Review paper

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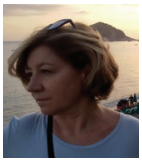
TRANSFORMABLE FURNISHING: FROM 'MODERN HOME' TO CONTEMPORARY HOUSE

Mobiliario transformable: del "hogar moderno" a la casa contemporánea



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ABSTRACT

Among the many problems highlighted by the recent COVID-19 pandemic is the inadequacy of many homes to accommodate people during a health emergency. During the various lockdowns, flats that needed to be bigger, more distributed, or more modern did not help to organise one's time or daily activities (studying, working, exercising, or simply secluding oneself) in the best possible way. Redesigning the existing seems a possible solution, not by demolishing obsolete dwellings, but by adapting them through 'light systems,' i.e., through furnishings: an 'ex-post' intervention that can redevelop spaces by leveraging the concepts of transformability and flexibility. Lessons can be learned in this respect, from the history of modern housing to contemporary experience. The article broadly traces this history (with a look at the culture of Italian living) so that from experience, we can learn solutions for living in the future.

KEYWORDS

Furnishing; transformability; modern and contemporary home; Italian design.

RESUMEN

Entre los muchos problemas que ha puesto de manifiesto la reciente pandemia de COVID-19 está la inadecuación de muchas viviendas para alojar a las personas durante una emergencia sanitaria. Durante los diversos encierros, los pisos que debían ser más grandes, más distribuidos o más modernos no ayudaban a organizar el tiempo ni las actividades cotidianas (estudiar, trabajar, hacer ejercicio o simplemente recluirse) de la mejor manera posible. Rediseñar lo existente parece una posible solución, no demoliendo viviendas obsoletas, sino adaptándolas mediante un "sistema ligero", come el mobiliario: una intervención "a posteriori" que puede reurbanizar los espacios aprovechando los conceptos de transformabilidad y flexibilidad. Se pueden extraer lecciones en este sentido, desde la historia de la vivienda moderna hasta la experiencia contemporánea. El artículo traza a grandes rasgos esta historia (con una mirada a la cultura de la vivienda italiana) para que, de la experiencia pasada, podamos aprender soluciones para vivir en el futuro.

PALABRAS CLAVE

Mobiliario; transformabilidad; casa moderna y contemporánea; diseño italiano.

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1. INTRODUCTION

There are countless analytical criteria with which to observe and reflect on the evolution of the residence during the 20th century up to the present day. Organisation and distribution of space, construction techniques, and materials have influenced the modern and contemporary habitat; no less so have the hypothetical responses of architects to social problems or new lifestyles and consumption to modify the gradually consolidated structures of the home over time. Finally, the recent pandemic is necessarily restructuring thinking on housing design, given the ineffectiveness of many previous housing typologies. Due to the health emergency and the confinements imposed in one's own home, many dwellings have shown their limits - physical, functional, and psychological - mainly due to their small size or their almost open as well as indivisible rooms. Critical reflection on the flexibility and adaptability of interiors as a possible solution to the adaptation of obsolete housing structures in the existing building stock has therefore returned to the fore.

Suppose the transformability of domestic spaces belongs primarily to the traditional oriental culture. In that case, it has nevertheless crossed the Western one throughout the previous century according to the interpretative lens of the integration between architectural space and furnishings or of the juxtaposition between the two, re-proposing itself up to the present day with ingenious solutions. Depending on the different epochs, that design theme is declined in different forms and arrangements, which have qualified new ways of interpreting and living in the home. The design methods have been characterised above all as 'arredamento' [furnishing] - understood as an ad hoc intervention, remodelled over time, that can be dismantled, even repositioned elsewhere - a term that is now obsolete, but which has, for a long time, positively marked an intense architectural season, especially in Italy.

Concerning the development of modern architecture, writes Giulio Carlo Argan, 'furniture tends to increasingly identify with or integrate itself with the construction fact' (Argan, 2003, p. 94). He adds further on: 'Everything, in modern architecture, tends to become "mobile"; and the "furniture" that constitutes furnishings can truly be considered the most sensitive and delicate formal terminations of architecture' (ibid., 95). From these considerations, we look at the modern home as a complex interplay between architecture and furnishings, in which flexibility can qualify the adaptation of domestic space to changing social conditions.

2. PROBLEM, STATE OF THE ART AND METHODOLOGY

The essay briefly traces a history of the flexibility and transformability of domestic furniture and its ability to modify inhabited space. It is considered a pertinent topic for a study, not only because it is a theme only hinted at in the Histories of Furniture and the Histories of Interiors, but because it is highly topical: the recent experience of the COVID-19 pandemic has, in fact shown how many modern homes have been unsuitable for the coexistence of several people - primarily engaged in different activities, such as studying, attending classes, working, exercising, and others - in the same house, if the latter has insufficient floor space. Recalling how, in the past, living spaces could be temporarily divided can serve to rethink the project of adapting housing structures during health or climatic emergencies differently.

In outlining the history of transformable furniture, the essay considers some historical precedents: examples of transformable furniture or projects for the temporary modification of certain rooms in the home appeared as early as the end of the 18th century and then during the second half of the 19th century. Subsequently, the development of the essay focuses on the experiments of various designers during the 20th century, with a focus on Italian architects and designers who made a fascinating contribution to the idea of transformability of interiors, both using furnishings that are themselves transformable and through mobile partitions of various types.

The survey methodology is historical-critical and organised according to a strictly chronological

criterion. Although hinting at historical precedents, the time range the essay focuses on is from the 1920s - the first rationalist trials - to the 1970s - the avant-garde examples at the exhibition 'Italy: The New Domestic Landscape' edited by Emilio Ambasz at Museum of Modern Art (New York 1972) -. In conclusion, the essay mentions some more recent projects that have picked up the design heritage of the 20th century, reworking it in a contemporary key.
The geographical area of investigation relates to Western countries, mainly Europe, the United States, and Italy. However, for contemporary projects, mention is also made of projects realised in other countries that are considered innovative in terms of the transformability of the home through furnishings and/or light movable partitions.

3. SOME HISTORICAL PREMISES

Interesting precedents of the transformability of the home can be found in all historical periods. However, from the second half of the 19th century, a specific interest in this design approach can be discerned. Giedion (1948) qualifies the 19th century as the age of invention and mechanisation of work, both in the industrial and domestic fields. In the latter, various social conditions - the increasing shortage of service personnel, the shift of family residence to the suburbs, and the family's economic autonomy- directed Americans' lifestyles. The single-family home is presented as an autarkic residence, i.e., self-sufficient in production (food and clothing above all) and consumption of goods; the wife-mother-father runs it, while the husband-father is reserved the role of Breadwinner, active outside the home.
For a housewife who was as independent as she was aware of her role in supporting the nation, Beecher & Stowe Beecher (1869) designed a neo-Gothic suburban cottage in which they experimented with new spatial organisation solutions. Among them, on the mezzanine floor of the house, the dining room features a screen on pivoting wheels, which temporarily divides the space to accommodate the nightly rest of one or two guests. On one side, the movable wall accommodates decorative elements or paintings; on the other, it has a series of storage units to serve the occupants of that small habitat, while the bed can split into two beds by sliding one under the other. (Fig. 1)

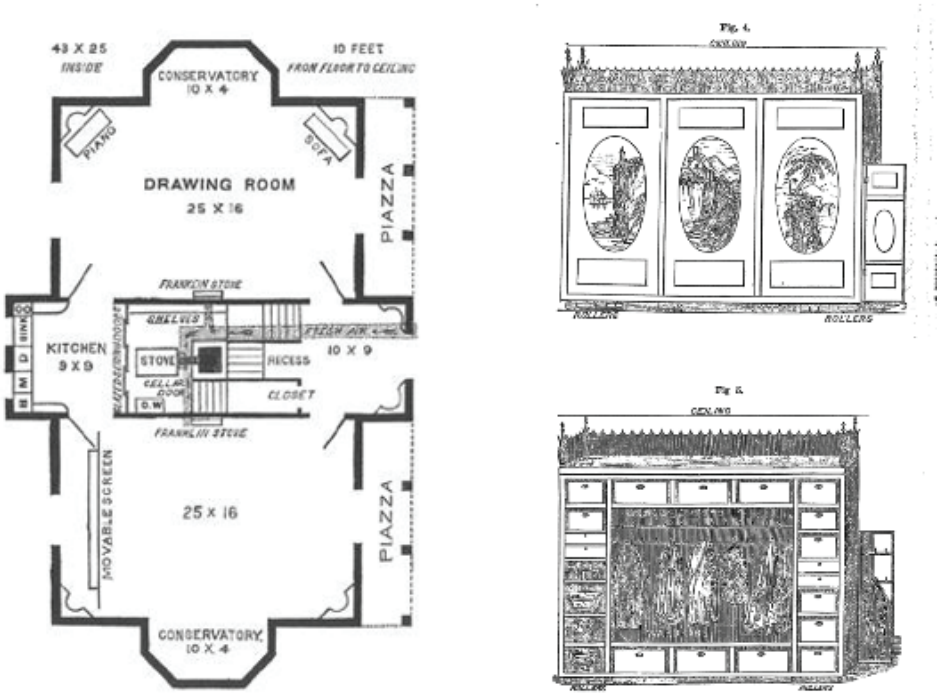

Fig. 1
The picture shows the internal organisation of the ground floor of the house designed by sisters Catharine Beecher and Harriet Stowe Beecher and the movable screen which, when moved around the room, allows a guest to be accommodated, as well as acting as a container on the one hand and as a display wall on the other.
(Source: Beecher & Stowe Beecher 1869.)

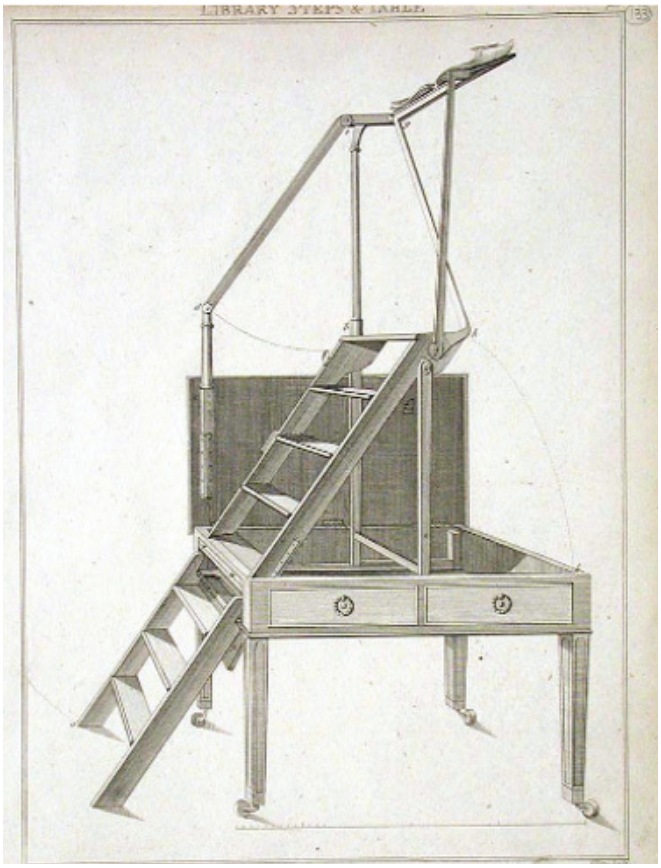

Fig. 2
Garnet Terry's engraving shows adesign by Thomas Sheraton for a library table with integrated retractable ladder for consulting books in a privatelibrary (c. 1792). *(Source: Author's archive).*

At the same time the Beecher sisters were composing a different idea of home, American industry began to produce transformable furniture, such as pianos that could be modified into beds, extendable chairs for daytime rest, and multifunctional desks. Experimentation with such furniture had, in fact, already taken place in craft forms in Europe: in addition to a few vernacular examples in Ireland and Great Britain at the end of the 18th century, the transformability of furniture defined as 'metamorphic' or harlequin had been tested by refined cabinet-makers such as Thomas Sheraton in England (Fig. 2) or Giovanni Socci in Italy.

However, the United States was the first to attempt their standardisation and subsequent mass production, thanks to a series of inventors who eagerly filed countless patents with the U.S. Patent Office. (Fig. 3) At the beginning of the 20th century, an exciting contribution was made by companies such as Sears, Roebuck and Co. (Chicago-Philadelphia), who sell objects, furniture, and even entire detachable houses by mail order, such as the 'Ashmore' bungalow (1916). Among the various proposals in the catalogue, a dining room with folding furniture, the 'Pullman Breakfast Alcove,' inspired by the railway carriage furnishings of George M. Pullman, who from 1860 had transformed train travel into a luxury experience, enjoyed some success. It is a set of tables and benches, mostly placed below a window inside the kitchen, used as a breakfast nook; when the table folds down towards the wall, it transforms into a daily sitting area or a corner for sewing or reading. (Fig. 4)

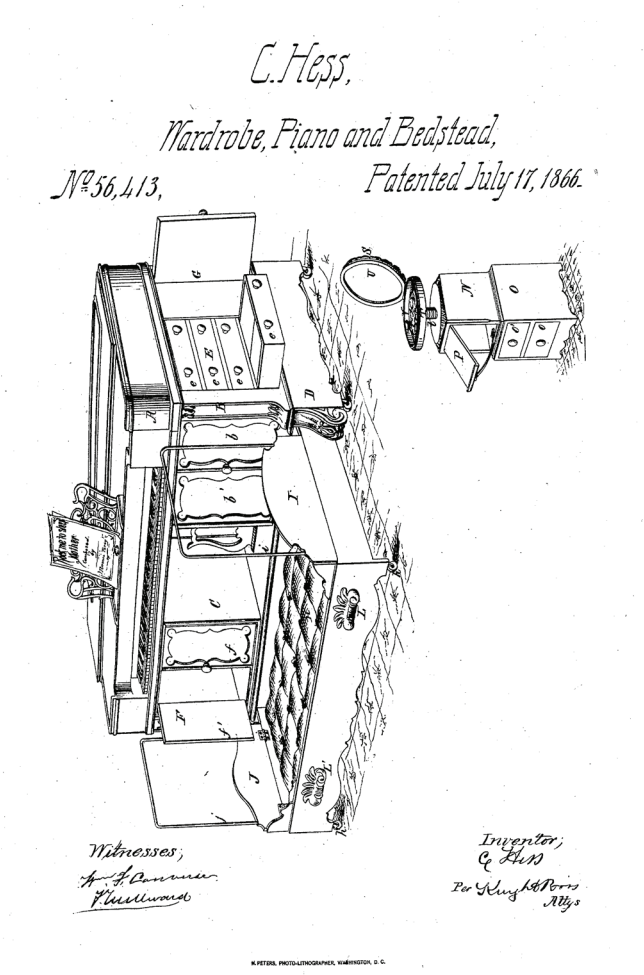

Fig. 3
Detail of Letter Patent No. 56,413 (dated 17 July 1866) for the patent for 'Improved Combined Piano, Couch, and Bureau' by Charles Hess (Cincinnati, Ohio).
(Source: United States Patent Office [https://patents.google.com/patent/US56413A/en]).

Fig. 4
The advertising image shows Breakfast Alcove 'The Dawn' with the table open (left) and with the table closed to the wall (right) for dual use of the space as a breakfast alcove or as a daily living room.
(Source: Sears, Roebuck and Co. catalogue [Chicago-Philadelphia, 1920]).

4. THE INTERIORS OF EARLY MODERN ARCHITECTURE

In Europe, the social housing problem first raised the issue of the transformability of interiors, investigated during the 1920s by German and Austrian architects and from the 1930s to the 1950s by their Italian counterparts. While still a student and on behalf of the Stadtbauamt [Municipal Technical Office] in Wien, Anton Brenner designed a building of rental flats with different surfaces at 26, Rauchfangkehrergasse (1924-1925). The two-room apartments are decidedly compressed, with the kitchen only 2.97 m2. The most significant degree of flexibility is in the living-dining room, which contains two folding beds ('Klappbetten') in an alcove, the perimeter of which can be screened off by folding panels covered in fabric; the

bedroom, on the other hand, is separated by a wall-cabinet passing through, with storage units accessible on both sides. The cost of these furnishing elements, given to the tenants, is redeemed monthly in the rental fee.

In the same period, the best-known experimentation in room modification was offered by Gerrit Thomas Rietveld in the Schröder Haus (Utrecht 1924). While the ground floor of the house is organised traditionally, i.e., in rooms, albeit small, the first floor (60 m2) lends itself to different uses at different times of the day thanks to a set of sliding panels that close or open the large room, segmenting it into smaller and more intimate ones. This project is a spatial as much as a temporal revolution of the architectural box, as the designer calibrates the space concerning the functions and times of day in which it is used; moreover, the rooms can be continually broken down or recomposed with simple gestures, while maintaining the stable core of the staircase and fireplace.

While the Schröder Haus represents an unprecedented interior solution in traditional construction, Le Corbusier and Pierre Jeannaret work on standardising the building structure - punctiform, with light infill and open plan - through reinforced concrete. This type of house requires containers built into the walls or dividing the rooms, rather than bulky furniture set against the walls, as Le Corbusier writes: 'Je dessine le plan d'ameublement et la coupe d'une chambre traditionnelle. La grande armoire normande, la commode de style ne permettent qu'unmauvais rangement fort inefficace (...) Je dessine en plan et coupe un dispositive moderne: fenêtres, cloisons et casiers. J'ai gagné une place considérable; on peut circuler à l'aise; les gestes seront rapides et exacts; le rangement automatique' [1] (Le Corbusier, 1930, pp. 109-111).

Therefore, the two designers implement the standardisation of the furniture with the idea of 'casiers standard', on which they have been working since 1924: they are multifunctional, modular elements that can be assembled horizontally and vertically. The cases and doors are made of plywood with mahogany veneer [2], with sliding, sluice, or hinged closures (natural or painted in colour); the entire system rests on the floor or is raised off it thanks to slender metal 'pilotis.' Sized exactly on the objects to be contained [3] - from plates to hats, from books to records -, the 'casiers' are in part reminiscent of the office archives or travel trunks admired by the Swiss master in search of a 'comforting norm', i.e., 'an equipment-prosthesis' that responds to all human needs, at least in the field of furniture (Le Corbusier, 1925, passim). The 'casiers' are presented in the pavilion of 'L'Esprit Noveau' at the Exposition Internationale des Arts décoratifs et industriels modernes (Paris 1925) as containers and, at the same time, space dividers: arranged in a plug or flat position, they close it up to a certain height, qualifying the various rooms in different ways according to the function the furniture fulfils (cupboard, cupboard, display unit).

A further experimentation of these multifunctional pieces of furniture is proposed by Le Corbusier, Jeannaret and Charlotte Perriand in the exhibition 'Equipement de l'habitation: descasiers, dessièges, destable at the Salon d'Automne (Paris 1929). The 'casiers' are used to divide a hypothetical flat for three people of about 90 m2 into a service area (kitchen, guest bed, bathroom, double bed), compacted on one side of the perimeter and with a luminous opalescent glass ceiling, and a large living room, with a floor made of Saint Gobain glass plates. Made of brass profiles and closed by metal sheets (painted white, blue, brown, red) or glass, these 'casiers métalliques' function as display cases, double-sided containers (with drawers or pull-out shelves) and separating screens, to which the three authors contrast tables and seats according to their design.

Equally compelling is the proposal for articulating accommodation using fixed and mobile equipment that Le Corbusier and Jeannaret conceived for one of the two residences at the Weissenhof-Siedlung (Stuttgart, 1927). If both buildings concretise the 'Cinq points d'une architecture nouvelle,' theorised by Le Corbusier a short time before, the flats of the Maison Double in steel are conceived as an ample continuous space, interspersed with deep wardrobes (with a horizontal masonry top), from which tubular frame beds (designed by Alfred Roth) and sliding panels emerge to divide the room into two or three independent bedrooms, served by the corridor behind them. In this case, the furniture is an immobile

mobilier, 'meuble et *non-meuble*, architecture et "sculpture",' (Rolland, 2022, p. 30) conceived so that somebody can transform the entire dwelling.

The depth of the wardrobe even becomes an 'other space' in the house that Walter Gropius designed for himself and his wife Ilse (called Ise) Frank in Dessau (1925-1926). The couple's bedrooms are divided by a double-sided container, through which they pass to go from one to the other, as well as housing a shared walk-in wardrobe. Compared to the articulated system of entrances leading to both rooms and the main bathroom, without the two interfering with each other, this furniture divides the couple's nightly rest and, at the same time, creates an intimate sharing between them. On the other hand, the living room-studio area is separated from the dining area by a simple curtain, while the dining area is in direct communication with the kitchen office through pass-through furniture and doors.

Although Le Corbusier and Jeannaret envisioned the industrial production of the 'casier standard' as a modular and variously organisable furnishing system [4], it was in the post-World War II United States that the idea of a multifunctional container that also divides space took on greater adherence to mass development. George Nelson and Henry Wright took this on with their 'Storagewall' project (1944), which represented an alternative to a locally made, cost-saving piece of furniture in cheap housing with an industrially produced element. The result of research into the current production of the two young architects for the magazine *The Architectural Forum* (1944) [5], the 'Storagewall' is a wall cabinet that overturns the traditional idea of storage, i.e., the wall cupboard. Double-sided, with an aluminium structure, about 20 to 30 cm deep (as opposed to the more common 60-65 cm), the container can replace entire walls of the home. The project thus formalises a 'new hybrid - not exactly architecture or furniture but with the qualities of both structurally autonomous and solid, but also modular and infinitely flexible' (Abercrombie, 2000, p. 72). (Fig. 5)

Fig. 5
The advertising image of George Nelson and Henry Wright's 'Storagewall' system illustrates how the container works and the types of objects it can hold. *(Source: Architectural Forum, (11), 1944).*

5. THE ITALIAN CONTRIBUTION

After the II Congrès international d'architecture moderne (1929), which sanctioned the adoption of the existenzminimum or minimum quality standard for low-cost housing, room flexibility became an interesting design variable in Europe for social housing and beyond. Italian architects experimented with it from the 1930s onwards in hypothetical projects presented in *Domus* magazine and temporary exhibitions. In particular, the Milan Triennale - with its numerous 'Mostre della Casa' or 'Mostre dell'arredamento' that cadenced its exhibition programme - offered designers frequent opportunities to conceive original visions of living. For our designers 'the term flexibility expresses [their] desire [...] to respond to multiple and contradictory objectives of the minimal dwelling. The more refined needs for comfort, but also the expression of a new "freedom" in dwelling, the aspirations for individual isolation and the needs for family control find in this device (the permutability in the use of limited spaces) the hope of making the inflexible flexible' (Teyssot, 1984, p. 91).
The one who first concerned himself with the transformability of the typical dwelling was Gio Ponti, who, in the magazine *Domus* (which he directed), conducted a proper taste campaign for the modern home. In this, furnishings must not have 'a purely formal conception' or one of social representativeness as in the past, but rather fulfil the needs of contemporary life, which 'has as its postulate (a) humanistic and non-mechanical ideal: in the sense of a humanism that is not anti-mechanical, but which has assimilated the machine and its derivatives' (Ponti, 1936, pp. 16-17). At the 6th Milan Triennale (1936), he exhibited a section (living-dining-studio) of a demonstration house that, through different furniture arrangements inside it, responded to various living needs. The two rooms of the installation are separated by a double-sided cupboard containing a sliding panel, which allows for variations in the use of the entire space. However, the architect concentrates more on juxtaposing the furniture - almost all by his design - to create different areas depending on the occasion.
Between 1937 and 1938, on the pages of *Domus*, Ponti then elaborated the idea of a 'flat for everyone,' with furniture that could be disassembled, folded, and sent anywhere, particularly to the colonies of the proclaimed Italian East Africa. The first published plans were by Alessandro Pasquali, who also published the executive design of the furnishings, while the idea that 'every room closes into a piece of furniture' (Domus, 1938, p. 42) was entrusted to the firm of Giovanni Berardi with drawings by Pier Nicolò Berardi. The furnishings (two bedside tables, a chair, and the backs of the bed) are disassembled and folded to be contained inside a cupboard or (four chairs and a table) a sideboard. In this way, the packaging is eliminated, shipping is simplified, and furniture assembly is carried out with only a screwdriver.
The 'house inside the cupboard' theme was finally relaunched between 1943 and 1945 by Ponti himself, assisted by the Saffa company for production (but the furniture did not actually go into production). If the architect looked to the catalogue sales that had dominated the furniture market in the United States since the end of the 19th century, in Italy, a solution to the wartime housing problem seemed to him to be offered by modular, foldable, concealable furniture. In other words, the transformability of the home now replicates the inevitable displacements of Italian families from destroyed cities or impracticable real estate rather than their moving abroad.
In the same period, Gian Luigi Banfi, Lodovico Barbiano di Belgiojoso and Enrico Peressutti also worked on flexible furniture [6]. For the living room of the T. flat (Milan, 1943), they designed a bookcase with a pull-out dining/working table, which could also be detached altogether and left isolated in the room, while the bedroom for three girls was transformed into a playroom/study by turning the beds back on themselves and switching them into furniture and shelves. However, these solutions rely on skilled artisans, for which industrial production is not feasible.
In the immediate post-war period, research continued above all on folding and concealable furniture, which, while aspiring to standardisation, were proposed above all as furnishing

solutions for small accommodations (Ignazio Gardella, accommodation for three people, 1946; Tullio Bussi, accommodation for one person, 1946; Eugenio Gentili Tedeschi, flat for two people, 1946), while Marco Zanuso founded the INA-mobile in 1954, a section dependent on the INA-casa, to reduce the number of tenants' furnishings as much as possible, to be replaced with fixed furnishings for social housing.
In general, however, Italian projects questioning the flexibility or transformability of the dwelling seem to be based on three main invariants: the equipped and modular wall, the mobile diaphragm, and the object-environment, which respectively investigate not only different ways of organising and using space but also stand out as responses - gradually more daring - to changes in Italian society. In other words, they mark the gradual passage from a traditional style of living towards more informal forms of living until establishing countertrends so futuristic that they could only be understood in the following decades. If the first two solutions seem in part to rework the influences of pre-war European rationalism and seek, at least in the first hypothesis, 'the transformability of environments even without creating "exceptional" solutions' (Feraboli, 2015, p. 175), the last one rises to an innovation with an all-Italian imprint.

5.1. The equipped and modular wall

At the 6th Triennale (1936), Franco Albini with others [7] presented an accommodation for one person (or hotel room), whose large room was articulated around a single container, which did not reach the ceiling but separated the space into day and night areas. More complex is the solution of the same architects [8] in the rental accommodation for four people, set up on the same occasion. The entire 160 m2 flat, intended for a wealthy class, is governed by a rigid modular grid (66x66 cm), which determines the equipped walls and light glazed filters, totally replacing the walls, for the only room of which the house is composed: even if the economic problem is less relevant in this case - the designers write -, that of the exploitation of space remains 'in all its importance, mainly because of the more complex habits of life which multiply the number and types of objects of use, and which require spaces suited to different occupations' (Domus, 1936, p. 27). Ample relevance is given to the living room, which becomes the central core of the residence, while the bedrooms and bathrooms are recorded on smaller dimensions. The kitchen is divided into office and preparation areas by a transparent diaphragm with a Cartesian rhythm, reflected in the cadence of the storage units, thus composing an airy spatial grid. (Fig. 6)

Fig. 6
Photograph of the kitchen by Franco Albini, Renato Camus, Paolo Clausetti, Ignazio Gardella, Giuseppe Mazzoleni, Giulio Minoletti, Gabriele Mucchi, Giancarlo Palanti, Giovanni Romano, for Flat No. 2 for 4 people. The Flat is presented in the 'Mostra dell'abitazione,' exhibition, at the 6th Milan Triennale in 1936. A glazed, modular diaphragm divides the office from the preparation area..
(Source: Archivio Triennale di Milano (Courtesy of)).

Throughout the 1950s, the fitted wall, custom-designed and generally made of wood, became a feature for homes intended for a more straightforward way of living. This design was proposed by Margherita Bravi and Luisa Castiglioni, who set up a modular furniture system at the 9th Milan Triennale (1951). Instead of walls, such furniture separated the kitchen from the dining room, the study from the living room, and the bedroom from the dressing room. All elements are made of solid wood, also used for the frames, with plywood bottoms and doors covered in coloured plastic laminate. Although the storage units are proposed as fixed, Bravi and Castiglioni's solution offers various interpretations of the composition and use of the living space.

5.2. The movable screen

The idea of a room partitioned by light and movable partitions, such as fabrics, has precedents that go back a long way in time (think of the spaces of the classical age or the bed with independent curtains): draperies of various thicknesses and qualities were used to close off a large room, to shelter from the cold or to create greater intimacy. This type of solution was taken up by Italian architects, especially during the 1950s and 1970s. Gianfranco Frattini makes elegant use of fabric in the furnishing of a flat in Bergamo (1955): thanks to a circular structure hanging from the ceiling, a heavy curtain unravels in the large living room, alternately enclosing it in a more intimate area and creating variously equipped corners (parlour, dining, study) or merging them into a single space. (Fig. 7)

Fig. 7
Gianfranco Frattini, Flat in Bergamo, 1955, detail of the living room with the movable curtain closing off a more private area for conversation.
(Source: Studio / Archivio Gianfranco Frattini (Courtesy of)).

The 'folding' wall also becomes frequently used to modify the home. Presented as a minimal solution for one person at the 10th Milan Triennale (1954) by Ponti and others [9], in the 1956 the 'alloggio uniambientale' [uniambiental flat] project was extended for four people until it became a hypothesis to be adopted in an entire residential building. The ample space of which the flat is composed can be transformed into smaller ones thanks to a series of mobile diaphragms, yellow on one side and blue on the other. They are 'accordion screens,' allowing one to view the house from one side to the other or to create a 'mobile labyrinth,' while the kitchen and bathroom are reduced to the essentials: 'the spaces are clear (...). And the furniture is few and light' (Domus, 1956, pp. 77-78).

The primary view is oriented towards the 'finestra arredata' [furnished window], presented by Ponti in 1954: a complex visual system composed of furniture, equipment, panes and light cut-outs; it is a primary/secondary structure of the dwelling, depending on whether one looks at it from the inside or the outside, and which changes during the day as well as at night. Ponti shortly afterwards implemented the concrete realisation of these ideas in his own 160 m2 flat in Via Dezza in Milan (1956-1957), a sort of taxonomic collection of what the architect presented in the exhibitions or in Domus, with which he exhibited a different way of living: modifiable according to use, day or night, moments of isolation or conviviality among its inhabitants.

The architect finally takes up the idea of a continuous but transformable domestic space, apart from the toilets concentrated on the perimeter, with 'La casa adatta,' an exhibition at Eurodomus 3 (Milan 1970) (Fig. 8). Here, the transformability of the architectural interior is entrusted to large folding diaphragms, with total opening, and to harlequin-type furnishings that can be moved on wheels to generate 'a domestic landscape freed from oppressive conventionalisms, a livelier way of living' (Ponti, 1970, p. 17), in which people can freely express their lifestyle. In this way, Ponti 'proposing this as a method proposes a custom: a way of living in a "versatile" space, in which furniture is light, mobile, foldable' (Licitra Ponti, 1990, p. 248). Among the most interesting transformable furniture is the two-seater mini-desk with built-in chairs, the table extendable from four to ten seats and the sofa-bed on wheels ('Apta' series, made by Walter Ponti).

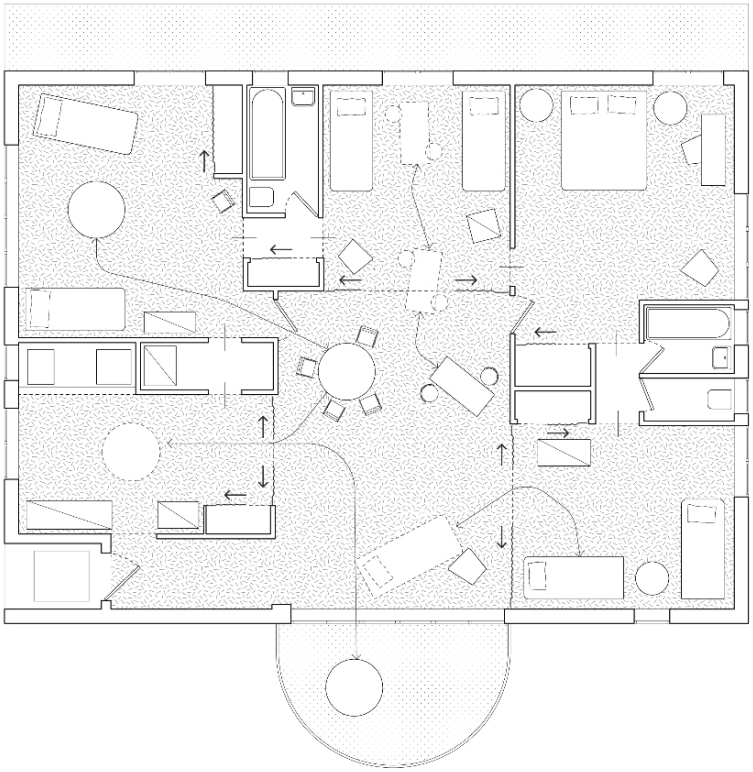

Fig. 8
Redrawing of Gio Ponti's 'La casa adatta' presented at Eurodomus 3 (Milan 1970), in which the movements of the furniture, room entrances and sliding walls are highlighted. Redesign by Valeria Colombo and Gianluca Rizzotti under the supervision of Prof. Michela Bassanelli.
(Source: Michela Bassanelli's Archive (Courtesy of)).

5.3. The object-environment

From the late Sixties to the early Seventies, the most original contribution of Italian architects on the transformability of the home was offered by the paladins of 'antidesign' (Colombo, 1969, p. 28), as opposed to the furnishing product chosen from the catalogue and inserted at the end inside the home. Joe Colombo and Ettore Sottsass responded to the libertarian

instances of a changed society with projects that distanced themselves from the wall perimeter to offer themselves as poles around which the domestic environment and human activities coagulated.

At the 13th Milan Triennale (1964), Colombo presented a kitchen on wheels, which could be moved anywhere and in which the necessities for cooking, including electrical appliances, and for setting the table for six people were reduced to a cube (75x75x90 cm) made of plastic-coated ash mounted on wheels. The 'Minikitchen' (made by Boffi) assumes a home that is no longer organised into specialised places by function, such as the kitchen, but is available to be lived in informally: it 'frees man from "place" and "time" by following him in space and revealing the aspect of conviviality during cooking' (Favata & Borgatti, 2015, p. 345). (Fig. 9)

Fig. 9
The prototype (Boffi) of Joe Colombo's 'Minikitchen' was presented at the 13th Milan Triennale in the exhibition 'Sezione Momenti di tempo libero: gli hobbies,' 1964. The picture shows the mobile kitchen open and with the utensils it can hold in view.
(Source: La rivista dell'arredamento, (17), 1964).

For the installation 'Visiona 1' at the Interzum Show (Cologne, 1969), the architect instead conceived a flat as a large void in which a block-living room, a kitchen-table, and a bathroom nucleus connected to a circular bed-cabinet are freely arranged, while at Eurodomus 3 (Milan 1970) he proposed two prototypes of transformable furniture, the 'Cabriolet-bed' and the 'Rotoliving', a wall-kitchen with a rotating table (made by Sormani), with which Colombo later furnished his Milanese flat in Via Argelati. In the latter two cases, the furniture is fixed but conceived in such a way as to modify itself and, consequently, change its relationship with the architectural space and people. Finally, as part of the exhibition 'Italy: The New Domestic Landscape' at the Museum of Modern Art (New York, 1972), Colombo once again concentrated the main functions related to living in four blocks (Kitchen, Cupboard, 'Bed and Privacy,' and Bathroom) which, condensed into just 28 m2, make up the 'Total Furnishing Unit.' The elements can be arranged differently in the room according to the needs of the inhabitants and, in some cases, take on more than one function (the sleeping

block can, for example, be used as a living room), presenting a more dynamic way of living that is constantly changing.
In the same New York exhibition, Ettore Sottsass presented the 'Microenvironment,' a living system developed through a kind of container: these are grey fibreglass modules, 30 cm deep, mounted on wheels and hinged together, which contain a wardrobe, kitchen, sink, refrigerator, pull-out table and more. The various activities associated with living are thus assigned to individual objects freely scattered throughout the space. Depending on their composition, they determine a variable domestic landscape, the result of the desires and empathies of the moment: 'The idea,' Sottsass writes in this regard, 'is that the furniture can move closer to or further away from each other, or rather, that one who lives in this furniture can move it closer to or further away from himself or his friends or relatives when he feels like it. So that each one as a private individual or each one as a representative of a group can manifest with the furniture states of his solitary adventure or the adventure of the group because the states, the needs, the dramas, the joys, the illnesses, the births and the deaths also take place in space, they move like sea beasts that shrink or widen to the right or the left, up or down, they coagulate or soften into plankton and so on' (Sottsass, 1972, pp. 162-163).

6. THE CONTEMPORARY PROJECT

In the present day, the transformability of the dwelling continues to be investigated, albeit mainly with accents of uniqueness rather than replicability for all. It is the case of the 32 m2 home in Hong Kong that Gary Chang renovated for himself, and initially for his own family (5 people and a tenant), over about thirty years, starting in 1976. From the first partitions in light partitions separating the personal rooms from a 'living corridor,' the architect moved on to increasingly evanescent divisions, even in fabric, until he conceived a single, accessible space with wall fixtures that, sliding in on themselves, conceal the kitchen, the walk-in wardrobe, and the bathtub. It is a project of total integration between furnishings and architecture, responding to the building compression of eastern megalopolises with a house in continuous transformation despite the narrowness of its surface area.
In his various flats of the Hinged Space Housing complex (Fukuoka, 1989-1991), Steven Holl transforms the interior by linking up with the Schröder Haus. Still, compared to the latter, his wooden panels do not slide but rotate on themselves thanks to a set of hinges, expanding the spaces during the day or reducing them at night [10]. LOT/EK (Ada Tolla & Giuseppe Lignano) also transformed a 210 m2 commercial loft (New York, 1996) into a studio-house using the pivoting rotation of aluminium-clad counter walls, which conceal the bedroom or kitchen. By rotating or shifting equipped containers, on the other hand, the Spanish studio PKMN Architecture manages to provide different configurations for small flats: as the MJE House (Salinas, 2014) or the 'All I Own House' (Madrid 2014) (Fig. 10).

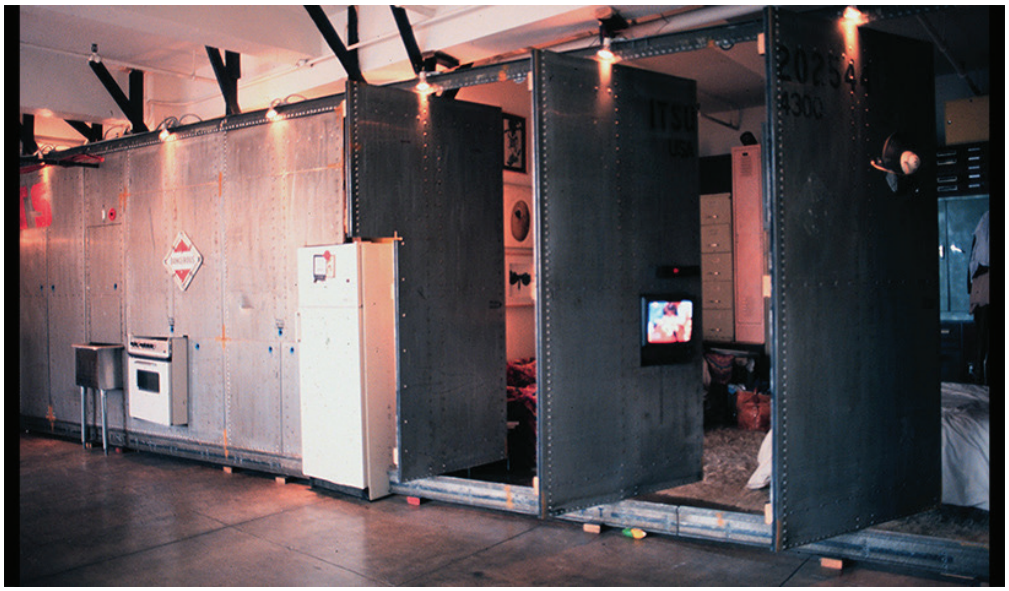

Fig. 10
Lot/Ek (Ada Tolla & Giuseppe Lignano), Miller Jones studio-house, New York 1996. In the picture, the pivoting aluminium-clad counter walls separating (and concealing) the sleeping area from the living room-studio are visible.
(Source: photo © Paul Warchol, reproduced courtesy of Lot/Ek studio).

While these space-modifying solutions were almost an exception in the contemporary residential scene until a decade ago, they have recently been proposed to the public under the motto: 'We create Expandable Apartments' [11]. A trend has been identified for metropolitan cities with very high costs for renting or buying a house that allows one to multiply the available square metres through customised transformable furnishings. Although this is an economical operation (mostly of doubtful spatial value) on a large scale, mainly referring to an affluent clientele and which does not change the dwelling, it highlights a problem: the relationship between quality of space, cost and surface area, which is increasingly impractical for many people.
On the other hand, the forced confinement due to the recent pandemic has highlighted the limitations of flats with limited dimensions or without adequate organisation of the rooms because they are not suitable for several people to live and work together for long periods. One response to the day-to-day difficulties imposed by pandemic confinements may be that of a domestic space that can be adapted to different usage needs (study, work, sleep, etc.) or can be subdivided by means of transformable furniture, sliding walls or curtains, and other 'custom-designed' furniture devices.

7. CONCLUSION

The essay briefly traced a history of furniture that non-permanently modifies the domestic space, emphasising the innovative contribution of certain architects and designers, especially from the 1920s to the present. In most cases, the case studies reported represent design 'exceptionalities:' that is, they represent solutions created ad hoc to solve the home's transformability problem. They are either elitist furnishings (see Gianfranco Frattini's project) or proposals - some have remained on paper - for temporarily subdividing small dwellings or solutions developed as demonstration exhibits in housing exhibitions. Only in a few cases - for example, Gio Ponti's project of a 'house inside the cupboard' or the 1972 experiments of Joe Colombo and Ettore Sottsass - did the proposals imply the idea of being able to mass-produce transformable furniture.
Although the idea of transformability through furniture has only sometimes been considered in home design, it represents a highly topical design theme. It can be an appropriate response to emergencies, such as the COVID-19 pandemic that has forced people to live together constantly in small dwellings, but also to a real estate market that, especially in large metropolises, offers increasingly smaller dwellings at higher and higher prices.
Thinking back to past experiments should allow today's planners to consider that the latter

may change over time according to different needs from their first formulation of the house project. Homes could be equipped beforehand with specific transformable furnishings or light partitions that allow the interior space to be modified and used in various ways should there be a need for greater privacy or to accommodate guests. The case studies considered show how this can be possible, for the most part, even at low cost, but only if there is, from the beginning of the design of the dwelling, an idea of organisation of the interior space that is neither prefixed nor immovable. In the ridge between the commercial practice of space exploitation and the new needs for cohabitation concerning possible future contagions, alternatives must be sought that take up the lessons of the past of transformation and adaptability of the home to build new models of contemporary living.

CONFLICTS OF INTEREST

No conflicts of interest.

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NOTES

[1] 'I'm drawing the layout and cross-section of a traditional bedroom. The large Norman wardrobe and the traditional chest of drawers provide poor, inefficient storage (...) I draw a plan and cross-section of a modern layout: windows, partitions, and lockers. I've saved a considerable amount of space; you can move around at ease; your movements will be quick and precise; the tidying will be automatic' (transl. by the author).

[2] Originally, they were to be made of metal, but the pavilion displays wooden prototypes made by Boufferet in Paris.

[3] The measurements specified by Le Corbusier for a 'casier' are width and height 75 cm, depth 37.5 to 50 cm; or 150 and 75 cm, depth 37.5 to 75 cm.

[4] This was possible in the 1970s thanks to the Cassina furniture company (Meda, Italy) and the studies by Filippo Alison.

[5] It was produced in 1945 by Storagewall, Inc., New York, and exhibited in the same year at the Macy's department store in New York.

[6] Ernesto N. Rogers is not accredited due to the racial laws in force in Italy at that time.

[7] Franco Albini, Renato Camus, Paolo Clausetti, Ignazio Gardella, Giuseppe Mazzoleni, Giulio Minoletti, Gabriele Mucchi, Giancarlo Palanti, and Giovanni Romano. Gold Medal Award.

[8] Gold Medal Award.

[9] Gio Ponti, Gian Franco Frattini, Alberto Rosselli, and Antonio Fornaroli.

[10] Holl (1996, 18) refers to traditional Japanese fusuma for organising the rooms of twenty flats in the building complex.

[11] From the presentation page of Ori Design Studio, New York: www.oriliving.com [Accessed 4 April 2023].

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