The future of the past: values and transformations of a public modern building. The Genoa fish market.

Francesca Segantin[1], Roberto Babbetto[1,2]

1 Ph.D. Student in Conservation of Architectural Heritage, Politecnico of Milano, Italy
2 DSA, Scuola Politecnica, Genoa, Italy

e-mail: francesca.segantin@polimi.it
e-mail: roberto.babbetto@libero.it

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The paper explains a possible methodology finalized to an appropriate conservation process applied to one of the first rationalist building in Genoa: the "fish market".
Designed in 1933 by the technicians of the Office of Public Works of Genoa, the building represents a case of Genoese modern architecture and a witness of the role of the Municipality in the architectural renewal of the city, since it was built during the transition period from the consolidate use of the historicist styles to the adoption of the modern rationalist standards. Assuming that the current configuration of the building is the result of many transformations occurred, between the Fifties and the Seventies, due to functional causes and urban transformations, the fish market, by the time, also became a testimony of the evolution of the Modern city.
All these historical and architectural values are, nowadays, at risk of disappearing, due to the decision of the Municipality to build a new fish market in a different location. To save the building from a possible abandonment, a strategy of re-use is thus required, based on a deep knowledge of its layered history, current consistency and state of conservation. Such a strategy should pay attention not only to the future developments, but also to the management of the building in the period that separates us from the future interventions. In fact, as often happens, due to the lack of maintenance activities and to different problems that are delaying a plan of re-use of the building, every day the conservation state of the fish market increasingly worsens. Taking advantage from the most recent digital tools applied to heritage conservation practices, the paper illustrates an attempt to create an instrument that allows the documentation of the past configurations of the building, as well as its continually evolving consistency and state of conservation. Furthermore, as a planning instrument, it could support the planning of maintenance activities and the management of future developments.

1. INTRODUCTION

Genoa's fish market is one of the first Rationalist building realized in Genoa still surviving today[1] (Fig.1). It was designed in 1933, according to the new Modernist canons and technical requirements, to be the only market for the wholesale and retail of seafood. Despite retaining its original function until today, the building is now partially defunct and is in an advanced state of decay. Nowadays, since the current structure is considered no longer adequate, the fish market is also at risk of abandonment, due to the Municipality's decision to move the fish wholesale trade from its historical site, in the central Piazza Cavour, to the outskirts of Genoa.
Although Genoa's fish market, since 2000[2], is protected according to the Italian Code of Cultural Heritage and Landscape, its continually worsening condition, and the eventuality of its complete abandonment open complex scenes concerning not only the possible loss of the unique values of a single building but – in a broader perspective – the future developments an important part of the city; in effect the strict relationship between the fish market and the part of the city of which the building represented a fundamental part, is amply testified by the different modifications and adaptations that it has suffered starting from the early Fifties, in the period characterized by operations of "radical and violent replacement"[3].

The different actions necessary to ensure the preservation of the fish market, with all its material signs and immaterial values, has thus to face complex challenges. In fact, while a strategy of re-use is required, the identification of possible future uses compatible with the historical values and architectural characters of the building has to deal with the specific morphological and organizational features of the existing spaces and structures. Also the conservation of the specific and characterizing materials of the building – as often happens in the case of the XXth century architectural heritage – has to face with structures made of experimental details and new materials mostly unknown in their behavior and capacity for decay. Since these are – together with a prolonged lack of maintenance – the main reasons for their fragility and short durability, the material conservation purposes have thus to find a balance with inevitable modifications and alteration to an (often supposed) original design[4] of the elements, in order to ensure their effective conservation.
Furthermore, other challenges are emerging from the "growing recognition of the global (systemic) and not occasional nature of any intervention"[5], a perspective that requires a systematic approach able in dealing with both the building and the 'system' – of goods, values, resources, etc. – of which it is part. Some of these challenges concern:

- The building in its complex relationship with (and possible role within) its urban context;
- The efforts in both retaining historic building and to ensuring its adaptation to technical regulations and requirements in terms of energy performances, safe use against the risks of fire or of earthquake, and so on;
- The risk assessments associated with the building complexity, since the forward-looking

[1] From the end of the Fifties until now, most part of the Genoa Rationalist heritage has been lost, due to demolitions, changes and abandonment, tied to several cultural and functional reasons: the second post war city's development and urban transformations, the critical judgment about the fascist era and architecture, and the lack of specific conservation law about this heritage.

[2] The declaration of cultural interest of 2000, according to the D.L.gs. n. 490/99, has been issued because it is a significant example of Rationalist architecture of the Thirties.

[3] Musso 2014.

[4] Musso, G. Franco 2015.

[5] Musso 2011.

identification and control of risks throughout the life of a building is emerging as one of the most important activities aimed at reducing possible irreplaceable losses;
- A possible sustainability of the recovery processes not "reduced to the mere technical sphere of energy saving or the application of new technical disposals"[6], but intended – in a larger perspective – in its complex relationship with economics, environmental, social and cultural issues.

For all these reasons, the identification of a complex and long-term strategy, aimed at maximizing the permanencies and manage all the inevitable transformations[7] compatible with the historic and architectural values of a building, seems to require the 'design' of an effective and prolonged path of knowledge. In fact, all the values and meanings stratified upon the building, and the continually evolving processes of decay that affect its consistency, require a continuous interrogation of the building, not confined to the early stages of preliminary investigations, but prolonged throughout the design stages and management of the building after the interventions.

On the other hand, even if not sufficient, the availability of an in-depth and interdisciplinary knowledge able in dealing with the complex and continually evolving reality of the building represent a necessary "first step in finding the right conservation strategy"[8] and require specific tools able in easing an effective management of the large amount of mutable information, the direct and continuous cross-comparison of information of diverse origin and nature referred to a same element and the evaluation of the impact (and consequences) of proposed interventions.

2. GENOA FISH MARKET AND ITS ARCHITECTURAL AND HISTORICAL VALUES

Genoa's fish market was designed by technicians of the Genoese Office of Public Works[9] in 1933[10], and represents one of the first and most significant examples of public Rationalist architecture in the city (Fig. 2). The fish market relevance concerns both its architectural language, that satisfies the Genoese first rationalism canons, both its construction history, which describes the Municipality's role in the architectural renewal of the city, started in 1926, with the creation of the "Great Genoa"[11].
Starting from the 1930's, public buildings, in fact, were designed according to the Modern architectural canons and requirements, representing the official fascist culture, in order to realize the Rationalist *facies of the* city.
New public buildings such as markets, schools, sports facilities and institutional buildings, represented, thus, the first example of Modern architecture in the city[12], unlike the most part

[6] Franco 2014.
[7] Musso 2011.
[8] Clark 2007.
[9] Genova 1933.
[10] The real fish market's designer is still unknown. The project has no signature, but generally the building design is referred to Mario Braccialini, chief engineer of Public Works Office of Genoa's Municipality, who was the project manager.
[11] In 1926, by will of the fascist govern, the Royal Decree of 3 January, defined the annexation to the city of Genoa of nineteen municipalities gravitating around the city, creating the actual city, the so called "Great Genoa". Starting from that year, Genoa passed from a surface about three thousand hectares to nearly twenty thousand, and its population grew from 304,000 to approximately 541,500 inhabitants. The new administrative boundaries made necessary a series of major public works that led to a substantial change in the city layout, in order of location production activities, the definition of a new network infrastructure, to meet growing demand for housing and renewal of its central areas, according to the needs of self celebration of the regime.
[12] Among the first public Genoese rationalism works, along with the new fish market, can be mentioned the Market of Pegli (1933), the Student House (1934), the flower market (built in 1934 and demolished in 1987 to the end of the realization of the

of the private buildings, that continued to be constructed, until the post World War II period, as stated by the traditional *Novecento* stiles canons[13].
Within the city's architectural contest, the fish market represented one of the building symbol of the transition from a historicist to a modernist architectural language, with its articulated volume composition, the presence of shelters strongly jutting and large glazed areas[14].
Another innovative aspect of the fish market arose from the designer's choice to abandon the typical architectural features of the covered markets of late Nineteenth and early Twentieth century, often characterized by the use of iron and glass structures, adopting a new innovative language for a market place, usually used in other kind of public buildings.
At the time of its inauguration, in 1935, the city celebrated the fish market as an example of "real and inspired modern architecture"[15] for its new architectural features, use of materials, and the close relationship between its form and function (Fig.3).
It was an imposing building characterized by an asymmetrical volume composition of rectangular and cylindrical blocs, result of the interior spaces articulation, arranged around the monumental radial entrance to the retail market (Fig.4). The modernity of the building was also defined by the presence of large metallic windows and glazed areas (in order to respect hygienic, lighting, ventilation, and aesthetic modern canons), the use of streamlined awnings over the entrances and new modern materials, used for coating the interior spaces and the outer facades. The inner space of the market sale rooms was mainly coated with ceramic mosaic tiled, while the facades were covered with special bricks Clinker and the decorative parts were upholster with thin stone slabs of Pietra rosa of Finale.
In the four floor of the building (including one underground), the inner spaces were organized in order to rationalize the functions related to the wholesale and retail of goods: at the basement were located the refrigerators cells and the warehouses, at the ground floor the wholesale and retail market and a cash office; at the first floor the offices and a big terrace dedicated to the drying of the fish baskets; and at the fourth floor the guardian house. Other modern elements were defined by the presence of many innovative machinery as goods lift and refrigerator systems.

After having survived the II Word War bombing, the fish market sustained many changes in postwar Genoa, especially in the period between the 1950's and 1990's. Starting from the 1950's, the architecture of the fish market, both internal and external, has been altered by interventions of varying degree, changing its original physical appearance. The most important change occurred because of the construction of the elevated road between 1962 and 1965: this freeway linked the eastern and western parts of the city centre, connecting the city to one of the most important highway exits, allowing traffic to traverse the city centre much more rapidly. This important infrastructure which today represents also a modern architectural monument, caused not only the demolition of part of the fish market, but also the loss of its original role in the urban life of the city. In fact, the elevated road's proximity to the fish market, contributed to isolate the building from its urban context.

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two bodies under the administrative center of the Court Lambruschini) and the swimming pool of the Albaro district(1934).
[13] Cevini 1989.
[14] Segantin, Cafferata, Moggia 2014.
[15] Marchisio 1935.

3. GENOA FISH MARKET TODAY: WHAT NEXT?

Despite all the modifications that occurred to the building over time, the fish market still preserves many architectural elements and characteristics that make it a real legacy of the first Genoa Rationalism: the main entrance of the market emphasized by the use of a radial septa structure, the presence of the original steel windows and part of the special bricks Clinker facade covering, are only few examples. The building also shows a lot of sings of alteration occurred over time, as the modification of the original internal distribution of the wholesale and retail space, the removal of the mosaics and ceramic tiles covering, and the demolition of a part of the external volumes, including the big distribution staircase (Fig. 6-7).
Nowadays, the location of the building in a very congested area separated from the historical center by two main roads, its advanced state of decay and the uncertainty about its possible future consistent utilization, poses complex challenges. Moreover, while problems of diverse nature prevent the drawing of a clear future for the building, every day its conservation state worsens and it is thus necessary to govern its life in the period of time that will separate us from its future utilization, minimizing losses and preserving its values and potential (Fig. 8-9).

The 'design' of an effective path of knowledge which could provide a deep understanding of the building in its layered history, real consistency and state of conservation, started with an extensive and coordinated series of investigations consisting of:

- The description of the morphologies, extensions and spaces layout which characterizes the building;
- An architectural survey campaign based on the integrated use of the different techniques of longimetric, topographic and photogrammetric nature;
- A series of historical inquiries, grounded on studies on indirect archive sources combined with the study of building itself as direct source of its material history, in order to outline the history of its complex history;
- A series of direct analysis on the different materials, components and constructive techniques, aimed at the evaluation of their consistency, state of deterioration/conservation and behavior over time.

On the other hand, beyond the importance of the individual results, a useful path of knowledge should be based on the possibility in cross-link and compare the great amount of information of diverse nature acquired within the listed research activities, avoiding the fragmentation and dispersion of information that often affect the process. Furthermore, equally important is (especially in the case of process of alteration and decay) the possibility in updating the information and integrate them with the already existing ones. All these goals, on the other hand, requires the availability of tools which allow a continuous and dynamic 'management' of information associated to a building throughout the entire decision-making process,

In recent years, many innovative tools have emerged, aimed at storing and organizing information in order to broaden the understanding and safeguard of the built heritage[16]. The most innovative ones, in particular, are based on the use of well-structured centralized repositories that allow to collect, compare and share in an effective and coherent way this wide variety of information, also supporting their coordinated updating. Among all this tools, Building Information Modeling (BIM) shows the combined use of the a 3D digital model and a

[16] Santana Quintero, Addison 2008

database, thus allowing connecting the shape of the 3D digital 'objects' with diverse thematic information referring not only to their visible surfaces, but also to their materials, methods of construction, also enabling their continuous updating.

Since BIM was originally intended for new architectures and industrialized building systems, its application in the field of preservation of built heritage faces many difficulties. In fact, the BIM tools currently available need to be adapted to meet the theoretical, cultural and technical needs for preserving existing building in their complex dimensional and constructive characteristics and evolution over time, avoiding excessive simplifications and data reductions.
Due to its capability in supporting a centralized, dynamic and coordinated management of information over time, a BIM model able in favoring the creation of a useful path of knowledge for the preservation of the fish market should allow to:

- Cross-link and compare information[17] emerging from the different inquires (i.e. the results of the chemical and mechanical analysis on materials with those emerging from archival sources) and establish their respective relationships;
- Manage time, that means record the historical evolution of the building and its parts, documenting both the major modifications (demolitions, new constrcutions, mutable uses) that led to its current configuration and the 'silent' transformations[18] that affected its materiality. The awareness of the historicised condition of the buildings (and that of the schemes we usually use to better understand them), the way they developed over time and how they have been maintained is, on the other hand, fundamental for a deeper understanding of their complex behavior[19];
- Record the variations of information over time, which is a fundamental task for the better understanding of some processes affecting the building that, for their dynamic nature, require a time-delayed monitoring of their evolution, rather than the description of their appearance in a very confined range of time.

On the other hand, the contribution of BIM methodology does not end in a better organization and visualization of the past and current configurations of a building, but can continues over time providing a living documentation that responds to changes and maintains an updated record of events in a building's life. In fact, the possibility in managing diverse information and their spatial and temporal variability[20], allows the storage and retrieving of information emerging (and produced) also during the planning stages and the maintenance activities performed after the interventions. During the planning stages, the achievement of progressive levels of understanding and of critical synthesis allowed by a BIM model could be accompanied by the possibility in performing diverse analysis, simulation and comparison of different possible 'actions', also predicting possible risks and problems. During the maintenance activities, on the other hand, the BIM model could represent the basis to which to anchor the continuous updating of data derived from monitoring activities, periodical inspections and so on.

[17] Grimoldi 2001.
[18] Jullien 2010.
[19] Benvenuto 1988.
[20] Knowles, Hillier 2008.

4. TOWARDS a BIM FOR THE GENOA'S FISH MARKET.

The construction of the BIM model of the fish market started with the creation of a 3D digital model able in describing the geometric characteristics of the building and its parts. The metric reliability of the model was assured by the possibility in importing and using in the BIM platform adopted – Autodesk Revit© – the diverse 'packages' of geometric data acquired during the survey campaign (Fig.9). The integrated use of longimetric, topographic and photogrammetric techniques adopted for the geometric survey, in fact, provided a series of consistent and geo-referenced data that, once imported in the modeling environment, allowed the easy modelling of the components of the building. On the other hand, the possibility in modeling 'intelligent objects', semantically and parametrically defined as components of the construction (windows, doors, walls, roofs, etc.), gave the possibility in moving beyond the mere graphic and static description of this components, to reconstruct their behavior, their relationships to the whole building and their interactions with other elements. Furthermore, the use of the database allowed incorporating the different information emerging from the diverse research activities, referring them to their respective objects.
As results, each 'object' of the BIM model incorporates, in an integrated way, a large amount of qualitative and quantitative information fastened to its three-dimensionality and organized in object's attributes (Fig.10-11). The information concern:

- The physical and mechanical characteristics of the materials;
- Manufacturers, as emerged from the archival sources (that in many cases were incorporated as digital images);
- The textual description of the constructive characteristics of each component as emerged from the combination of indirect sources (shop drawings made during construction, construction manuals, etc.) and on-site investigations;
- The current configuration and state of conservation of the components, documented through a series of specific photos;
- A series of textual and graphical information concerning the decay processes that affect the diverse components.
- A specific chronological attribute (i.e. 'year of construction', 'year of demolition', etc.) for every component, deduced from historical sources (reports, archival drawings, etc.).

Thanks to the listed multi-dimensional characteristics, the BIM model of the fish market allowed documenting through a single repository all the different configurations and the modifications – from major renovations to smaller maintenance repairs – that characterized the building over time, also creating a visual chronology that supplements the traditional photographs, thematic maps and written narratives (Fig.12).

The possible advantages in using BIM to organize a useful path of knowledge for the preservation of the fish market, on the other hand, do not end with the possibility in retrieving and cross-comparing diverse stored information referring to the same object, but also include many possibilities in creating new information and perform complex interrogations. From the BIM model of the building, in fact, it was possible to extract new information (areas, volumes, glazing surfaces, glass/floor area ratio, quantities of the different components as windows, columns, etc.) and combine them with the existing ones in order to perform:

- Evaluations fundamental for making informed decisions, such as the evaluation of energy performance (Fig. 13), analysis of spaces to identify possible uses, etc.
- Simulations useful to compare multiple design options or to detect possible clashes and conflicts that could emerge on the construction site or after the interventions.

In a BIM model the different information, once stored in the centralized database, can be organized to produce multiple forms of graphical, numerical and textual outputs depending from del central repository. Due to this characteristic, when an information is added or manipulated in a view, all the associated drawings and views change as well, maintaining the consistency of information.
Such a characteristic, combined with the capability of BIM in managing the variability of information over time, is fundamental to expand the possibilities in managing information beyond the preliminary and design stages, to the construction site and the management of the building after the intervention. In the case of the fish market, in fact, the possibility in 'managing time' using a single repository will allow the possibility in keeping track not only of the past modifications, but also of the future interventions, also providing "the basis for monitoring, management, and routine maintenance of a site, as well as a record for posterity" [21]. Furthermore, since the different activities performed during the construction site and the maintenance of a building require the availability of specific records, from the BIM model of the fish marked a great variety of digital documents were extracted, consisting of some traditional orthographic projections (plans, cut sections, details etc.) and a series of specific schedules and reports useful for the contracting procedures, management of the construction site, periodical inspection or monitoring, and so on (Fig. 14).
As results, during the construction site and the management of the building after the interventions, every information could be stored and integrated with the existing ones through the most appropriate record, referred to a specific 'object' and characterized in its chronological attributes. Once such information will be stored in the most appropriate view, all the associated documentation will be automatically updated.
On the other hand, one of the most important contribution that BIM could offer to a path of knowledge useful for the preservation of existing building maybe resides, beyond its technical aspects, in "the essence of Information Modelling, [that] lies in the methods of evolution of the information content" through the life of a building[22].

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