Architecture Drawings and Digital Archives: Acquisition, Structuring, Preservation

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Introduction

The central role of archival drawings as primary evidence for the history of architecture, landscape, cities and infrastructures has long been a clear fact.

As Manfredo Tafuri affirms, "architectural drawings, interpreted precisely as archaeological traces, from which a text is decomposed, also serve to 'disseminate' the work […] to the point of telling us something more about that work, as if the work alone did not speak sufficiently" [Tafuri 1983, p. 24]; also according to Tafuri, "a drawn work or a cycle of drawings of an architecture can even modify the reading of another work" [Tafuri 1983, p. 25].

According to Gillo Dorfles, "when we speak of Architectural Design (DA) –and not of design for architecture or design in architecture– we mean to specify the existence of an autonomous design, existing as such and not to be confused with other types of design […] a design, in short, linked in some way to the architectural fact" [Dorfles 1983, p. 33]. In the same essay, Dorfles speaks of "the artistic value –and not only a utilitarian expedient– of the DA" and then again considers "it is necessary here to judge the DA as an artistic operation in its own right, detached from what may be the characteristics of the building that may be constructed later on the basis of the primitive drawing" [Dorfles 1983, p. 34], stressing that it should not "be considered as an artistic operation in its own right, but as an artistic operation in the context of an architectural project". He underlined how we must not "fall into the ambiguity of wanting to always and unquestionably equate the value of the DA with that of the

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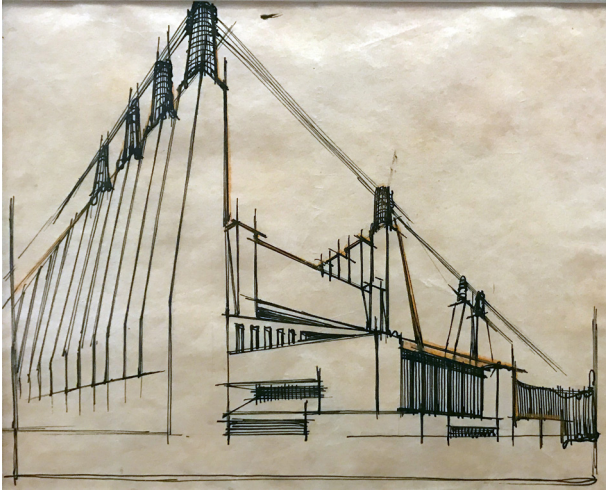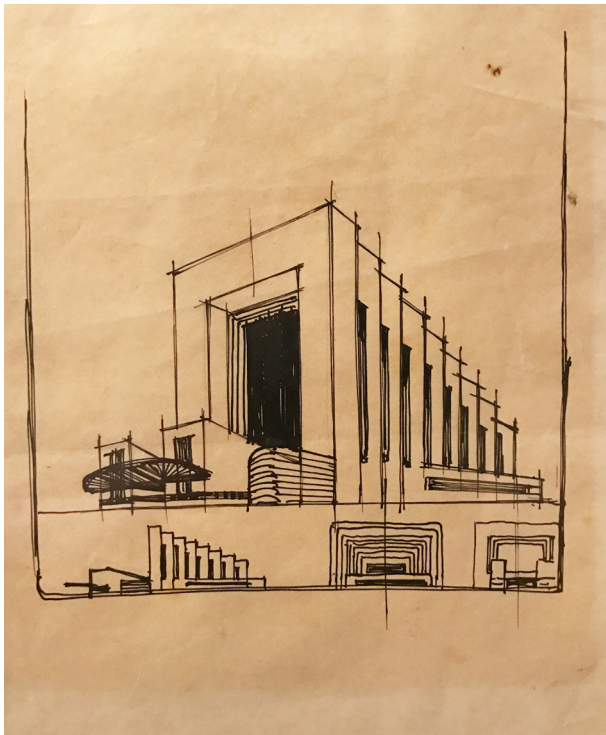
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actual architectural work and, also, of admitting the existence of an autonomous value of the DA, even if this does not prelude the realization of a subsequent architectural work" [Dorfles 1983, p. 35].

Vittorio Gregotti, moreover, said: "every drawing collected has value as a document of a design process, it describes the complicated path that from the first initial ideas leads to that set of graphic communications that describe the object in all its parts, allowing its construction" [Gregotti 1983, p. 41]. These are just some of the voices that have been raised on the occasion of the constitution of CSAC (Centro Studi e Archivio della Comunicazione) of the University of Parma; voices of architects, engineers and designers gathered in 1980 by Arturo Carlo Quintavalle in the founding moment of a center whose fundamental purpose is the collection of documents for the formation and transmission of the architectural project, at least in its section dedicated to the project.

In this occasion, there are numerous issues related to the collected architectural drawings, ranging from the authorship of the drawings themselves, seen as an expression of the designer or of his poetics through the study drawings, but also the dichotomy between the role of the architectural drawings, drawn up according to the graphic codifications necessary to communicate in the shared technical language the characters of the project, and the ideational sketches, expression of the creative process of the author.

Since 1980, the form of the archives is still entirely traditional, structured in such a way as to be able to preserve the paper, photographic and plastic materials that need to be stored in very specific spaces and logics, in which the preserved drawings and projects tell, better than many words, the extraordinary story of modern and contemporary Italian architecture and its memory that has been preserved thanks to the work carried out in a capillary fabric of institutions, Superintendencies and State Archives, museums and university departments, foundations, professional orders, heirs of authors who have worked in this direction, albeit with specific aims and different methodological approaches According to Antonia Pasqua Recchia of the DGA (Direzione Generale Archivi, MiC, General Direction of Archives), "the activities that make such diverse archives accessible and allow for the reconstruction of an organic documen-

tary fabric on which to base the study of history are very complex and range from the identification of the archives themselves, to their inventorying and digitalization, to the construction of networks and knowledge systems through which to conduct research and cross-reference information and data'' [Recchia 2008, p. 5].

The advent of digital technology, as we know, has opened new and different opportunities for the organization of archival material. On one hand, these possibilities allow the creation of digital copies to be consulted instead of paper copies, thus facilitating their preservation and safeguard; on the other hand, they facilitate remote consultation, making easier the archival research and the possibility of obtaining digital copies of studied materials.

This new scenario, together with the great opportunities and potential that the network offers, presents some critical steps that mainly concern the following three aspects.

The acquisition of drawings

The topic of the acquisition of drawings from the archives is obviously a priority and cannot be dealt with in a unique way, given the delicacy of the supports we are dealing with. Paper of various weights, cardboard, glossy paper, paper glued on canvas supports, tracing paper, are undoubtedly the most common supports for architectural drawings, with different techniques of representation that range from pencil, ink, charcoal, to watercolor or other techniques of color application that, together with the different sizes of the drawings, make it impossible to identify univocal tools and procedures for their acquisition and transformation into digital images.

It is difficult, if not impossible, to use scanners or other acquisition tools that involve contact with the paper support, given the risk of altering its consistency, especially if it is already in a precarious state of preservation, as often happens in the case of ancient or valuable materials preserved in historical archives (e.g. in State Archives).

More and more often, the acquisition techniques used involve the use of a camera and the subsequent three-dimensional processing (photo modeling) of the images to reproduce the 'volumetric' consistency of the support.

An exemplary case is the one related to the exhibition on Leonardo da Vinci's drawings held at the Museum of Palazzo Poggi in Bologna between the end of 2019 and the beginning of 2020; an exhibition in which no original


Fig. 3. Antonio Sant'Elia, 1913. Industrial building with corner tower [Coppa, Mimmo, Minosi 2016, pp. 52, 53].

drawings were exhibited but only five digital elaborations of some of Leonardo's drawings. A ''virtual exhibition, designed as something that wants to illustrate the process to produce and show knowledge, able to account for the entire system of preservation and communication of the original drawing which is absent''' [Ubertini 2019, p. 8]. ''Through ISLe and its faithful reproduction of form, characters and appearance down to the microscopic scale, the exhibition aims to investigate, describe and communicate the drawings, their methods and content'' [Ubertini 2019, p. 8] giving visitors the opportunity to see details of the drawings previously unimaginable [1].

The system of acquisition and reproduction of archival drawings developed by the Alma Mater Studiorum - University of Bologna, reaches in this case the apex of its technical possibilities through the project *ISLe* (*InSight Leonardo*), a digital communicative artifact developed to surrogate, investigate, describe and communicate drawings, their methods of representation and their contents, accurately reproducing their form and appearance. *ISLe* proposes the transposition of drawing into digital form as an interactive three-dimensional photorealistic replica […] proposing a unitary solution to two distinct and complementary issues. The first one is the constitution of archives of drawings that faithfully describe the information of the original physical analytical system […] the second issue is related to the methods for the acquisition and the three-dimensional restitution of drawings, that is

Fig. 4. Ignazio Gardella, 1936. Studies of the front and perspective sketches of the Alessandria anti-tubercular dispensary [Loi 1998, cover image].
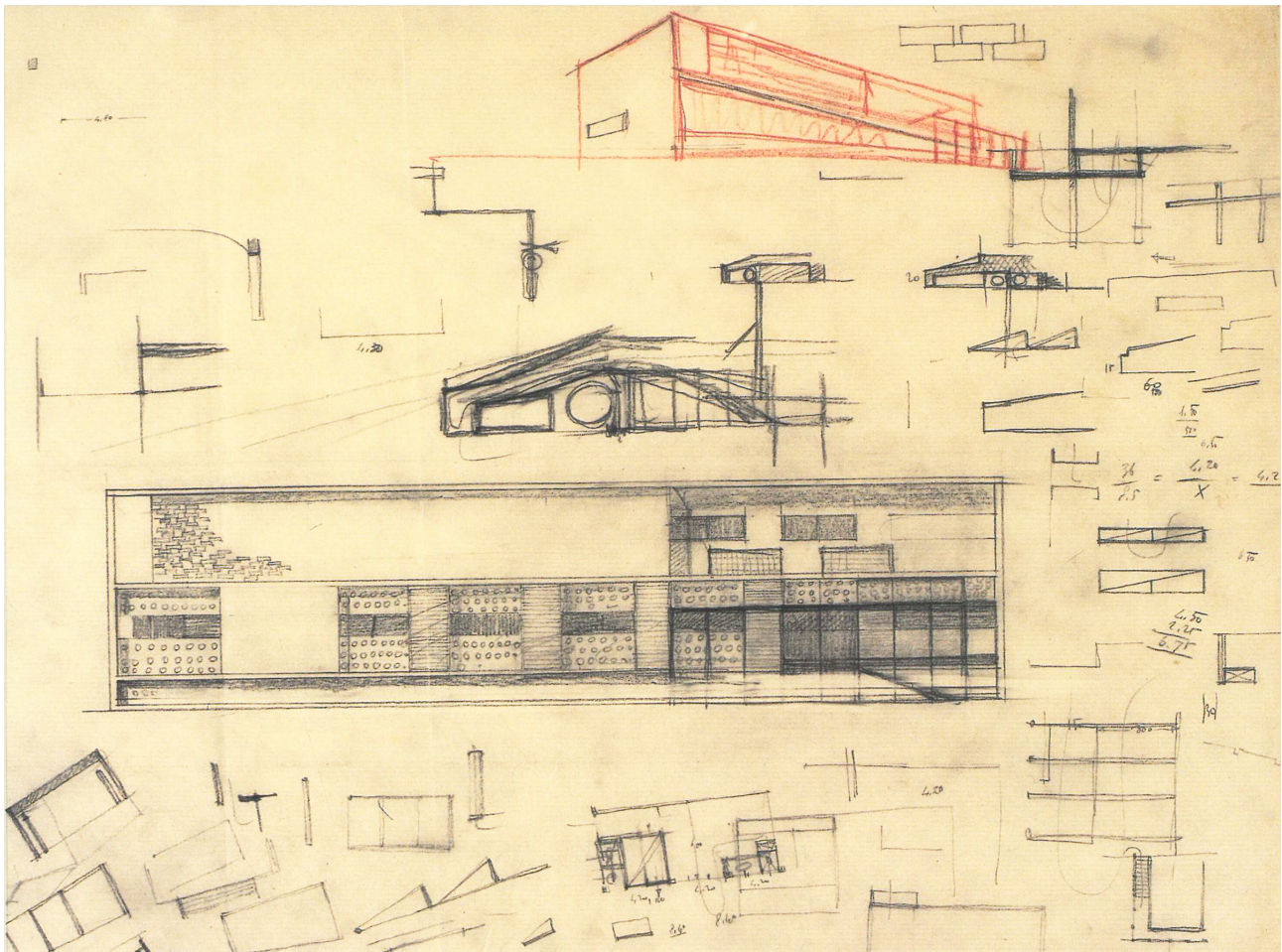
the systems and the techniques that allow to reproduce and show analytically in a perceptive form the three-dimensionality of the graphic sign" [Apollonio et. al. 2019, p. 38] through the use of the grazing light photographic technique and other techniques, such as RTI (*Reflectance Transformation Imaging*), which show the characters of the micro-surface of the supports, restoring their two-dimensional shape and color and allowing the interactive re-illumination from any direction [2].

Beyond virtuous cases like this one, which, given the uniqueness of the materials studied, have seen the development of integrated systems of acquisition and restitution of exceptional refinement and performance capacity, there are many aspects linked to the reproduction of archival materials that scholars know well: the fidelity of the dimensional and formal data, first of all; the resolution of the images that allows us to see beyond what the naked eye sometimes permits; the 'weight' of the images in digital terms, also in relation to the possibility of sharing the material online, through the structuring of special platforms.

Structuring the Digital Archives

Another fundamental aspect concerns the structuring of the digital archives, so that it can be easily consulted and contain all the information which can be useful to scholars. An excellent example is the project on architectural archives, promoted by the DGA (Direzione Generale Archivi, General Direction for Archives): it was launched at the end of the 1990s with the aim of guaranteeing the preservation, knowledge and use of these sources of particular importance for the history of architecture and urban planning, for the reconstruction of the activity of designers and their works and, therefore, of the events related to the transformation of the territory and the built environment, as well as a correct reference for restoration interventions.

Motivations to which is added the equally significant one of preserving the original materials from the particular risks to which they are exposed due to the delicacy of the supports and the value of the works.

The 1999 pilot project [3] implemented by the Soprintendenza archivistica per il Lazio (Archival Superintendence Office of Lazio) was followed in the following years by other Superintendence Offices, with an almost complete coverage of the national territory.

Fig. 5. Pier Luigi Nervi, 1938. Perspective view of the tower of the Acqua e della Luce building, Rome [CSAC Parma, Project Section, Gio Ponti Fund] (photo by the author).
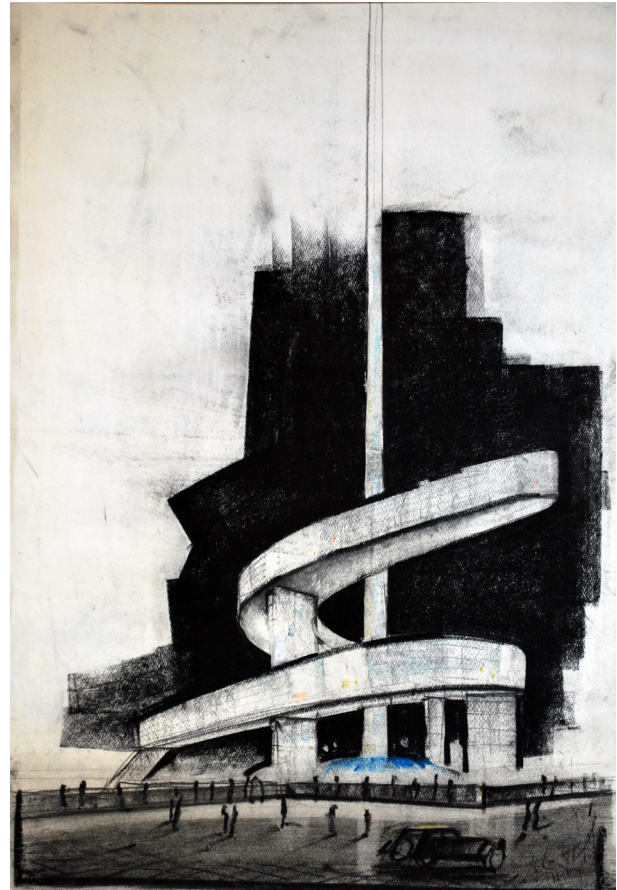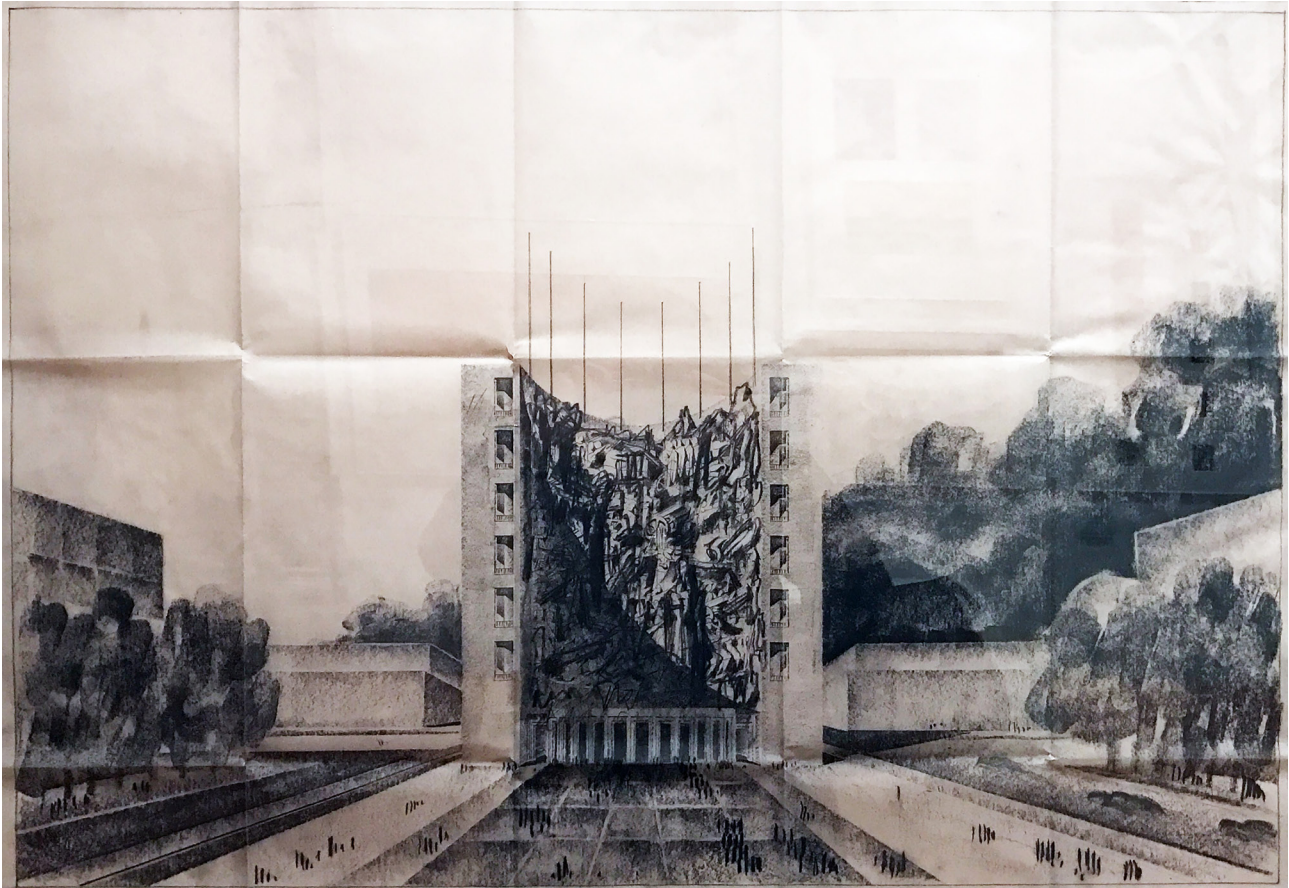
This project includes a series of related interventions; in fact, in accordance with their institutional tasks, in addition to surveying and identifying the archives in the places where they are preserved, Superintendencies activated a series of measures for their protection and valorization, starting with the declaration of historical interest, which gives private archives the status of Cultural Heritage, and followed by reorganization and inventorying (indispensable to make the archival complexes usable), high-fidelity reproduction of graphic works (to allow a better preservation of the originals and a wider use of the images, by inserting them in databases that can also be consulted on the web), restoration of deteriorated documents (particularly complex due to the peculiar characteristics and fragility of the different supports of the drawings); finally, to find places of preservation, in many cases favoring the acquisition by the State Archives. The results of the regional censuses were able to flow into a shared information system within SIUSA (Sistema Informativo Unificato per le Soprintendenze Archivistiche, Unified Information System of the Archival Superintendencies) [4], where a dedicated thematic path was created, which serves as a connection point for the results of the censuses [Sistema Informativo Unificato].

The situation that emerges from SIUSA, where data continues to be inserted, updated and published, clearly shows the results achieved: there are about 800 archives of designers [Archivi degli Architetti], including some of the most famous protagonists of 20th century architecture, such as Achille Castiglioni, Luigi Cosenza, Costantino Dardi, Plinio Marconi, Luigi Moretti, Pier Luigi Nervi, Mario Ridolfi, Giuseppe Samonà, just to name a few. The places of preservation are very diverse: from private individuals to State Archives, cultural institutions (universities, foundations, academies) and professional orders. This confirms the polycentrism of preservation, typical of the Italian situation; a characteristic that makes it even more important to have descriptive systems that allow the retrieval of information and the identification of the archives and sometimes the nuclei of the same archives that are physically divided (such as that of Pier Luigi Nervi's drawings) and give a complete and coherent description.

In 2012, an important step was added, in the context of the increasing attention to the use and valorization by the archival administration, with the creation of the website Archivi degli architetti within the SAN (Sistema Archivistico Nazionale, National Archival System) [Sistema Archivistico Nazionale]; which presents, in addition to the archival resources, various contents (images, editorial texts) that enrich the information potential, even though they cannot exhaust it [5].

In the web-based platform, the reference context is that of the history of Italian architecture in the last two centuries, to be retraced through six sections dedicated to the partners, to the territorial paths, to the protagonists and to the projects they developed in the course of their activity, with a multimedia gallery of images and other digital resources, which allows different search modes.

Obviously, there are many other digital archives referring to single institutions, e.g. MAXXI (Museo delle Arti del XXI secolo) or CSAC (Centro Studi e Archivio della Comunicazione) that allow online consultation of their catalogs and in some cases also offer the possibility of viewing part of the images online.

In all of these web-based platforms, the metadata and the entries in the cards that illustrate the archival material preserved are fundamental. They must be able to transmit precise informations of different kinds; from the precise location of the source, to aspects tied to the supports, formats, and representation techniques used relative to the materials present in the various fonds, up to the contents, the projection methods, the presence or absence of inscriptions, annotations and, finally, the state of preservation.

Preservation of Digital Materials

The issue of preservation of images in digital format constitutes a very delicate point and concerns not only the digital formats into which analogue graphic works have been transformed, but also the digital formats into which the actual graphic works were born. This refers to the drawings of contemporary architects, 'digital natives' who, if on one hand simplified the acquisition phase, cancelling it, on the other hand are also subject to the problem of corruptibility and obsolescence of the supports.

In fact, the preservation of digitally archived materials has long been one of the most challenging problems for the scientific and professional community, both from a theoretical and methodological point of view and in terms of identifying and implementing low-cost, easy-to-adopt solutions. Technological obsolescence is the main reason, though not the only one, for this difficulty.

Fig. 7. Pier Luigi Nervi, 1952. Manifattura Tabacchi Bologna - Barrel storage sheds and mixing workshop[CSAC Parma, Project Section, Pier Luigi Nervi Fund] (photo by the author).

Fig. 8. Pier Luigi Nervi, 1960. George Washington Bridge - Bus Passenger, New York. Perspective view [CSAC Parma, Project Section, Pier Luigi Nervi Fund] (photo by the author).

Fig. 9. Pier Luigi Nervi, 1961. Field House Dartmouth College, New Hampshire. Perspective view [CSAC Parma, Project Section, Pier Luigi Nervi Fund] (photo by the author).
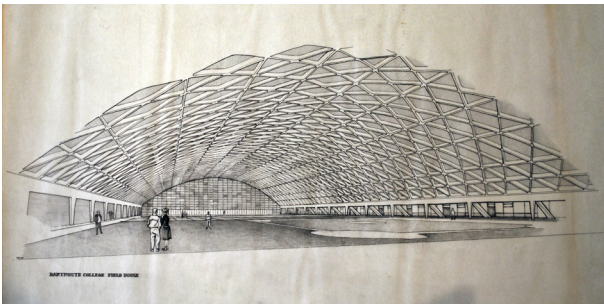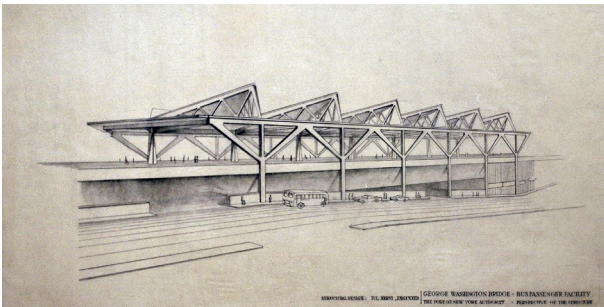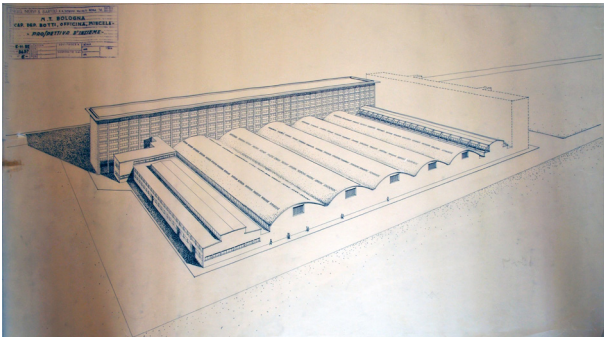
Unlike what happens with analogical documentary sources, for which the passage of time determines, in the absence of pathological situations, the dual effect of increasing the value of the resource, which remains unchanged over time, and of ensuring the conditions for verifying its authenticity (e.g., by analyzing the support, the materials, and the data), the obsolescence of technology is the main reason, analyzing the support, the writing materials, the structure of the graphic document, the typology of the annotations), the management and the keeping of digital documents must face a continuous, unstoppable and inevitable process of technological transformation, which neither organizations nor individuals are able to escape without jeopardizing, on the one hand, the accessibility of the contents over time and, on the other, the guarantees of integrity of the sources themselves.

The complexity of the problem has long been clear to experts, but only a few years ago some international research initiatives have been launched that are able to ensure the amount of financial resources and, above all, the continuity over time of the work programs necessary to obtain significant results. The fragility of the media, the ease of manipulation, and the frequency and relevance of technological changes have also highlighted, especially in recent years, the essential need to create repositories/archives capable of ensuring a high level of reliability and security.

Digital preservation is a dynamic process that, as mentioned, requires a continuous monitoring of experimentation and research activities and, above all, requires substantial investments. The manipulation (in terms of reworking) of the information content of an archival document is a positive investment, if it saves repetitive consultation and sometimes even dangerous photocopying activities.

The fragility of the media, as already pointed out, is a risk factor especially in terms of security, while the incessant evolution of digital formats has challenging consequences. In order for computer archives to be preserved, it is indispensable that two substantially conflicting needs are reconciled: authenticity (which consists mainly in the activities of certain identification and guarantee of the integrity of the documents and their relationships) and the general and long-term accessibility of the document systems, made possible by the use of technological and organizational solutions that allow the overcoming of obsolescence problems. In essence, the preservation function is increasingly configured as an articulated and dynamic complex of activities, tools, procedures that, with the aim of ensuring the conditions for the survival of digital materials, require

clear principles and a regulatory framework of reference. In an interview by Lucia Bosso [Bosso 2022], Kristin Fallon, an expert in the use of digital tools for the archiving of digitally edited design documentation, also emphasizes the urgency of managing the multiplicity of digital formats that are used in the production of images in contemporary design, which leads to the creation of digital documents that make up the archives of today's architects, some of which can already be consulted online [6].

The creation of these online archives necessarily poses a question, well emphasized by Fallon [Bosso 2022]: that of choice, linked to the organization and management of digital documentation, in order to regulate the creation, management and preservation of digital data, thanks to prescriptions to be applied at the very moment of data creation and throughout the entire design process.

Conclusions

The creation of digital archives of architectural drawings is now a widespread practice and is made necessary by several factors, as explained in the preceding paragraphs. Depending on the materials in question, it is not easy to define a structure for the information useful to bypass the need to consult the native formats of the archival materials, which are always a precious source of information and emotions that only the physical and visual contact with the original can transmit.

For those who work in the field of architectural representation, the possibility of consulting historical and project archives is fundamental. It is also fundamental to be able to find one's way through the institutions [7] that collect and catalogue material and its location in an attempt to systematize information and make it easier, if not direct online consultation, to find locations and sources to consult, in the construction of a 'catalog of catalogs' that recalls that of the Library of Babel of Borgesian memory [Borges 2003, pp. 67-76].

As Dante Giacosa said, "creativity is the soul of the project and is expressed in drawing, an irreplaceable means of expression, the first and greatest help in the eyes of the designer. Designers must be aware and proud, verbal description is not enough, in technology. Drawing is necessary; redoing it several times, perfecting it. [...] *drawing stimulates the imagination and helps the fantasy*" [quoted by Koenig 1983, p. 61].

Fig. 10. Pier Luigi Nervi, 1961. Unesco headquarters, Paris - preliminary studies for the 4th building of the Unesco headquarters - central pillar [CSAC Parma, Project Section, Pier Luigi Nervi Fund] (photo by the author).

Fig. 11. Pier Luigi Nervi, 1964. Papal Audience Hall - Vatican City. Studies for the Pilgrims' Hall - floor variant for the throne area [CSAC Parma, Project Section, Pier Luigi Nervi Fund] (photo by the author).

Fig. 12. Pier Luigi Nervi, 1971. Papal Audience Hall - Vatican City. Vatican Hall - Elliptical staircase railing - knots [CSAC Parma, Project Section, Pier Luigi Nervi Fund] (photo by the author).
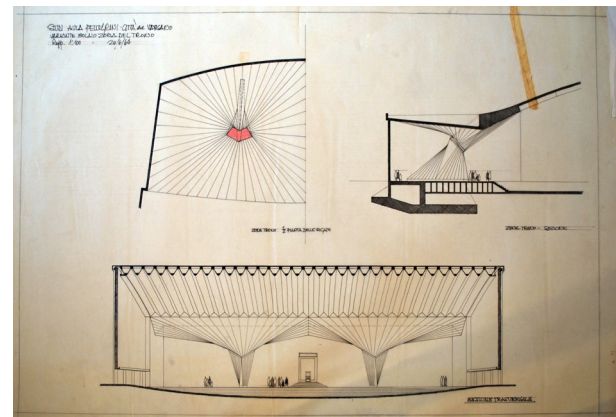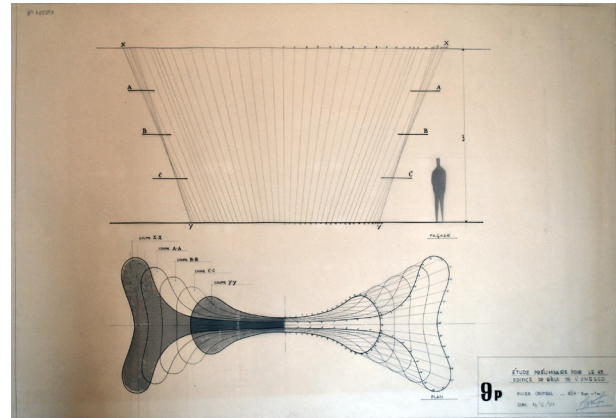
The boundless historical, modern and contemporary iconographic patrimony related to architectural design is a fundamental element of the training and continuous growth of those who, for work or passion, work in the field of architecture and, in particular, architectural representation. For this reason, the archives that collect these materials play a fundamental role and must be structured in such a way as to be widely accessible and usable. This is possible only through the definition of an adequate process of acquisition of the materials and a correct structuring of the informative data on them and on the appropriate preservation strategies, both for analog and digital material.
Beyond the examples of institutions that, due to their role and mission, deal with this, there are many interesting examples of the creation of archives based on architectural drawings and structured according to specific logics, linked to the peculiarities of the materials collected.
One of these archives is certainly the one created by the UID (Unione Italiana per il Disegno) Archival Commis-sion, *Drawing in the Archives of Architecture* [9], whose objective is to communicate, through the research carried out by professors and researchers of the disciplinary area, the contribution that graphic analysis and representation, both traditional and digital, can provide on the theme of the Archives of Architecture, Engineering and Design and on the iconographic materials they contain. This database aims to offer new interpretations through graphic contributions, analyses and digital reconfigurations that, starting from traditional project drawings, allow traditional graphic analyses and three-dimensional explorations that go beyond the limits of the sheet, providing a more dynamic and interactive use of the original materials kept in the archives and exemplifying, through the collection of a series of disciplinary researches carried out on these materials, the wealth of analyses and in-depth research ideas that can be developed through the study and knowledge of the architectural drawings kept and preserved in the Archives.

Notes

[1] *ISLe: InSight Leonardo.*

[2] For a detailed description of the process, see Apollonio et. al. 2019, pp. 31-51.

[3] Again in 1999, the proceedings of the international conference organized by the Ufficio centrale per i beni archivistici (Central Office for Archival Assets) and held in Reggio Emilia in October 1993, *Archives for the History of Architecture*, were published. Many archivists and architects who studied the history of architecture and conservation participated in the conference, providing a broad picture of the documentary sources and preservation institutions.

[4] Such a far-reaching project has found support in several agreements signed by the Direzione generale per gli Archivi (General Directorate for Archives) with the Direzione generale per l'architettura e l'arte contemporanee (General Directorate for Architecture and Contemporary Art) for the drafting of a national plan for the protection of the Documentary Heritage for 20th century architecture (2001), with the Mendrisio Academy of Italian Switzerland (2002, renewed in 2012), with the MAXXI Foundation (2012), with the DG ABAP (Direzione Generale Archeologia, Belle Arti e Paesaggio) and the AAA/Italia (Associazione nazionale Archivi di Architettura, National Association of Architecture Archives, 2013).

[5] Dr. Elisabetta Reale, current Director of the Istituto Centrale degli Archivi (Central Institute of Archives), spoke in depth about SAN and the entire system of architectural archives in her talk entitled *Gli archivi di architettura nei sistemi archivistici nazionali: dal censimento alla valorizzazione* (Architectural archives in the national archival systems: from census to valorization), held on February 9th, 2022 within the review *Gli archivi di architettura nel XXI secolo. I luoghi delle idee e delle testimonianze*, curated by Laura Farroni, Michele Beccu and Marta Faienza (Roma Tre University).

[6] See, for example, the website of the Fondazione Renzo Piano (Renzo Piano Foundation) [Fondazione Renzo Piano].

[7] See, for example, the activity of the AAA ITALIA (Associazione nazionale Archivi dell'Architettura, Association of Architecture Archives) [Associazione nazionale Archivi dell'Architettura].

[8] Current composition oif the UID (Unione Italiana per il Disegno) Archives Commission: Caterina Palestini (Coordinator), Piero Albisinni, Emanuela Chiavoni, Laura Farroni, Cinzia Garofalo, Francesco Maggio, Chiara Vernizzi, Marco Vitali.

[9] <https://www.unioneitalianadisegno.it/wp/archivi/> (accessed 27 January 2022).

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