality of the initial documentation has a decisive influence on the subsequent phases of interpretation, assessment and design, highlighting the need for structured methodologies for understanding industrial heritage (Otamendi-Irizar et al., 2024).

At the same time, advances in digital technology have significantly expanded the possibilities for documenting cultural heritage through the use of digital surveys, geographical information systems (GIS), three-dimensional models and immersive virtual environments. These tools now make it possible to capture, organize and analyse large quantities of diverse data, fostering an increasingly integrated understanding of the built environment. However, their integration into unified methodological workflows—capable of transforming the acquired data into structured knowledge—remains an open area of research (Otamendi-Irizar et al., 2024).

This paper offers a reflection on urban surveying as a practice of knowledge-building and as a process of translating spatial experience. The case study is the site of the former Officine Grandi Motori (OGM) in Turin's Aurora district, a location that stands as one of the most significant examples of Turin's industrial development. Founded in 1891 as the Officine Meccaniche Michele Ansaldo factory, designed by Pietro Fenoglio, subsequently expanded by Giacomo Mattè Trucco between 1905 and 1915, and acquired by FIAT in 1923, the complex now serves as a chronological record of the various phases of the city's industrial development (PoliTo, 1984; Lanzardo, 2000). Despite its strategic location close to the historic center, the area is currently in a state of neglect and disrepair and acts as a physical barrier within the urban fabric. At the same time, its inclusion amongst the Urban Transformation Zones provided for in the General Development Plan highlights its strategic role in future urban regeneration processes, whilst respecting historic features and buildings of significant architectural interest.

In this context, an integrated methodology for documenting industrial heritage is proposed, combining direct surveying, photographic documentation, semantic classification, georeferencing using GIS systems, and virtual environments for accessing the information. The aim is to demonstrate how integrating these tools – which are normally used separately – into a single operational workflow makes it possible to organize heterogeneous data into a coherent system capable of revealing the characteristics, relationships and enduring features of the historic urban fabric, thereby highlighting the role of representation as an active tool for interpreting and constructing knowledge.

DRAWING AND SURVEYING AS VECTORS OF KNOWLEDGE

Since its earliest origins, drawing has primarily served as a form of communication, enabling the transmission messages, information and content. From this perspective, it can be interpreted as a genuine language, capable of conveying knowledge, structuring information and generating meaning (Cicalò et al, 2025). As a system of signs through which information is encoded and communicated, drawing plays an active role in the construction, organization and dissemination of knowledge (Arnheim, 1969).

Similarly, urban surveying cannot be regarded merely as a descriptive tool, but rather as a language capable of systematically exploring different fields of knowledge. The observation and analysis of the urban context can therefore be understood as processes of cognitive awareness, in which the representation of spaces within the built environment functions as a medium through which perceptions are transformed into structured graphic form (Garzino, 2010).

Surveying should therefore not be limited to mere recording of the built environment, but rather understood as an interpretative tool capable of identifying, relating and organizing the relationships between the elements that constitute the urban landscape. Through representational codes, it reveals patterns and enduring elements that contribute to defining the urban image and its recognizable identity (Coppo, 2007).

In this sense, conceiving drawing and surveying as languages entails acknowledging the necessity of translation in the transition from one linguistic system to another, since every form of expression possesses its own codes, rules and modes of communication.

Every act of translation involves a process of selection, interpretation and re-elaboration through which the original content is inevitably transformed. In the passage from physical reality to survey and then to drawing, the data are not simply reproduced, but rather reconfigured through new perceptual and representational codes that modify their legibility and meaning. This transformation is never neutral; it depends first and foremost on the individual's perception of space and then on specific cognitive and design intentions.

The translation from survey to drawing therefore does not merely imply a loss of information compared to the observed reality, but rather produces an interpretative gain, since graphic abstraction enables the articulation of structures, continuities, discontinuities and relationships that are not immediately evident from direct site observation. In this sense, the drawing does not simply describe the space, but actively constructs a new form of territorial understanding (Docci et al, 2009).

SURVEY AND REPRESENTATION METHODOLOGY APPLIED TO THE CASE STUDY

The research was conducted through a structured process comprising several sequential stages, including direct observation of the urban space, photographic documentation, data organization, and the digital representation of information relating to the buildings in the Ex OGM-site. The objective was not limited to documenting the existing conditions of the sites, but rather to explore a cognitive process capable of transforming the direct experience of the urban space into a structured information system that can be queried, interpreted and navigated.

The initial phase of the research involved direct observation of the urban environment and the systematic

SYSTEMATIC PHOTOGRAPHIC SURVEY



Figure 1. — An example of the different types of photographic capture (elaboration of the authors).

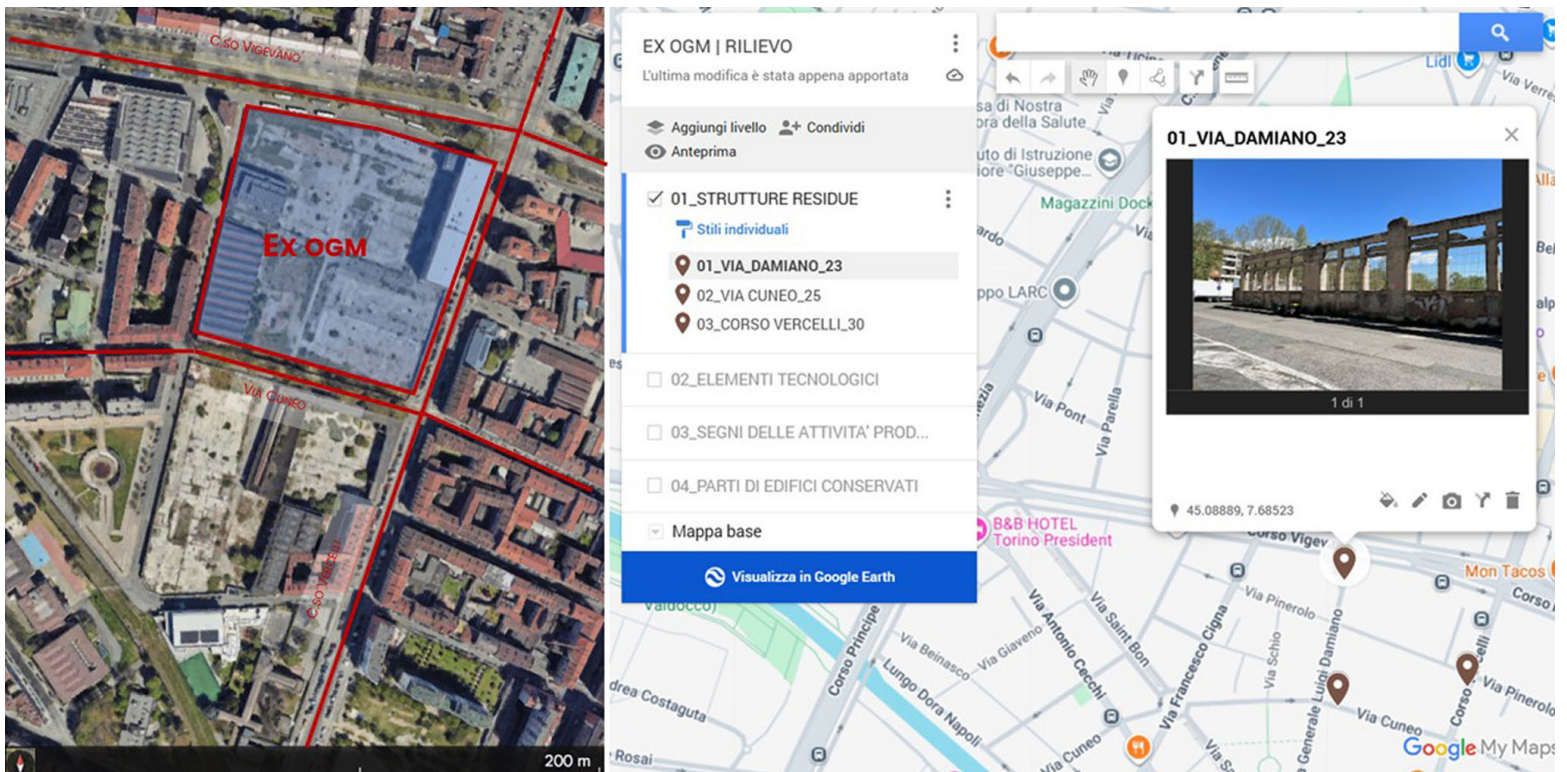


Figure 2. — Overview of the case study and an example of rapid field mapping within the Google My Maps web GIS environment (elaboration of the authors).

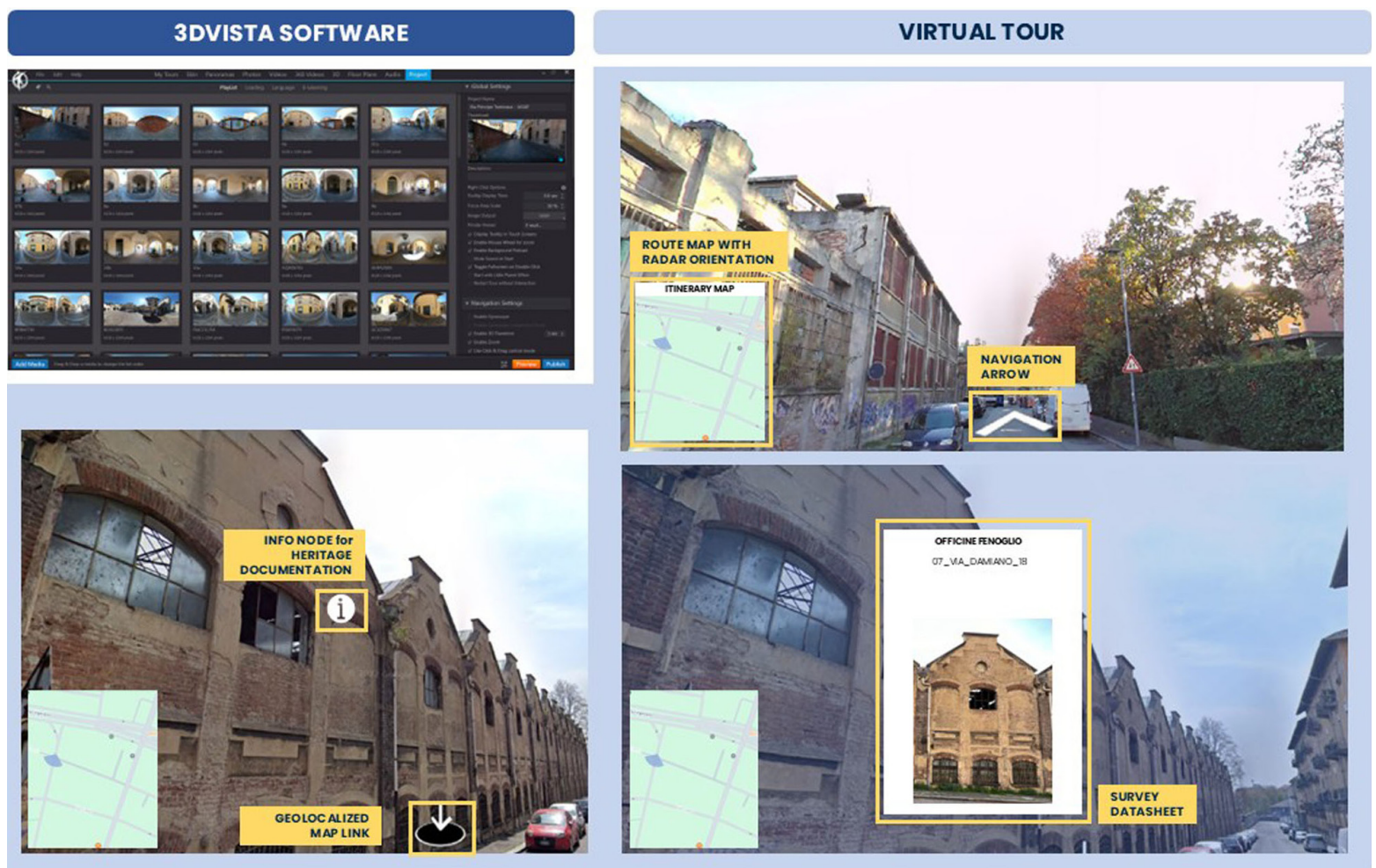


Figure 3. — Development interface in 3DVista and virtual tour navigation features (elaboration by the authors).

photographic documentation of the built heritage at the chosen site. Survey activities focused on different categories of physical evidence relating to the site's history; in parallel, other photos were acquired using a 360-degree camera, with the aim of subsequently developing an immersive virtual environment (Fig. 1). The devices employed, namely Insta360 ONE X2 and Insta360 ONE RS, are distinguished by their capacity to capture high-resolution spherical images and ensure continuous recording of the surrounding space.

The resulting photographic documentation thus provided a dual level record: on the one hand, an analytical registration of the remaining elements of the industrial complex; on the other, a synthetic representation of the spatial and perceptual relationships of the entire urban itinerary.

The collected images were subsequently organized through a process of typological classification based on the identification of categories relating to the features identified: residual structures, technological elements, signs of productive activities, and preserved parts of buildings. The following phase involved the georeferencing of images and associated information using the Google My Maps platform (Fig. 2). For each identified category of elements, a dedicated layer was created within the digital map, enabling the linkage of photographic data to their corresponding spatial location. This procedure made it possible to identify recurring features, persistent elements and variations within the built environment, thereby supporting a comparative analysis of the architectural characteristics along the road.

Finally, the 360-degree panoramic images were imported into 3DVista software in order to develop an interactive virtual tour. The resulting digital environment was conceived as a navigation system integrated with the georeferenced map, allowing users to virtually explore the

urban route and access information about the individual architectural features surveyed. The immersive navigation was further supported by an interactive plan of the urban route, synchronized with the corresponding panoramic scenes. This system allows the observer's position within the analyzed spatial framework and the orientation of the view to be monitored in real time, reinforcing the relationship between the immersive experience, geographical location and the organization of architectural information.

The overall process can be interpreted as a sequence of successive translations: from direct spatial perception to photographic documentation, from classification to digital mapping, and finally to the construction of a navigable virtual environment. From this standpoint, the survey shifts from being a technical data-acquisition procedure to a cognitive practice through which the urban space is progressively understood, interpreted and made legible (Fig. 3).

FROM OBSERVATION TO UNDERSTANDING: THE COGNITIVE CONSTRUCTION OF URBAN SPACE

Urban surveying can be interpreted as a knowledge-building process that develops through a succession of perceptual, cognitive, and representational operations. Visual perception is defined as a process of decoding external reality performed by the observer, through which meaning and significance are attributed to what is perceived (Massironi, 1989). Therefore, spatial observation does not constitute a passive recording of information present in the built environment, but rather an interpretative activity through which the observer recognizes elements and stable relationships, and constructs an understanding of the place.

From this perspective, surveying represents the natural continuation of the perceptual process: the act

of observing, selecting, and documenting architectural elements involves a continuous interaction between subject and environment, in which knowledge emerges from the direct experience of space. This interpretation is grounded in theories of embodied cognition, according to which cognitive processes cannot be considered independent of action and bodily experience, but develop through the interaction between mind, body, and context (Varela et al., 1991). The site visit to the Ex OGM-area constitutes a form of situated knowledge production, in which walking becomes a tool for urban investigation which, supported by digital elements, reveals the latent layers of collective memory and meaning embedded within the urban fabric (Borucka et al, 2026).

The experience conducted in the Ex OGM-site highlights how each phase of the project contributes to the progressive construction of urban knowledge. Direct observation of the space constitutes a first level of perception through which morphological characteristics, spatial relationships, and architectural peculiarities of the historic fabric are recognized. The photographic acquisition of construction and decorative elements introduces a further level of insight because it requires a conscious selection of what is deemed significant in order to direct attention to specific aspects of the building. A central role in this process was assumed by the georeferencing of the

collected information since the association between each element in the area and its position within the urban space can be interpreted as a form of spatial indexing (Bocconcino, 2020), in which geographical location becomes the ordering principle through which different heterogeneous data are related and structured into databases (Biallo, 2005). The digital map is therefore not simply a data archive, but a cognitive device capable of supporting new forms of reading and interpretation of urban space. Georeferencing using GIS systems is now one of the most effective tools for integrating spatial data and descriptive information into searchable platforms, thereby facilitating the analysis, conservation and management of cultural heritage (Liu et al., 2024).

The cognitive process finds further development in the immersive environment created through the virtual tour as digital navigation constitutes the continuation of the cognitive path started in the field. Through the virtual exploration of urban space, the user retraces the same operations of observation, comparison, and interpretation that characterized the acquisition and classification activities. The ability to simultaneously access the virtual tour, georeferenced information, and related descriptive content also allows for the clarification of relationships and connections that might otherwise remain implicit during a physical visit. In this translation process, the transparency of

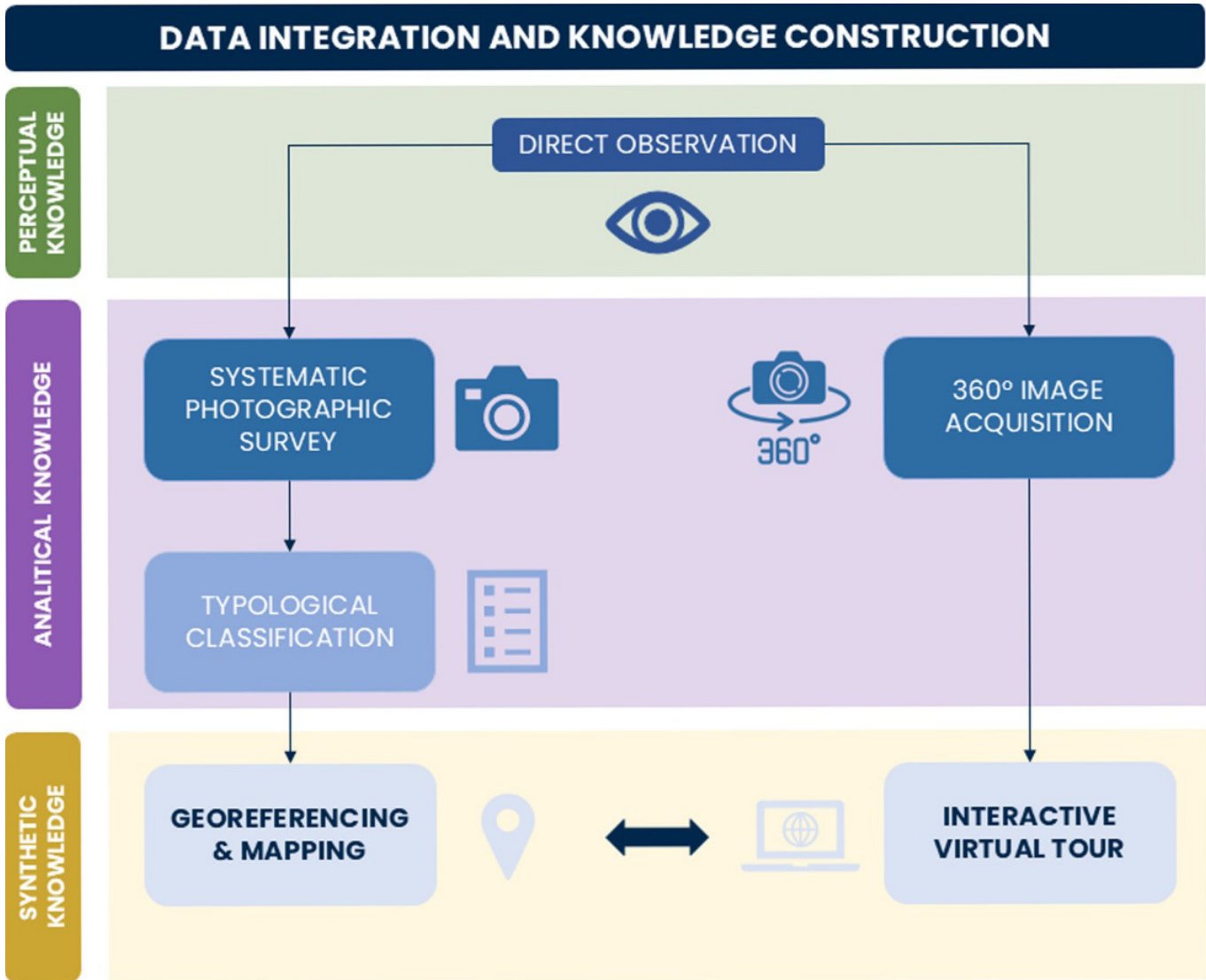


Figure 4. — Methodological framework applied to the case study (elaboration by the authors).

the reconstructive data becomes a fundamental principle for ensuring scientific rigour, enabling digital visualization to act as an interface for translating interpretative hypotheses into verifiable visual forms.

The entire process can therefore be interpreted as a progressive construction of knowledge articulated on three different levels. The first corresponds to the perceptual knowledge derived from direct observation of the urban space. The second coincides with the analytical knowledge produced by photographic acquisition and the classification of architectural elements. The third is represented by the synthetic knowledge generated by georeferencing and digital navigation, through which individual pieces of information are integrated into a unified system of relationships.

Knowledge of urban space does not pre-exist the observer's action, but emerges progressively through the interaction between the body, surveying tools, the built environment, and representation systems. From this perspective, doing becomes a form of thought, and surveying is configured as a cognitive practice through which space is progressively translated into awareness, understanding, and shared knowledge.

CONCLUSIONS

The experience conducted in Ex OGM-area highlights how the value of urban surveying lies not only in the production of documentation, but also in the ability to generate knowledge processes through systematic observation and the organization of collected information. Surveying is a translation practice in which direct experience of space is progressively transformed into structured knowledge. The classification of the different relevant elements of the area, their geolocation, and subsequent integration into digital navigation environments have enabled a multilevel reading of urban space, highlighting characteristics and relationships that would otherwise be difficult to discern from direct experience alone.

This paper demonstrates how tools such as interactive maps and virtual tours can be interpreted as visualization aids, but also as cognitive devices to foster new ways of exploring, enjoying, and understanding built heritage. From this perspective, digital representation takes on the role of a cognitive infrastructure through which data, observations, and interpretations are organized into a coherent and interrogable system, contributing to a deeper understanding of the historical urban space.

REFERENCES

- Arnheim, R. (1969). *Visual Thinking*. University of California Press.
- Biallo, G. (2005). *Introduzione ai sistemi informativi geografici*. MondoGIS.
- Bocconcino, M. M. (2020). Integrazione e interazione: la centralità del Disegno e dell'Informazione quando una sola tecnologia non basta più. In *Rappresentazione, Architettura, Storia* (pp. 217-231). FrancoAngeli.
- Borucka, J., Picchio, F. (2026). Transforming urban experience through virtual tours: a digital storytelling of Gdańsk and its heritage. *Heritage Science*, 14 (1).
- Cicalò, E., Menchetelli, V. (2025). Il disegno come linguaggio. *Disegno*, (16), 7-15.
- Coppo, D. (2007). Fronti strada e immagini della città storica. In F.I. Apollonio (Ed.), *I colori di Cesena. La scena urbana della città*. Vol. 1 (pp. 18-21). CLUEB.
- Docci, M., Maestri, D. (2009). *Manuale di rilevamento architettonico e urbano*. Laterza.
- Garzino, G. (2010). Il rilievo del comfort per gli spazi urbani: prime riflessioni per analisi speditive. In Coppo, D., Boido, C. (a cura di), *Rilievo urbano. Conoscenza e rappresentazione della città consolidata*. Alinea.
- Lanzardo, L. (2000). *Grandi Motori. Da Torino a Trieste: culture industriali a confronto (1966-1999)*. Milano: FrancoAngeli.
- Liu, B., & Wu, X. (2024). Emerging trends in GIS application on cultural heritage conservation: a review. *Heritage Science*, 12(1), Articolo 143.
- Massironi, M. (1989). *Vedere con il disegno*. F. Muzzio.
- Otamendi-Irizar, I., Azpiri Albistegui, A., & Eizaguirre-Iribar, A. (2024). *Research Methodology for the Documentation and Analysis Phase of Industrial Architectural Heritage Preservation*. Historical Archaeology.
- Politecnico di Torino. Dipartimento Casa-Città, (1984) *Beni culturali ambientali nel Comune di Torino*. Società degli Ingegneri e degli Architetti in Torino.
- Spallone, R., Teolato, C., Russo, M., Vitali, M., Palma, V., Pupi, E., Rinascimento, M. (2025). Visualising Piffetti's Library in Villa della Regina Museum: an Interdisciplinary Digital Project for Knowledge Accessibility. *EVA Berlin Conference 2025*, 143-152.
- Varela, F. J., Thompson, E., Rosch, E. (1991). *The embodied mind: Cognitive science and human experience*. MIT Press.