ISSN 1828-5961

Digital Transformation of Architectural Legacy: Creating a Virtual Museum for preservation and dissemination

This project aims to valorise, preserve, and disseminate the architectural legacy of renowned Argentinian architect Miguel Ángel Roca (M.A.R.) by creating a virtual museum intended as a constantly updatable digital environment. By leveraging advanced digital tools such as BIM modelling, Virtual Reality (VR) and Digital Twin (DT) technologies, the research first focuses on collecting and cataloguing Roca's sketches and designs within a dynamic, user-friendly digital archive. This actively configures as a Common Data Environment (CDE) based on well-known communication and in-cloud storage platforms, i.e., Microsoft Teams and SharePoint, to promote accessibility, interdisciplinary collaboration, and interoperability, thus fostering innovation and enhancing engagement with diverse audiences. Following the definition of shared standards for the systematisation of the preexisting documentation, novel models of selected projects, maps and visualisation tools will feed the digital ecosystem under consideration so as to set up a virtual museum with differentiated access levels for managing and dissemination purposes. Consistent with global trends in cultural heritage digitisation, the project preserves Roca's influential contributions to modern architecture and urban planning while enhancing access to his body of work. It integrates cutting-edge technologies, such as BIM and GIS modelling, for existing and unbuilt projects, while also providing immersive experiences and tools for critical analyses. This evolving digital catalogue ensures sustainability through continuous updates and metadata integration, positioning the museum as a hub for research, education, and cultural exchange. Ultimately, it aims to bridge the gap between historical preservation and modern technology, revitalising Roca's teachings and making his legacy accessible to future generations by embracing innovative approaches to teaching architectural history.

DOI: https://doi.org/10.20365/disegnarecon.35.2025.14

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Keywords:
digital archive; architectural legacy; interoperability; data-systematisation; visualisation.

ISSN 1828-5961

INTRODUCTION

The outcomes presented in the following are the first results of the activities carried out within the framework of the research project *"Estimular 2024/2025 – Archivo Gráfico Digital: del dibujo a la experiencia inmersiva. Caso de estudio: Miguel Ángel Roca – Código: 33720230100060CB"* funded by the *Secretaría de Ciencia y Tecnología* (SECyT) of the *Facultad de Arquitectura, Urbanismo y Diseño* (FAUD), Universidad Nacional de Córdoba (UNC). The Project aim to develop a digital repository to preserve and transmit the graphic, architectural, and urban work of the Architect Miguel Angel Roca (M.A.R.), from the setting up of a database to its virtualisation employing immersive Extended Reality (XR) technologies.
As part of an ongoing collaboration between the Faculty of Architecture, Urbanism, and Design at the National University of Córdoba (UNC, Argentina), the Department of Civil Engineering at the University of Salerno (UNISA, Italy), and the Department of Architecture and Industrial design at Tshwane University of Technology (TUT, South Africa), the partnership focuses on developing innovative techniques using digital tools for architectural representation and visualization. An interdisciplinary team from different institutions brings its expertise in engineering, architecture, and digital technology, leveraging cutting-edge digital tools to enhance architectural education, heritage conservation, and public engagement, thus reinforcing international academic collaboration while ensuring long-term access to architectural knowledge and offering new ways to explore and understand Roca's architectural legacy (Fig. 1) (R. Ferraris, 2015; Roca, 2006).
Therefore, one of the project's main objectives concerns the generation of a virtual museum that integrates the database under construction, providing varying degrees of accessibility, differentiated for management and general dissemination purposes. To this end, it is vital to first set up a user-friendly, continuously updated digital catalogue to ease consultation and provide innovative tools for the analysis, study, and dissemination of M.A.R. projects and design strategies (V. Ferraris et al., 2024). Promoting interoperability will ensure compatibility with other digital platforms, enhancing data sharing and integration, and engaging diverse audiences. Indeed, a crucial element of this initiative is defining a shared protocol for BIM models in openBIM format – by employing Industry Foundation Classes (IFC) standard – so as to ensure effective interoperability and allow for compatibility with a range of digital platforms. This will enhance the accessibility to information for all users, streamlining the exchange and integration of data, and generating a comprehensive and engaging resource to valorise M.A.R.'s body of work (Fig. 2).

STATE OF THE ART AND PROJECT GOALS

The transmission of architectural legacy has been addressed in numerous examples of digital archives, such as the archives of Le Corbusier, Mies van der Rohe and Frank Lloyd Wright, as well as in the work of Latin American architects such as Oscar Niemeyer and Luis Barragán [1]. However, creating a digital archive for living architects, such as M.A.R., represents a significant novelty in architectural documentation, preservation and dissemination.
While it is widespread that cultural heritage tangible and intangible values transmission is inevitably linked to technological development progress, due to their multifaceted nature, digitisation and virtualisation activities do not seem to converge towards a single shared methodology. Moreover, both national (Ministero della Cultura. MiC, 2022) and international (Apollonio & Giovannini, 2015; Denard, 2009) do not intend to impose a rigid and defined workflow but rather offer guidelines so that researchers can propose and implement flexible and transparent strategies,

Fig.1 - Timeline of architect Miguel Ángel Roca's (M.A.R.) life and work, systematically organizing his achievements to preserve his legacy and offer new insights into his architectural contributions. Elaboration by Keila Nahir Trevisan.

DOI: https://doi.org/10.20365/disegnarecon.35.2025.14

ISSN 1828-5961

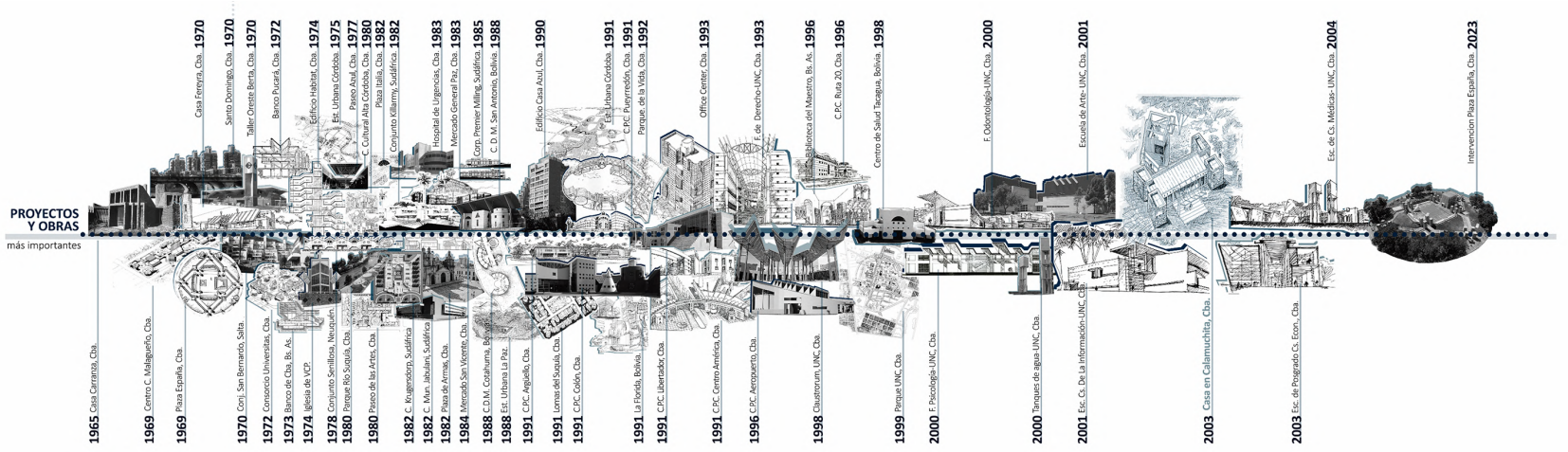

Fig. 2 - Chronological synthesis of M.A.R.'s most significant works, highlighting key projects that showcase his architectural legacy. Elaboration by Keila Nahir Trevisan.

paying particular attention to the sustainability of the method used over time as well as in data management and conservation.

Many studies in the literature deal with internationally relevant projects involving multiscale digitisation, ranging from individual objects in museum collections (Parrinello et al., 2024), to architectural heritage (Maietti et al., 2017), and urban portions of protected and unprotected landscapes (Dell'Amico, 2022; Picchio et al., 2020). In these cases, the structuring of an archiving system becomes a preliminary step to any management operation first and then to sharing and enhancement (Patankar et al., 2025).

Hence, on the one hand, organising the available sources is the first essential step for the creation of a digital cataloguing and valorisation system, as in the case of the research proposed here regarding the digitisation of the documentary sources of the vast archive of Miguel Angel Roca, with the aim of developing a management system; on the other hand, there is also a need to develop applications for mediated sharing in open access aimed at enhancing and disseminating his work. The HBIM (Heritage BIM) (Lovell et al., 2023; Murphy et al., 2013) and HGIS (Heritage GIS) (Doria & Morandotti, 2023; Galeazzo, 2024) methodologies combining the potential of geometric modelling with the possibility of connecting structured data to modelled objects, typical of information systems, represent the ideal tool for experimenting with multipurpose collection and cataloguing procedures in the creation of digital twins (DT). Furthermore, it is essential to correctly map the information contained within these digital repositories, simultaneously acting as both content and container, through the appropriate structuring of datasets, accompanied by paradata (data on methodologies and processes) and metadata (data about data, i.e., formalised statistical data) (Münster et al., 2024). To date, this can be achieved both within well-known BIM authoring systems – Autodesk Revit (Sanseverino et al., 2024) – and via tools not originally designed for this purpose but now equipped with dedicated plug-ins – i.e., Blender, Trimble SketchUp, etc. (Diara, 2022; Sbrogiò, 2024). These tools are constantly updated, and if used properly, they ultimately facilitate the organisation of the model elements according to the tree structure provided by the open IFC standard (BuildingSMART, n.d.), also allowing a certain degree of freedom in the customisation of the attributes to be inserted. The open-source structure of this format even makes it possible to manually edit the descriptors of the classes created during the export phase, using text editing tools, even if they have not been compiled (Sanseverino et al., 2021). There are many desktop and online viewers available for viewing and exploring models in IFC format characterised by a user-friendly interface, so this visualisation tool is suitable for both more experienced users and a wider audience, for which Extended Reality (XR) applications are generally preferred (Russo, 2021). Through user-friendly interfaces, it is possible to favour the aspects of communication and diffusion of cultural heritage, thus overcoming what, for various reasons, appears to be a cognitive, physical or even economic barrier for end-users, and opening up to subjects with different types of cultural background and diversified objectives (Bonacini, 2014). In particular, the development of virtual tours to which a limited and appropriately selected amount of information is linked (Geris & Özdener, 2020), becomes the ideal support for promoting the diffusion of heritage (Ferreyra et al., 2024) to the general public.

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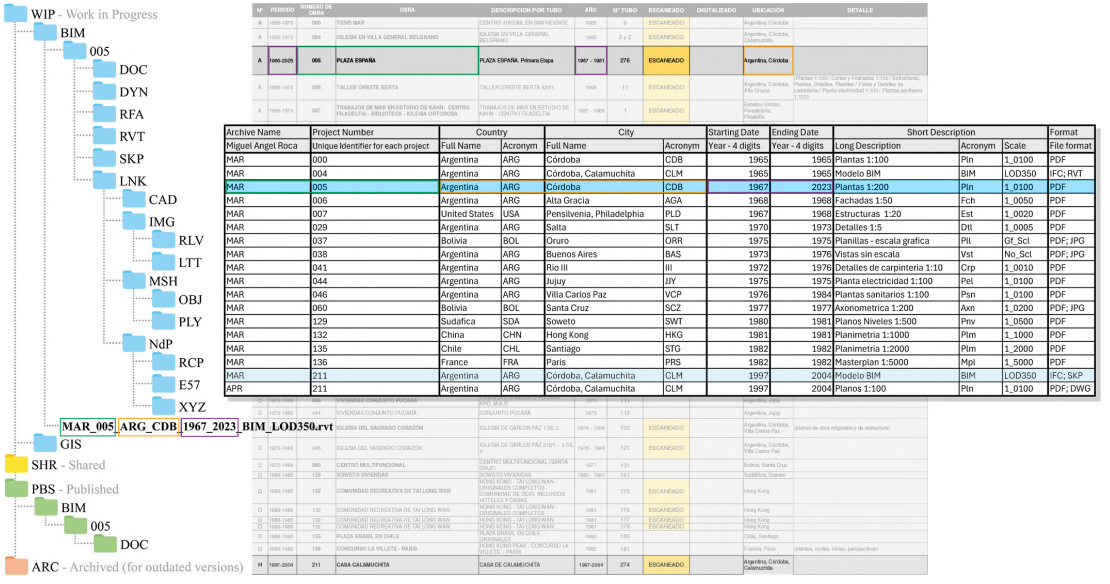
ISSN 1828-5961

Although recent studies are also focusing on the attempt to develop virtualisation tools starting from BIM-type modelling (Ferretti et al., 2022), these applications are still particularly cumbersome from implementation and computational point of view (Banfi, 2021; Fiorenza et al., 2025), so here we have decided to set up the virtual museum of the works of M.A.R. and make it openly accessible to end-users through a virtual tour of the "Casa en Calamuchita". This house, which represents a manifesto of his poetics, is the most suitable for linking the first models developed – made available online in OpenBIM format – as well as GIS mappings of his design strategies organised by type of intervention. Each project is given both the name by which it is known and the identification code assigned for classification purposes within the closed management system in order to facilitate identification in both cases.

M.A.R.'s influential contributions to modern architecture and urban planning require conservation in a format that transcends the limitations of physical archives. As digitisation reshapes cultural heritage conservation globally – exemplified by initiatives like *Europeana* and *Google Arts & Culture* – the project objectives align with such trends to safeguard Roca's work while improving its accessibility.

The generation of a virtual museum dedicated to M.A.R. represents one of the pioneering efforts in documenting the thoughts and reflections of living architects, offering a unique opportunity to combine both analogue and digital methodologies (Sanseverino & Dell'Amico, 2023). By leveraging digital technologies, the project not only preserves original materials but also enhances the understanding of Roca's work, making it more inclusive and relevant. Focusing on building a sustainable and updatable catalogue allows us to bridge the gap between expert research and public interest while simultaneously providing a blueprint for future architectural digitisation initiatives.

The proposed research activities involve students and researchers from Italian and international universities to develop synergistic collaborations and help elaborate a real digital ecosystem (Parrinello et al., 2023), by experimentally implementing, in each case, multi-platform management and dissemination procedures and aiming at optimisation. Digital technologies and their hybridisation represent the future of archives and museums (Giovannini et al., 2024) saved from oblivion in a process of constant re-presentation of memory re-elaborated in the minds of end users (Christillin & Greco, 2021).



Archive Name	Project Number	Country		City		Starting Date	Ending Date	Short Description			Format
Miguel Angel Roca	Unique Identifier for each project	Full Name	Acronym	Full Name	Acronym	Year - 4 digits	Year - 4 digits	Long Description	Acronym	Scale	File format
MAR	000	Argentina	ARG	Córdoba	CDB	1965	1965	Plantas 1:100	Pln	1_0100	PDF
MAR	004	Argentina	ARG	Córdoba, Calamuchita	CLM	1965	1965	Modelo BIM	BIM	LOD350	IFC; RVT
MAR	005	Argentina	ARG	Córdoba	CDB	1967	2023	Plantas 1:200	Pln	1_0100	PDF
MAR	006	Argentina	ARG	Alta Gracia	AGA	1968	1968	Fachadas 1:50	Fch	1_0050	PDF
MAR	007	United States	USA	Pensilvenia, Philadelphia	PLD	1967	1968	Estructuras 1:20	Est	1_0020	PDF
MAR	029	Argentina	ARG	Salta	SLT	1970	1973	Detalles 1:5	Dtl	1_0005	PDF
MAR	037	Bolivia	BOL	Oruro	ORR	1975	1975	Planillas - escala grafica	Pll	Gf_Scl	PDF; JPG
MAR	038	Argentina	ARG	Buenos Aires	BAS	1973	1976	Vistas sin escala	Vst	No_Scl	PDF; JPG
MAR	041	Argentina	ARG	Rio III	III	1972	1976	Detalles de carpinteria 1:10	Crp	1_0010	PDF
MAR	044	Argentina	ARG	Jujuy	JJY	1975	1975	Planta electricidad 1:100	Pel	1_0100	PDF
MAR	046	Argentina	ARG	Villa Carlos Paz	VCP	1976	1984	Plantas sanitarios 1:100	Psn	1_0100	PDF
MAR	060	Bolivia	BOL	Santa Cruz	SCZ	1977	1977	Axonometrica 1:200	Axn	1_0200	PDF; JPG
MAR	129	Sudafica	SDA	Soweto	SWT	1980	1981	Planos Niveles 1:500	Pnv	1_0500	PDF
MAR	132	China	CHN	Hong Kong	HKG	1981	1981	Planimetria 1:1000	Plm	1_1000	PDF
MAR	135	Chile	CHL	Santiago	STG	1982	1982	Planimetria 1:2000	Plm	1_2000	PDF
MAR	136	France	FRA	Paris	PRS	1982	1982	Masterplan 1:5000	Mpl	1_5000	PDF
MAR	211	Argentina	ARG	Córdoba, Calamuchita	CLM	1997	2004	Modelo BIM	BIM	LOD350	IFC; SKP
APR	211	Argentina	ARG	Córdoba, Calamuchita	CLM	1997	2004	Planos 1:100	Pln	1_0100	PDF; DWG

Fig. 3 - Data systematization for the implementation of a BIM-Oriented digitization and cataloguing process using a shared taxonomy to organize the database, ensuring effective accessibility. Authors Elaboration.

METHODOLOGY

The presented application follows two parallel paths. The first aims to define an internal cataloguing system for M.A.R. work, with a view to establishing and testing a series of procedures and optimising their sustainability. To this end, the definition of a shared taxonomy underpins the systematisation of the information database (Lo Turco et al., 2024), to ensure easy organisation of the datasets and its effective accessibility to all stakeholders involved.

A key aspect of properly working coordination is information sharing. Therefore, we first determined the set of tools to adopt in order to foster and facilitate collaboration among researchers, architects, and educators, thus actively implementing a supervised network for content generation and knowledge exchange. Namely, we choose the cloud storage provider by the interoperable Microsoft tools, i.e., Teams and Sharepoint. The latter environment allows for setting up a file archiving system first organised in four main tabs representing the four sub-areas of a Common Data Environment (CDE) within information modelling according to the PAS 1192-2:2013 (BSI, 2013), named as follows: "WIP" (Work in Progress), "SHR" (Shared), "PBS" (Published) and "ARC" (Archived, for outdated versions) (Fig. 3). Within each tab, we defined the same tree-based folder structure same folder structure, first divided into the

DOI: https://doi.org/10.20365/disegnarecon.35.2025.14

ISSN 1828-5961

main Information System we are currently working with, i.e., "BIM" and "GIS", then within them a folder named via a three-number ID, univocally corresponding to a specific M.A.R.'s project according to his internal classification, as soon as the corresponding documentation is properly digitised and catalogued. Within the project folders, the "DOC" (Documentation), "RVT" (Revit Models), "RFA" (Revit Families), "DYN" (Dynamo VPL Scripts), "SKP" (SketchUp Models), "LNK" (Linked data to support the modelling process), and so on, are generated upon necessity; particularly the "LNK" folders contain as many subfolders as necessary storing data extracted from the documentation (DOC) and elaborated within the modelling process.
Additionally, we are developing a naming structure to develop a unique ID for each stored file in order to facilitate browsing and easily keep track of the project they belong to, both within Microsoft Sharepoint – thus preventing archiving mistakes via a quick visual analysis – and when they are shared via other tools. The coded name will contain the ID of the archive (MAR), followed by the number ID of the specific project (###), the country acronym (e.g., ARG), the city acronym (e.g., CDB for Córdoba) the starting and the ending year, and a short description. Therefore, for the BIM model of the "Casa en Calamuchita" – first designed in 1997 and ended in 2004 – will be named as follows: "MAR_211_ARG_CLM_1997_2004_BIM" (Fig. 4). Moreover, upon sharing the BIM model in the IFC format with the general public, we decided to implement a coding for the model components that is currently under evaluation (Fig. 5).
As mentioned, this catalogue will also serve as the basis of the virtual museum, systematically categorizing and detailing his architectural contributions. Carefully organising this information will facilitate user access and allow for intuitive navigation throughout his legacy; allowing for the boundary between container and content to blur and create an actual "monument" through which students and researchers will have the chance to experience Roca's design process, his poetics, and his construction philosophy (Roca, 2006) remotely, from all around the world.

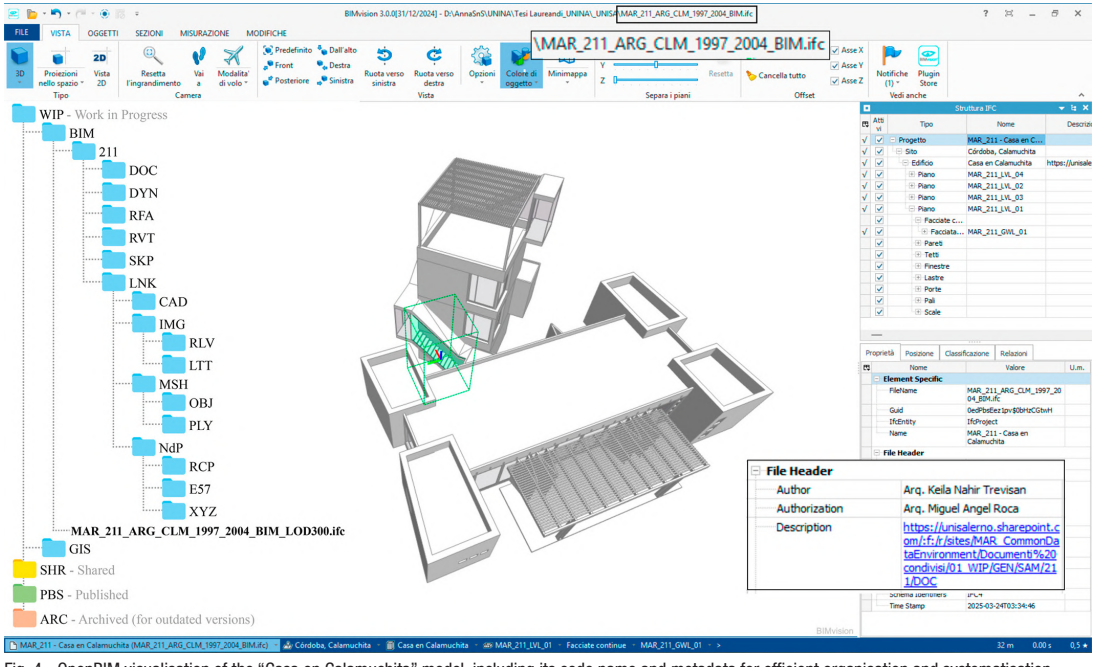


Fig. 4 - OpenBIM visualisation of the "Casa en Calamuchita" model, including its code name and metadata for efficient organisation and systematisation within the catalogue. Authors Elaboration.

TESTING THE WORKFLOW

Based on the presented framework, we are currently developing digitisation strategies with the collaboration of international students from the National University of Córdoba, who are already familiar with M.A.R.'s body of work and aware of the importance of its valorisation. Indeed, as part of the cooperation between universities, research team members have been actively involved in joint projects between the UNC and UNISA since 2012. In detail, some of the master's theses– developed within the framework of the research project *"Archivo Gráfico Digital: del dibujo a la experiencia inmersiva. Caso de estudio: Miguel Ángel Roca* / Digital Graphic Archive: From Drawing to Immersive Experience. Case Study: Miguel Ángel Roca" – focused on investigating procedures to preserve, analyse, and reinterpret Roca's architectural and urban legacy testing innovative digital tools and cutting-edge methodologies. To date, three of the first outputs have actively integrated within the database and its virtualisation, complying with the standardisation rules defined and set up by the Common Data Environment (CDE), thus allowing testing them for further optimisation.
The first thesis [2] entitled *"El renacer urbano: Miguel Ángel Roca y la ciudad de Córdoba, intervenciones en el área central y la vigencia de su legado"* [3] revisits Roca's urban interventions in Córdoba, using different techniques to map the different stages of his work and proposes a sustainable revitalization strategy based on his original vision. By analysing pedestrianisation, heritage conservation, and urban renewal, the

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ISSN 1828-5961

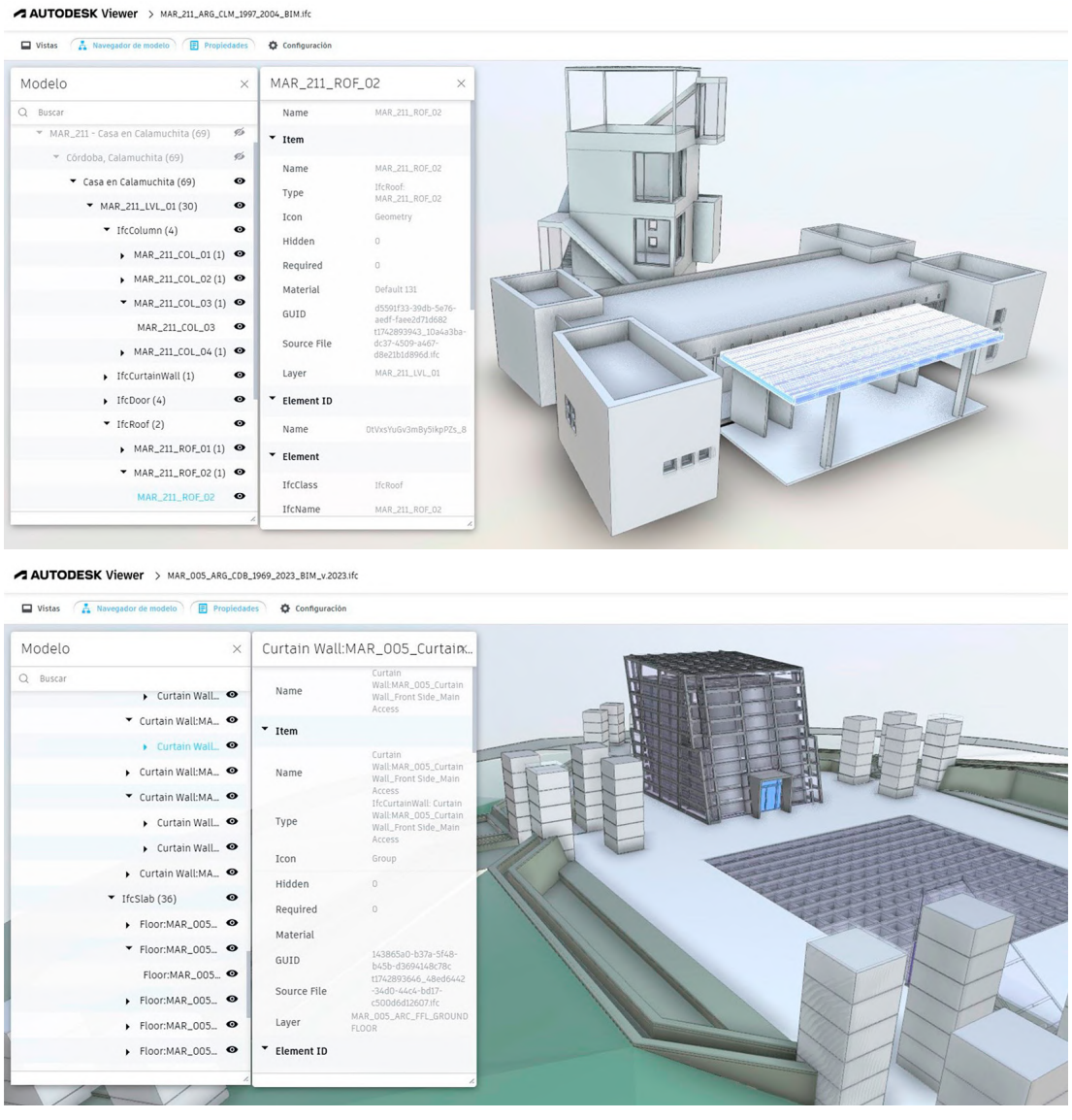

Fig. 5 - OpenBIM visualisation of the "Casa en Calamuchita" and "Plaza España" models, featuring cataloguing system details and component encoded naming. Authors Elaboration.

study offers solutions to modern mobility and preservation challenges. On the other hand, the second thesis entitled *"Desafíos y Oportunidades en la Gestión Museal: el Impacto de las Tecnologías Digitales en el Museo Metropolitano de Arte Urbano y Plaza España, Córdoba, Argentina"* [4] focuses on digitising Plaza España and its Museum using Scan-to-BIM methodology to generate a model (Fig. 6) to enhance museum management and public accessibility by integrating advanced scanning techniques like laser mapping, aerial photogrammetry, and 360° imaging. Peculiar to this case study is the evolution of this junction within the urban infrastructure of Córdoba, with its round layout dating back to 1889, first redesigned as the above-the-ground square (1969) and later enriched with an under-the-ground museum (2017-2023), in both cases by Roca. Lastly, the thesis entitled *"Trazos de una identidad Arquitectónica entre memoria y futuro: el Proyecto de la Fundación Roca"* [5] examines M.A.R.'s personal home (1997-2004) in Calamuchita (Fig. 7), proposing its virtual transformation into the Roca Foundation, i.e., a cultural centre dedicated to his work.

Working at a different scale level, they started developing information models testing different authoring tools – Sketch Up for the "Casa en Calamuchita" (Fig. 8) model, and Autodesk Revit for the multiphase modelling of "Plaza España" and its Metropolitan Museum of Urban Art (Fig. 9)– and informative GIS maps. The first GIS mapping – developed via Google My Maps (Figs. 10, 11) concerns the "Urban strategy for the city of Córdoba designed by Miguel Ángel Roca between 1979 and 2004", and it is organised in four phases according to time frames and levels of the competition "Plan Barrio Centro: Towards a Metropolitan Centrality".

The information collected is integrated within the Virtual Tour of the digital museum based on the "Casa en Calamuchita" using the openBIM format, exporting the correctly mapped models to IFC (Fig. 12). This format ensures interoperability among different platforms and allows for more efficient data management, serving in this case to both the "internal" management of the database and its "external" dissemination. For the open-access visualisation

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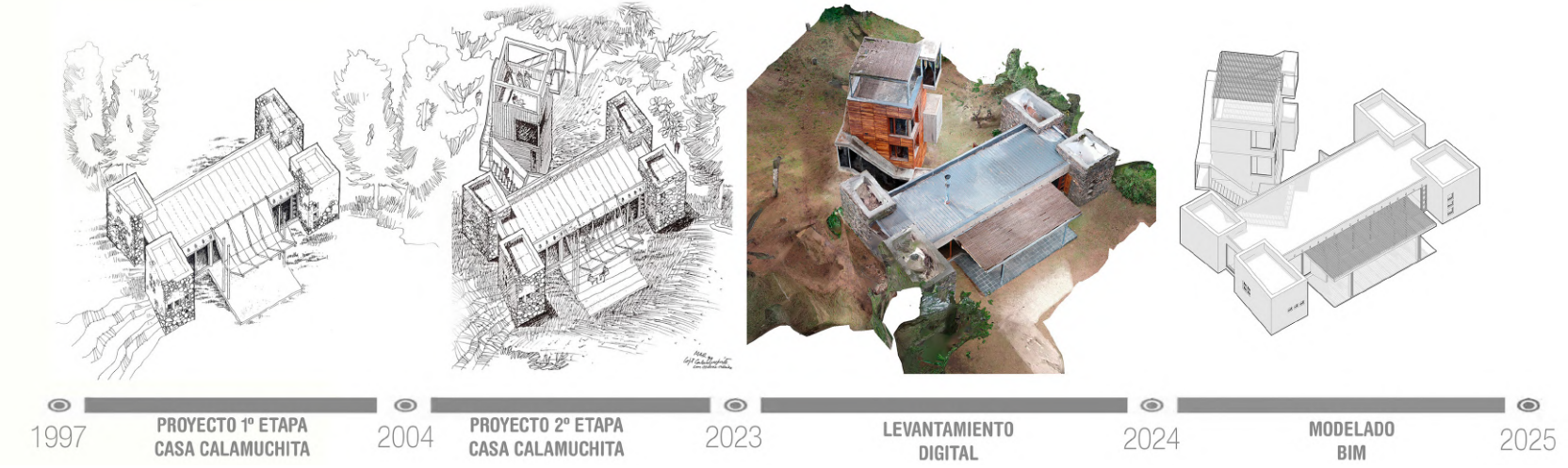
Fig. 6 - M.A.R.'s "Plaza España". From a hand-drawn concept to a completed project, and from reality to digital, through advanced surveying and modelling techniques. Author Elaboration.

of the models, we decided to employ the Autodesk Viewer, which provides essential inspection tools, such as sections, selection and element isolation and displacement, along with querying and measuring features.
A key component of this initiative is integrating immersive experiences that foster greater engagement and sensory interactions. Although compared to Digital Twins, Virtual Tours are able to convey a limited amount of information, their potential for interaction, based on a highly customisable and user-friendly graphic interface, makes them the perfect medium to engage the vast majority of non-specialist users (Geris & Özdener, 2020); they are usually fascinated by the possibility of building their own unique exploration of the architectural artwork, which can be further enriched by audio narrations regarding insightful details and anecdotes shared by the architect himself. For the presented application, the Virtual Tour has been generated via the 3D Vista software employing twenty-eight 360° panoramas – acquired with the Insta360 ONE x2 Action Camera and numbered sequentially and according to the corresponding floor – and the simplified floorplans of the four levels, within which each 3D view has been materialised via a clickable red spot that will also redirect the observer to the related panorama. In the upper-right corner, an info point provides some brief information concerning the house while simultaneously opening a web page showing its IFC model. On the other hand, the

Fig. 7 - M.A.R.'s "Casa en Calamuchita". From Concept to Reality, and finally to a Digital Model for Educational Analysis and Exploration. Authors Elaboration.



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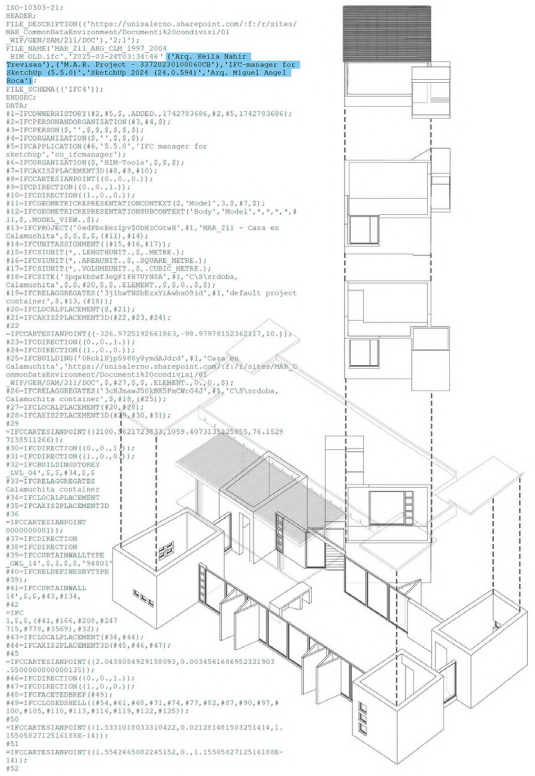


Fig. 8 - M.A.R.'s "Casa en Calamuchita" modelled using Trimble SketchUp and plug-in IFC manager in order to integrate the OpenBIM tree structure and export code, ensuring compatibility with open standards for seamless data exchange. Elaboration by Keila Nahir Trevisan and Octavio Lopez [6].

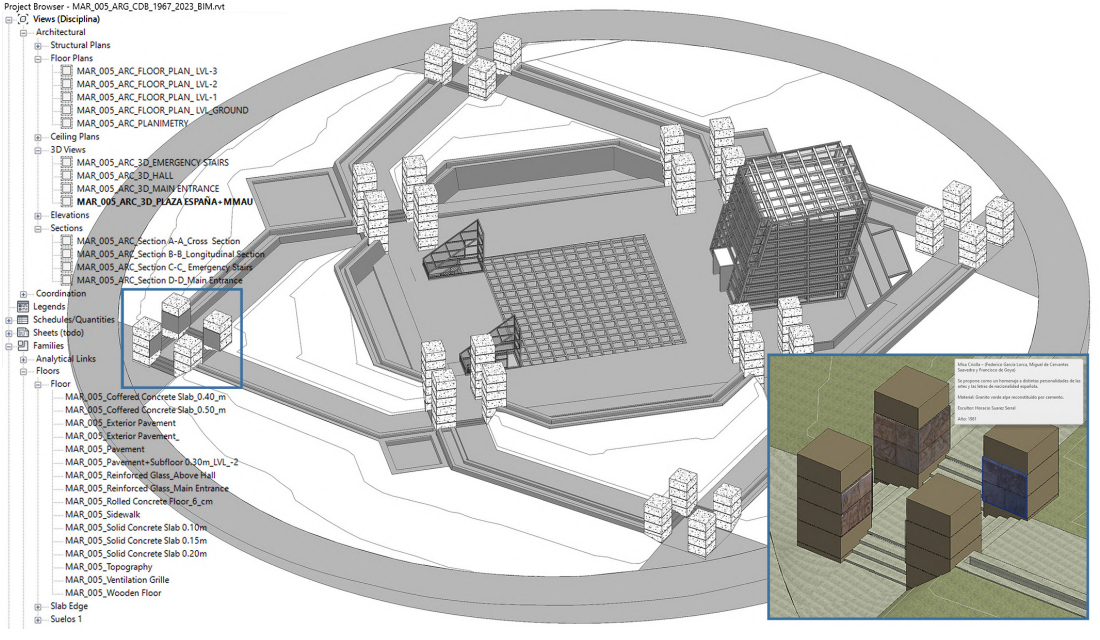
proper setting up of the museum information is now localised in the second-floor room, which actually serves as the architect's study; we started by placing a panel showing the map of the "Barrio Centro" M.A.R. projects (1979-2004) that provides a hotspot to open the Google Map (Fig. 13). The thematic map shows the outlined urban designs, whose further classification is synthesised employing colour-coded icons as recalled in the annexed legend. Furthermore, each of them contemplates an information panel showing in the title both the common and the coded name of the projects, together with some general data and the link to the M.A.R. personal website. As soon as further models will be produced, they will be also shared via this identity card, as done so far for the "Plaza España" IFC (Fig. 14). Moreover, a direct link to the sharable documentation available, as stored within the "DOC" folder, is provided in the "Description" of the IFC "File Header".

The accuracy of the BIM models is ensured by employing integrated survey data complemented with the 2D available documentation. Indeed, central to this process is the digitisation of archives, where physical records and project materials are transformed into digital formats with the aid of advanced surveying techniques (La Russa, 2022). The active integration of cutting-edge technologies in a unified digital archive framework constitutes a multi-level filing system in which each architectural representation is the connection node linking multiple branching data. Indeed, each BIM model developed for managing purposes becomes simultaneously container and content, as in the case of the model of the "Metropolitan Museum of Urban Art" in "Plaza España" developed to support the managing of the building and planning of temporary exhibition layouts, while additionally integrating a catalogue of the fix artwork (Fig. 15).

CONCLUSIONS AND FUTURE APPLICATIONS

The project seeks to achieve a collection of transformative outcomes, supported by a strategic integration of advanced technologies and a focus on accessibility and sustainability. At its core is the creation of a virtual museum – an engaging, web-accessible platform that showcases Roca's work

Fig. 9 - M.A.R.'s "Plaza España". BIM authoring systems - Autodesk Revit modelling highlighting the cataloguing system of each element (top), an axonometric view shows the final phase of the model (centre), enriched with semantic details regarding the bas-reliefs of the artists placed on the monoliths (bottom). The model allows for continuous updating that can increase its complexity and depth. Elaboration by Maria Belen Moll.



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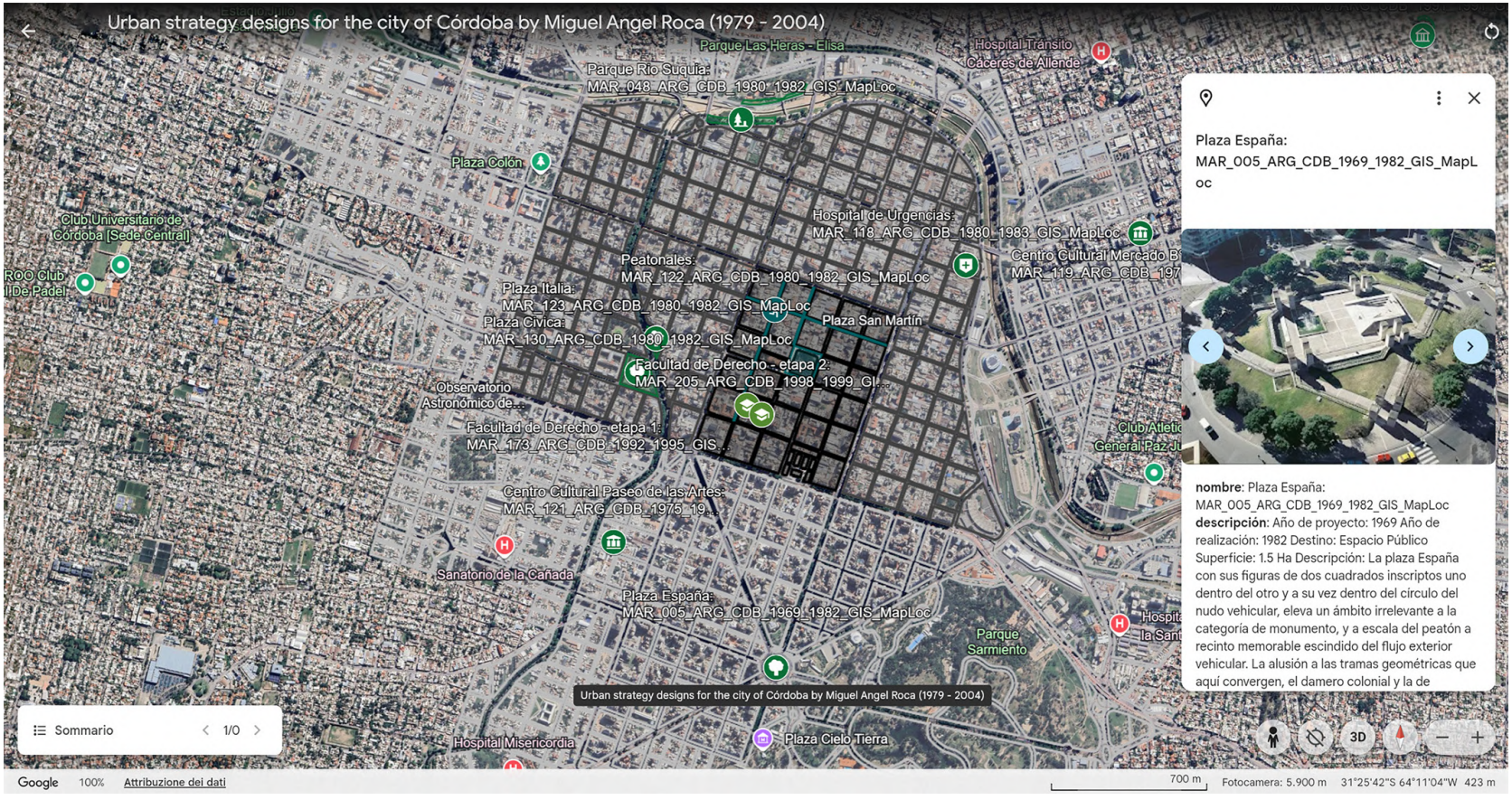

Fig. 10 - GIS cartography realised through Google My Maps visualising M.A.R.'s Urban Strategy Designs for the city of Córdoba, incorporating his projects, enriched with semantic information and systematic data cataloguing. Elaboration by Maria Eugenia Scolari.

while leveraging cutting-edge technologies such as Digital Twin (DT) and Virtual Reality (VR) to deliver an immersive and educational experience for users. Furthermore, employing the open-source IFC format allows for the manual editing of the attribute values via any text editor and even some limited customisation by adding further descriptors upon getting familiar with the openly shared IFC data structure, therefore leaving room for the possible automated editing by developing just a few ad hoc "lines of code".

The core of the project is the generation of a customizable digital catalogue designed to adapt and evolve with ongoing updates, along with a digitisation protocol to fit the CDE. This repository will include files, images, 3D models, and metadata, with robust capabilities for advanced search and interdisciplinary collaboration. Sustainability is a key focus, reflected in the catalogue's ability to maintain relevance through continuous updates, preserving the long-term value of the museum's resources. Moreover, the implementation of data interoperability standards enables seamless integration with other architectural databases and platforms, fostering cross-disciplinary exchange and ensuring the museum's position as a hub for innovation and collaboration.

A descriptor-based adjustable digital catalogue, capable of bearing ongoing updates and interdisciplinary collaboration, further enhances

DOI: https://doi.org/10.20365/disegnarecon.35.2025.14

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the user experience by enabling efficient search and retrieval of information (Bocconcino et al., 2024), ensuring streamlined access to the M.A.R. virtual museum's vast resources. This effort will be eventually supported by the deployment of an intuitive online platform, designed with web-based accessibility in mind and with the possibility to be powered by AI-driven assistance. Underpinning it all is a collaborative and adaptive framework, fostering continuous improvement through contributions from experts in architecture and technology.
Additionally, this evolving ecosystem ensures that the virtual museum remains customizable (updated and updatable), innovative, and responsive to the needs of its users. This type of interaction not only enhances immersion but also promotes active learning, allowing users to become protagonists in their exploration; by combining cutting-edge technologies with architectural archiving principles, this initiative seeks to innovate the ways in which M.A.R.'s work is studied and shared, creating a dynamic and deeper engagement and appreciation of his architectural legacy by revisiting Roca's contributions, revitalizing his teachings, emphasizing his cultural impact, and ensuring that his work is preserve for future generations.

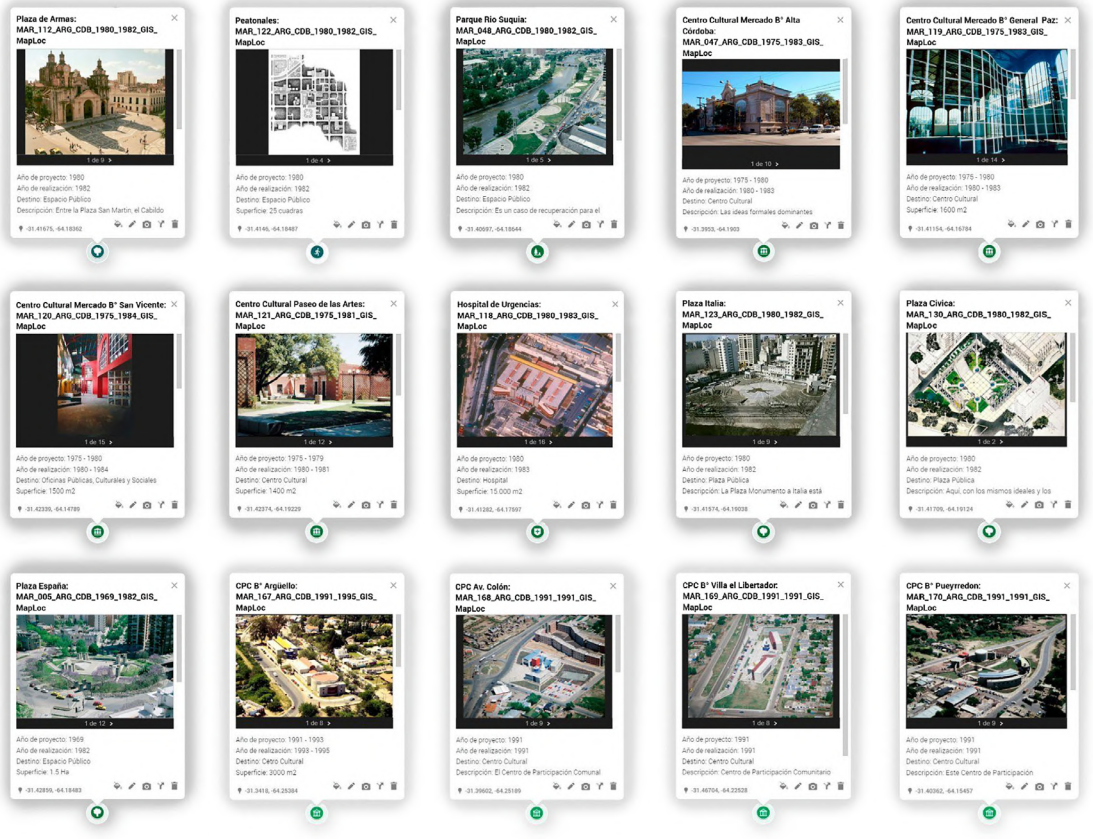

Fig. 11 - Summary of M.A.R.'s project panels associated with GIS cartography incorporating related information, metadata, and organised according to the established catalogue system. Elaboration by Maria Eugenia Scolari.

NOTES

[1] Architects' archives websites: https://www.fondationlecorbusier.fr/; https://miesbcn.com/; https://franklloydwright.org/; https://www.oscarniemeyer.org.br/; https://www.barragan-foundation.org/ (last accessed March 2025).

[2] Master's Theses in Building Engineering - Architecture in the framework of an ongoing Double Degree agreement between the Department of Civil Engineering of the University of Salerno and the Faculty of Architecture, Urbanism and Design of the Universidad Nacional de Córdoba, Argentina, fostered by professors Salvatore Barba and Roberto Ferraris. Activities conducted in the field of the project FraMMET "Fragility, Marginality, Mobility, Energy Transition (TNE23-00074)" funded by Italian Ministry of University and Research (MUR).

[3] By Maria Eugenia Scolari, University of Salerno and Universidad Nacional de Córdoba, 2025.

[4] By Maria Belen Moll, University of Salerno and Universidad Nacional de Córdoba, 2025.

[5] By Keila Nahir Trevisan, University of Salerno and Universidad Nacional de Córdoba, 2025.

[6] In case any link to access the IFC models does not work anymore, please use the following redirect app "https://autodeskviewerredirect.netlify.app/". By typing the old link in, you will be automatically redirected to the updated version of the model.

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ISSN 1828-5961

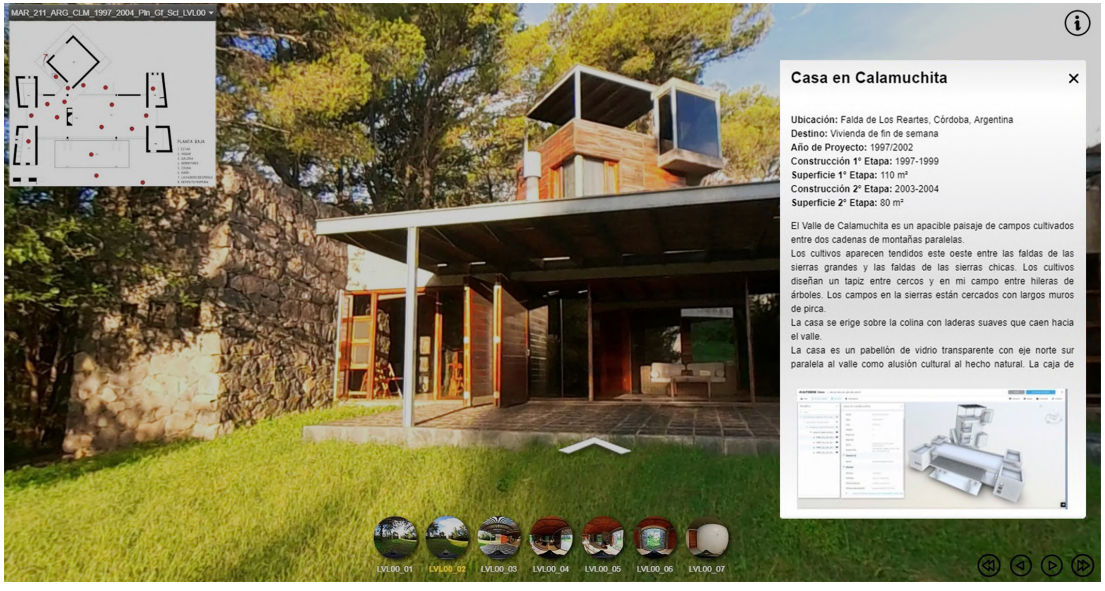

Fig. 12 - Virtual tour of the "Casa en Calamuchita", designed to serve as a virtual museum access point for M.A.R.'s works. It integrates semantic information, metadata, paradata, and files catalogued in various open standard formats for enhanced accessibility and analysis. Authors Elaboration [6].

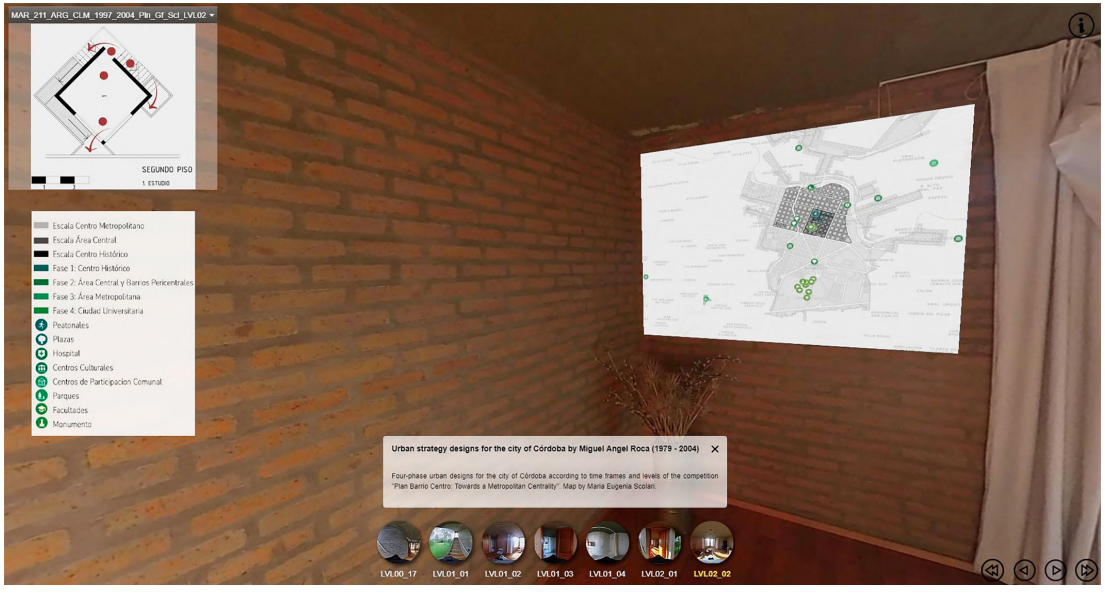

Fig. 13 - A key feature of the virtual museum for preserving and disseminating M.A.R.'s architectural legacy is the interactive map, incorporated in the Virtual Tour which provides detailed information about his projects. Authors Elaboration.

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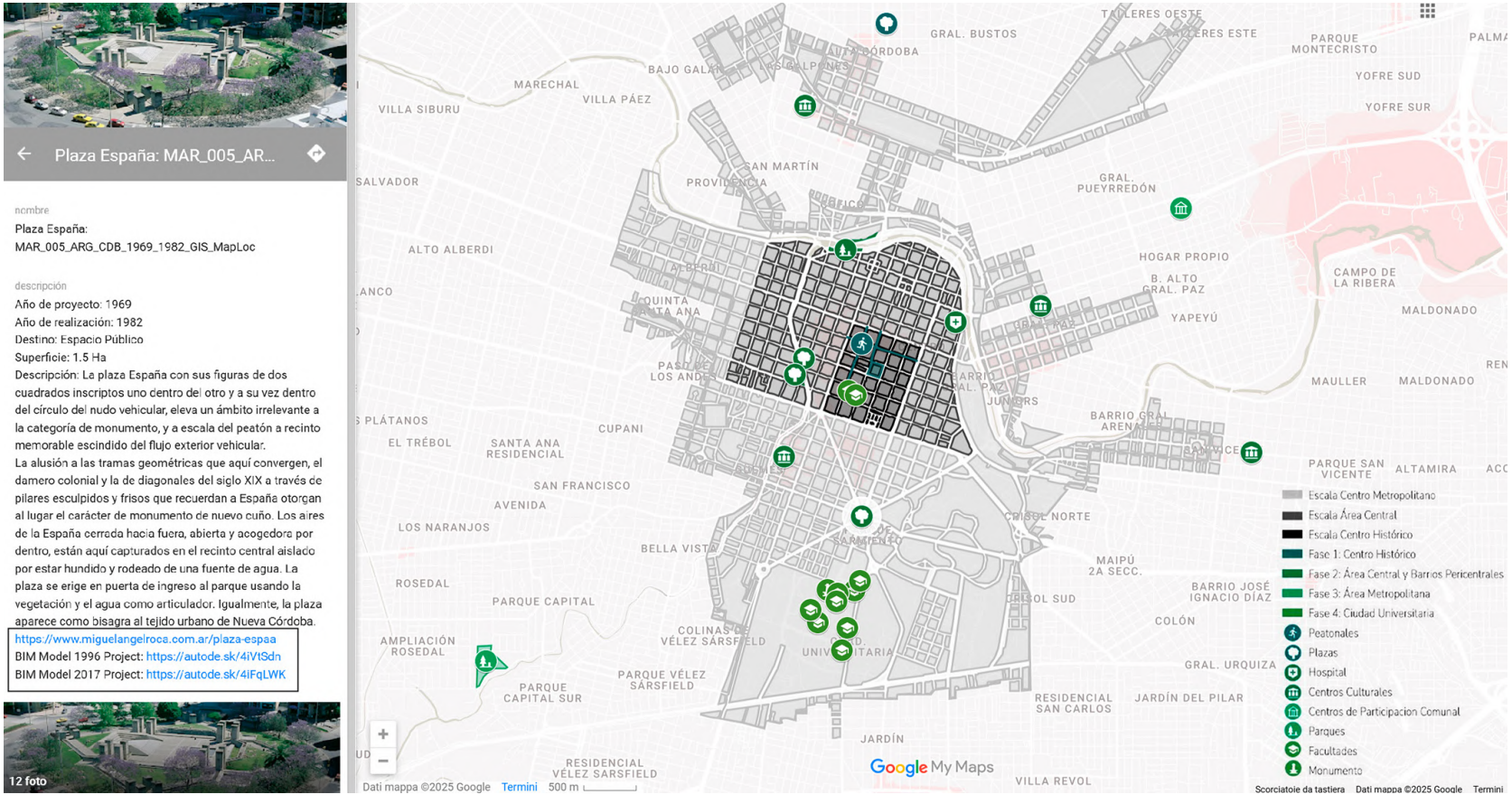

Fig. 14 - Interactive map that provides detailed information on M.A.R.'s projects, organised according to the coding system and systematised in the catalogue. It includes links to online models in open-source formats, i.e., "Plaza España" IFC, according to the different phases of the project. Elaboration by Maria Eugenia Scolari [6].

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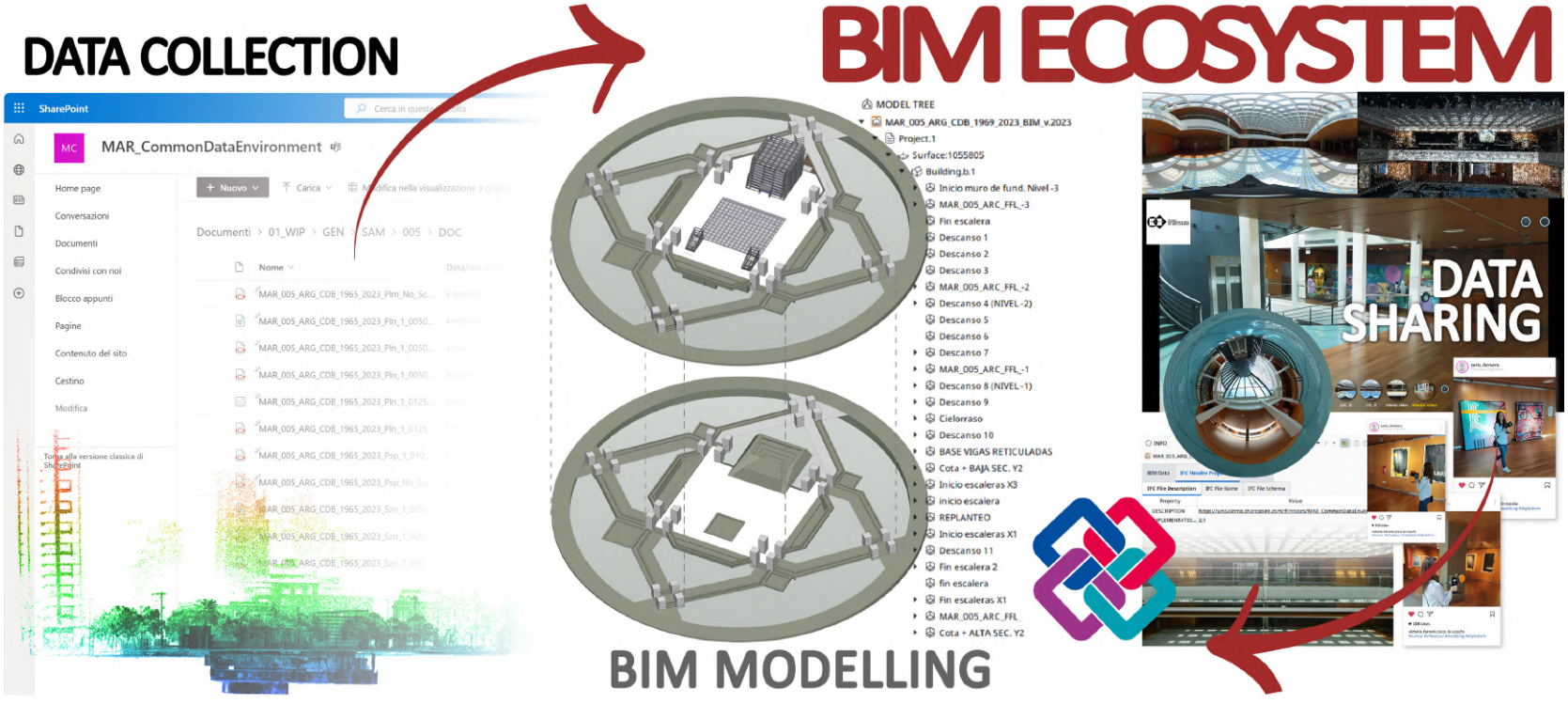

Fig. 15 - Photo merging of the BIM Ecosystem of “Plaza España” consisting of three main phases: “Data Collection”, “BIM Modelling”, and “Data Sharing”. Author Elaboration.

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