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Olivetti factory in São Paulo in 1992 © Arquivo Histórico Municipal Araci Borges Dias Martins, Guarulhos. Tombo-27670.

The Olivetti of Zanuso among project, process, and product

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Abstract: During the years of post-war reconstruction in Italy, the project represented an instrument of revenge on the ruins inherited from the war and industry seemed to be the answer to the needs of a society that was rebuilding itself. The bond between project and industry thus spreads to all sectors of artistic production and the common thread is the use of words borrowed from the world of industry, thus raising the phenomenon of industrialisation.

Olivetti's experience is placed in this scenario, characterised by his interest beyond the factory, aimed at architectural, urban planning, cultural, publishing, and political issues. The Olivetti ideal focuses on aspects ranging from the typewriter to the city. The best architects work for Olivetti, and among them is Marco Zanuso. The factory is the *topos* of the project, in which theories of building industrialisation are synthesised. Zanuso experiments with the material's potential to address issues related to the factory; in the reinforced concrete, he discovers the possibility of rationalising the composition process. Thus, the structure finds the perfect balance between technique and expressive language, generating space, light, form, and function. The beam-pillar system, an ideal synthesis of the architecture for Olivetti in Argentina and Brazil, discloses the capacity to conceive space as a single entity, in which the recognisability of the construction system becomes the identifying key of the factory itself.

Keywords: Olivetti, Zanuso, Brazil, industrial heritage, modern architecture.

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1. Introduction

During the post-war reconstruction years in Italy, the project seemed to represent the unique instrument of revenge on the ruins inherited from the Second World War. At the same time, the industry appeared to provide the solution to the needs of a society that had to rebuild itself. The combination between design and industry spread to all sectors of artistic production, and the common denominator was the use of words borrowed from the world of industry - model, series, components, standardisation, reproducibility - thus generating the phenomenon of industrialisation, or 'generalised phenomenon' as Marco Zanuso defines it. Indeed, the construction process of prefabrication answers the urgency of reconstruction and the recovery of the housing deficit. Even after the First World War, the protagonists of the Rationalism culture trusted in an industrial system that could replace craftsmanship. They were able to mass-produce technological elements to reduce time and costs. However, while prefabrication is used for housing construction, the occasion to experiment and apply new construction methods and processes is found in industrial buildings. Freed from the restrictions imposed by the civic building, the designer is called to conceive a working environment in which flexibility and speed of execution can be ensured. The material of choice for these experiments proves to be reinforced concrete used in different techniques and combined in new mutations. These include prestressing linked to prefabrication to create structural elements prestressed before assembly with other features. Although prestressed reinforced concrete found its first promoter in Gustavo Colonnetti, figures such as Riccardo Morandi, Silvano Zorzi and Franco Levi were the ones who experimented with using it. (Iori, 2017: 240-41) Significant contributions also came from the collaboration of structural engineers and architects, made possible by industrial patronage. Among these architects is Marco Zanuso; the factory is for him the "favourite theme [...] on which he moves at ease and the occasion of the theme is rarely accidental: there he recognises the heart of modern society"[1] (Gregotti, 1957: 59-60). Zanuso transcends the design scale and experiments transversally with forms and elements in design and architecture, seeking continuity between the professions of designer, architect, and urban planner, characterised by the scale of intervention and conjugated by the act of designing.

Research in the field of elasticity leads the architect to experiment with the potential of reinforced concrete, recognising in it the possibility of rationalising components, limited to a few models, to create a load-bearing structure immediately recognisable in its section. In this way, the image of the factory is that of a concrete system, not an abstract construction, the result of a priori compositional research external to the process itself.

Factories, a representation of progress and modernity, are historically not only a place of work and production but also of aggregation, political struggle, and both public and private life. The building type is thus modified in the formal structure setting, and the factory also assumes the unusual role of a modifying element of the urban fabric; the structure manifests both the link with man, the worker and the nature of the factory itself. The post-war society was profoundly different from the one before the Second World War: the entire system of values linked to the world of work had to be renewed. In this scenario, Adriano Olivetti played a fundamental role not only in defining a factory model capable of taking on social issues and not only productive ones. He achieved this through a paradigm shift that saw in man - and not in the product or machines - the heart of the factory and thus pursued the civil evolution of the working class; but also in the theorisation of the need to aesthetically express - through a symbiosis between design and architecture - this social vision.

2. The client, the architect, the factory

Concerning the broader theme of the transition from Modernism to Postmodernism in architecture, the role played by Zanuso in the evolution of the relationship between architecture and industrialisation should be highlighted. While previous studies on Zanuso have dealt with his architectural works and industrial design objects within his production, this contribution intends to reconstruct their reciprocal influence alongside that between industry and project, between architect and client. These observations become even more significant considering the sequence - not only in time - in which the three factories of Merlo (Buenos Aires), Guarulhos (São Paulo) and Scarmagno (Ivrea) were built for Olivetti.

In this respect, the figure of Adriano Olivetti is emblematic precisely in the determination of a civil and symbolic value, which triggers a non-conformist vision of the factory's architecture as a place not only necessary for production but a synthesis of human virtue and the binomial Man - Nature. The factory conceived in this way also acquires an urban value in its being a form within a well-defined natural space, a complex artefact dominated by internal forces bearing meanings and forms that go beyond itself. The factory model conceived by Olivetti must incorporate the surrounding landscape and contribute to creating a new one. According to Crespi (1999), Olivetti's ideal of societal reform fits almost naturally with Zanuso's 'peculiar humanism', and the factory constitutes for



Figure 1 | Olivetti factory under construction. São Paulo, aerial photograph, 1959 - © Masami Kishi, Arquivo Histórico Municipal Araci Borges Dias Martins, Guarulhos. Tombo-3009.



Figure 2 | Olivetti factory on the left and Philips factory on the right under construction. São Paulo, aerial photograph, 1959 - © Masami Kishi, Arquivo Histórico Municipal Araci Borges Dias Martins, Guarulhos. Tombo-3010.

him the "*topos* of the contemporary technical environment" (Porta, 1982: 636), which leads him to approach Olivetti's vision of the industry, so full of anthropological underlining of the workplace, grasping all its functional, productive, technological and sociological complexity.

A factory is a machine within which all the shades of the production process penetrate and relate to each other within the variables of time and space. In designing the Argentine factory together, the two protagonists, the architect and the client, imagined the future factory (Grignolo, 2013).

The *modus operandi* of Zanuso finds full manifestation in the industrial architecture of the Olivetti client through experimentation with the synergic integration of components. In designing industrial architecture, he perceives technological and functional constraints that speak the same language as his mental *habitus,* allowing him to implement the mechanisms of integration between technique and supporting structure. 'Supporting' and 'supported' are the most significant aspects of tectonics that Zanuso works on, focusing on the structure-construction-tectonics relationship. "When a structural concept has found its implication through construction, the visual result will influence us through certain expressive qualities that have to do with the play of forces and the corresponding arrangement of the building's parts, but which cannot be described in terms of construction and structure alone" (Sekler, 1965).

In the meantime, the 1951 and 1954 the two Triennale Milano sanctioned one of the decisive steps for the birth of new and fundamental design sectors, such as industrial design, whose development also led to significant changes in architectural design. The coincidence between product design and architectural design profoundly changed the relationship between architecture and industry in the rationalist period and the following years. The correspondence, sought in the design, between object and architecture unhinges the idea that standardisation and uniformity are synonymous with flattening expression, conditioning of freedom and limitation of the

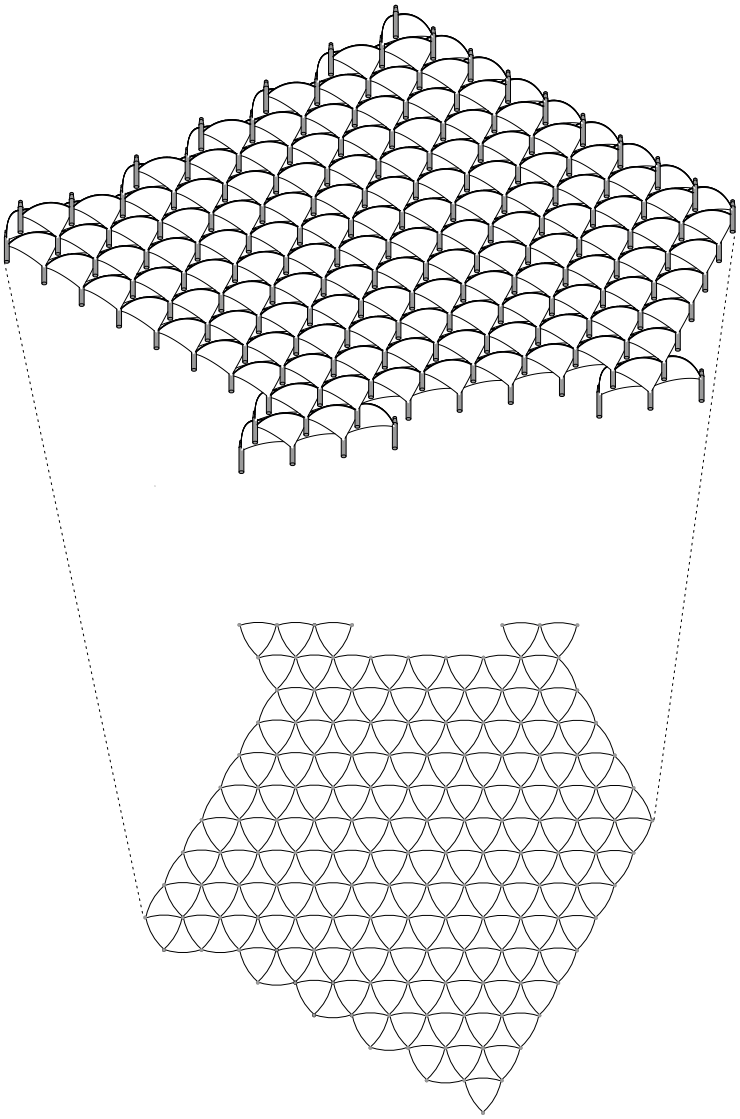

Figure 3 | Olivetti factory in Brazil. Monometric axonometry from below of the interior space and of the vaults - © Giuliana Di Mari, 2022

architect's abilities. On the contrary, this design idea has an intrinsic value of quality, which distances the monotonous image of prefabrication. The theme of prefabrication evolves in the direction of the assembly of components, in analogy with the design of the object and resumes the studies inherent to building design with industrial manufacturing cycles. The concept of modularity also changes, defining itself as a module object. This form-object research involved the field of architecture, dwelling with greater freedom of experimentation in applications on industrial buildings. Much of the industrial architecture realised between the 1950s and 1960s is characterised by flexibility and expandability, which implicitly manifests itself in the form, which explicitly descends from function and material. In the constructive potential of concrete, the prospects for the modernisation of 20th-century architectural culture lie. Concrete, an icon of modernity, is understood as a privileged material of experimentation capable of favouring the change of form and structural language (Blakely, 2011).

With the Brazilian project, Zanuso transforms the external identity of the factory, which becomes increasingly blurred until it blurs into the contours of the surrounding landscape. On the outside, it adapts to the vaguely hilly Paulist landscape; on the inside, there

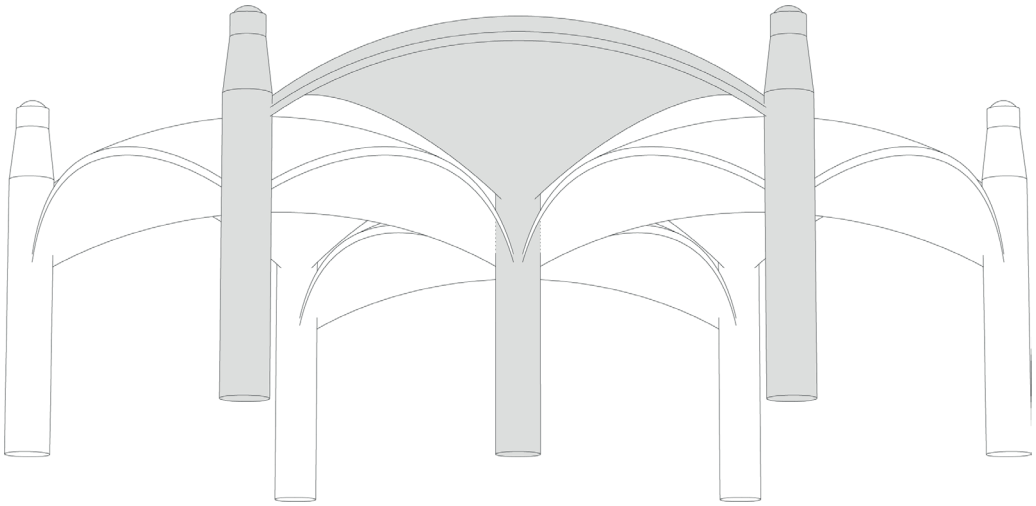

Figure 4 | Olivetti factory in Brazil. Central perspective from below of the vaults - © Giuliana Di Mari, 2022.

are spaces designed in a completely experimental way, an unusual fluid open space in the plan, that on the vertical plane projection is articulated through different elevation changes. The architect's idea is to develop not a single factory body but a flexible modular structure that can contain the individual production units and regroup them by function. Thus, the equilateral triangle, twelve metres on a side, with three possible directions of expansion, is identified as the generating element. The triangular domes rest on each vertex on a hollow pillar, furnished inside with all functional air exchange systems, constraining the undulating roof dotted with black chimneys. The triangular modules form individual environmental units that allow the lines of the different phases to be oriented. To give lightness to the roof, Zanuso creates very thin vaults made of a composite system of brick and concrete, stacked to be a screen against the intense sun rays of the Brazilian latitude. To statically realise these shell structures, he designed one of these vaults in Italy so that he could study their behaviour. Constructed in Ivrea, it was then destroyed with hammer blows, demonstrating the tremendous structural collaboration that allowed for considerable savings in reinforcing the vaulting bars (De Giorgi, 1999).

The area destined for the typewriter assembly line is located separately from the main building but remains connected. Two long, rectilinear, parallel buildings host the two different types of processes and allow the noise of the factory to be isolated by the spacing and use of sound-absorbing plaster. The architect imagines the roof of these buildings as triangular vaults topped by a reinforced concrete cross-beam structure and reinforced brick floors. Offices and services such as the library, infirmary, canteen, and after-work facilities are located in a hexagonal building with large windows that follow the land's natural slope and are in contact with the garden.

From the design, the new Olivetti factory is a very dynamic and complex structure that fits into the landscape like an artefact whose innovative white domes contrast with the clouds of the Brazilian sky.

3. The material, the form, the technique

The construction principles underlying the Olivetti factory in São Paulo can be traced back to those employed by Zanuso in his product design project. Thus, the Lambda chair innovatively recalls the São Paulo factory through the experimental use of modular elements. Similarly to how the factory's vaulted ceiling is supported, the Lambda had to support the weight - of a person - by distributing it evenly over the supports. The two projects, product design and architecture, are from the same period. The thin triangular vaults of the factory bear their weight on the three cylindrical pillars, which form a *continuum* reminiscent of that produced by the seat and chair legs.

The construction principle used by Zanuso in Brazil - previously in Argentina and later in Italy - is that of prefabrication on site. Throw this is how he solves the problem of moving from the vertical to the horizontal, in a synthesis translated into the design outcome, the module object identified in Brazil in the vault is supported by three pillars.



Figure 5 | International Shopping Center Guarulhos entrance today - © Giuliana Di Mari, 2022.

The Brazilian factory is placed into the category of form-resistant structures whose static behaviour is described by Sergio Musmeci as "characterised by stresses contained on the plane tangent to the roof (membrane stresses) whose bond with the loads acting locally on the vault is isostatic"[2] (Musmeci, 1969: 692).

The vaults are obtained by the intersection of a pyramid with its vertex in the centre of the sphere with a radius of 9.50 metres. The vertical structure is therefore made up of a mesh of pillars arranged in such a way as to provide support for the spherical domes whose vertexes coincide with the vertexes of an equilateral triangle of 12 metres per side. To avoid the insertion of primary and secondary structures and thus to make the dome self-supporting, it was designed as a membrane with a thin structure. The partial prefabrication of the membrane's constituent elements with brick elements resulted in savings in formwork and assembly.

This process is the result of Zanuso's analytical-compositional method in which the exact coincidence of time and place is verified and, in this correspondence, the conceptual and physical outcomes of the object are realised, which, even in its industrial outcome, expresses a poetics of design. For Zanuso (1953: 38), prefabrication is "a work that re-proposes the essence of the building, from materials to their processing, from the element to its limits of modularity: a work of concentrating propulsive forces from the world of culture to that of technical production",[3] a thought he was able to apply in the laboratory of industry and culture that was Olivetti.

4. The cognitive and methodological contribution

Delving into the relationship between Zanuso and industry reveals the significance and decisive role that industry has played in his work as a designer, not only in terms of commissioning but through its evident cognitive and methodological contribution and, more generally, in the impulse it has given to the transformation of design processes, modifying them from within.

It is thus clear that 'consciousness', even before 'knowledge' of technique, represents for Zanuso the most direct and coherent way to architectural design; and that although this is a constant prerogative throughout his production, it is in his industrial architecture projects that this ideology is fully realised. Zanuso argued that if the Modern Movement had aimed to express modernity in the world, industrial design - connected to production than architecture - was closer to the modernist aspiration than architecture was. By engaging in industrial design, an architect could come closer to modern architecture's production and intentions. Zanuso thus pursued a role of 'responsibility' concerning technique and the definition of the object, understood as an instrument for living. If the architect aimed to promote value other than gratification, he would need a kind of 'cultivation'



Figure 6 | International Shopping Center Guarulhos interior view of the vaulted part of the original factory - © Giuliana Di Mari, 2022.



Figure 7 | International Shopping Center Guarulhos interior view of the part that was originally dedicated to the assembling area - © Giuliana Di Mari, 2022.

rather than technocracy. Zanuso found such a concept in Adriano Olivetti's production philosophy to a certain extent. Zanuso's factories for Olivetti were explorations of industrialised architecture. Through their reflection on the approach to architecture, and industrial design, these factories were distinctive investigations into the relationship between architecture and industrial design.

Suppose the modern is identifiable in what manifests itself as innovative concerning what preceded it. In that case, the Modern Architecture argument starts from the outcomes of the industrial revolution, which affected the construction field in the last century at a pace unknown to previous eras. Transformations in production processes and experimentation with new materials have impacted architectural innovation, regardless of the styles that represent its historically codified images.

The intrinsic characteristics of industrial architecture and its relationship to history and design imply a vision at multiple scales of investigation. Fundamental to understanding every aspect of the design is the study of the technological and environmental characteristics of the organism regarding the materials and techniques used and the context in which it is inserted.

Therefore, the approach to the compositional theme is related to a global and synthetic vision that highlights the close connection between material, structural, spatial and formal components. The integration between technique and purpose of architecture builds a process that allows the built object's historical, cultural and linguistic continuity to be recognised. Thus, in a unitary and synthetic vision, one will find the perfect correspondence between all the components and all the relationships involved in the formative process.

The objective of investigating science and art in their historical development includes the study of the evolution of materials and building systems, as well as the construction of specific buildings and building types. Therefore, scientific tools and construction characteristics are needed for a correct recovery intervention. Observing the object through the eyes of its time allows us to grasp its motivations, merits and defects (Guardigli, 2019).

5. About the usefulness of building object

The attempt to rethink the role of the factory within broader reasoning on the city implies considering its attitude to transformability as an architectural resource at the service of urban planning. Uncontrolled urbanisation has meant, over time, increasing consumption of land and territorial resources. In reconsidering the city's development processes, it is essential to incorporate spaces defined as urban voids and the many abandoned industrial areas, with the higher goal of recovering the existing. These operations first imply an awareness - and knowledge - of the intrinsic and extrinsic significance of the industrial heritage, a characteristic element of modern architecture. The Charter of Nizhny Tagil defines industrial heritage and sets out a sequence of historical, technological, architectural, and social values necessary to legitimise its preservation. Industrial heritage consists of places, buildings and machinery from industry or closely related. The reference methodology is that of Industrial Archaeology, understood as an interdisciplinary method to study what is linked to industry and production processes, material and immaterial evidence, natural and artificial landscapes, documents and machinery. Again, the historical period to which the Charter of Nizhny Tagil, and more generally these studies, refer goes from the early 18th century to the present day, including the pre-industrial and proto-industrial roots of this heritage (Chimisso, Parisi, 2021).

When a process of reuse begins - concerning the utility concept of the building object, recovered to accommodate an activity other than the original one - the reinforced concrete factory - examined in its specific architectural history by delving into the technological aspects of the construction principle - appears as vulnerable. The problem of knowledge and interpretation is mixed with the need to adapt and conserve the existing; this appears, for industrial buildings, particularly complex, considering the correlation between form and function as the core of the design. Reuse is, therefore, a problematic practice in which it is necessary to interpret and decode the object to respond in general to social needs connected with the artefact, in this sense, it cannot disregard the preservation of historical memory (Barelli, Lucchesi, 2002: 315-26).

In this context, the reconstruction of the specific architectural vicissitude intervenes in analysing the constituent elements of Zanuso's design and the variations of the theoretical matrix applied to the specificities of the factories built for Olivetti, admitting the place as a piece of the knowledge process.

During the 1990s, Olivetti sold the factory to a company that converted it into a shopping centre in 2007. From here began the process that led to the oblivion of the factory's history, an icon of modern architecture in São Paulo, a rare work by Zanuso outside Italy. Beatriz Kühl (2008: 204-05) recounts the steps of this process that led to the architectural alteration of the Olivetti factory in Brazil:

> "[...] the factory, which was previously in a good state of preservation, has undergone significant demolition (facades, walls, fencing of the production and assembly building, total demolition of other buildings and elements that made up the complex), leaving only the structure supporting the vaulted roof and the roof itself in the production building, and the assembly building, without their respective facades. [...] The link between the structure and its overall configuration was disregarded, resulting in a radical alteration of the internal spatiality and the destruction of the façades in a project conducted essentially for reasons of use. Even if it was possible to save a part of the complex, the transformation works carried out have deformed the interior and the whole significantly; added to this is the construction of new elements of dubious architectural quality, which completely erase what an exceptional example of industrial architecture in São Paulo was."[4]

Recovery - reuse - is still today an aggregate of techniques, roughly consolidated, which aim at enhancing the single object rather than building an urban narrative plot. The interest in issues related to the decommissioning of industrial areas has traversed a singular path. Parallel to the end of the construction of the last factories, in the transition between mechanical and electronic technology, the debate on these issues began, which remained at a standstill throughout the 1980s, until in the 1990s, it broadened its gaze to include generic industrial elements worthy of protection. This was undoubtedly due to the crisis in the industry itself, which brought with it the problems associated with decommissioning and, however, to the growing realisation that an era had come to an end. Something new had to be invented, this heritage had to be recognised as such and innovative intervention strategies had to be implemented.

The recognition of values common to the various industrial declinations led, in the 2000s, to the need to scientifically determine the practice of recovery in an archaeological but also and above all historiographical sense. In its industrial declination, modern history has thus acquired meanings derived from cultural and architectural specificities.

Factories such as the Olivetti ICO in Ivrea, the AEG in Behrens or the Ford River Rouge have conveyed specific

values in their design and construction. It is, therefore, necessary to reflect on the factory's role as the architect's creative endeavour and as the ultimate experiment of modernity, as Le Corbusier described it. Its symbols are the symbols of machines' civilisation, irrepressible technology and its strategic role in society (Spada, 2018).

The São Paulo factory was dissimilar to the Olivettian joint in Ivrea, which was recognised in 2018 as a UNESCO heritage site. Of the Brazilian factory, only the hollow pillars and the triangular domes they supported were considered necessary, so they were the only parts of the factory worthy of the act of *tombamento*[5] and thus preserved in the disfiguring transformation of the factory into a shopping centre. The totality of the project testified to innovative experimentation that invited a transition between design and architecture. Zanuso gave life to complex buildings, always conceived in every smallest part, functional, and flexible in their interior spaces, responding to the demand for space and time variability.

The international examples, and the case of the Ivrea Joint itself, show how the fate of the Brazilian factory could be different: a preservation and dignified use of modern industrial structures, abandoned or in ruins, with new quality architectural interventions that respect and dialogue with the historical architecture.

Notes

[1] The quote is translated by the authors

[2] The quote is translated by the authors

[3] The quote is translated by the authors

[4] The quote is translated by the authors

[5] *Tombamento* is a legal instrument created in 1937 by federal law (Decreto-lei No. 25 - DL25/37) as a form of protection for Brazilian cultural heritage. Furthermore, cultural heritage was greatly expanded in the 1988 Constitution, which approved *tombamento* as one type of protection among other forms of conservation. It was also by the 1988 Constitution that Decreto-Lei No. 25 became the general national norm on *tombamento*. The main effect is to preserve tangible, movable or immovable property that is recognised as having cultural values. Obligations are thus created for the owners of the property, for the government, as well as for society in general, to maintain and preserve cultural assets (Rabello, 2015).

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