REUSE OF MODERNIST BUILDINGS: PEDAGOGY AND PROFESSION

Guest Editors:
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Paulo Providência
Gonçalo Canto Moniz
ZUS: Elma van Boxel
and Kristian Koreman
Atelier do Corvo
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Exhibition
2nd RMB Workshop, Coimbra
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Knowledge without bounderies Norton de Matos School
Joelho 9 integrates a set of events organized in the frame of the European Erasmus Project, ‘Reuse of Modernist Buildings’ (RMB), where scholars and students develop new pedagogical and hands on methodologies to take the challenge of adapting the huge building stock produced in the 20th century.

The educational research on the Reuse of Modernist Buildings will support the design of a new curriculum to train architects on the methods and tools on how to transform buildings and urban areas that were planned according to the modern concepts. To frame the pedagogical approach, Joelho presents and discusses the professional production that offers the best practices on RMB.

The call for full papers opened Joelho to international contributions on the topic that give interesting scenarios on projects and pedagogies in different regions. These contributions were balanced with invited authors that presented their well-known proposals. This was only possible, due to the collaboration of several reviewers that supported the selection of the papers.

Special thanks to Michel Melenhorst, the coordinator of the RMB project, and Paulo Providência our colleague, for the coordination of this outstanding issue, that in not only a theoretical reflection but also an operative tool.

Joelho 9 also presents the 2nd RMB Workshop “Coimbra Modern City today: from functional buildings to community spaces” that joined students and teachers from five European schools in Coimbra during one week, April 2018, in the Santa-Clara-a-Nova Convent

The Reuse of Modernist Buildings dialogues with the artistic approach of Miguel Palma, an inspiring reuse of images of modernist objects (cars, airplanes, boats, bridges) in provoking collages.
Reuse of Modernist Buildings: pedagogy and profession
As the story goes, the once-famous Dutch architect Piet Blom liked to take an evening stroll around the sites of buildings of his under construction to critically reflect on the day’s results. If dissatisfied with some beam, column or other part, he would not hesitate to write an instruction in oil crayon on the offending component for the workers, such as ‘perhaps better not’ (a euphemism for remove!). For Blom, the architect who had coined the term of structuralism, to design was to solve a puzzle, in which all the pieces should fit regardless of style. Later on in his career especially, the decisions he took had nothing to do with fashion; he crafted, planed and sliced on his own half-finished buildings. Whether new or existing, finished or unfinished, it made no difference to him.

When designing new constructions, architects tend to blithely go their own way with regard to style. When working as a designer with building stock, however, you have to take a stance on dealing with the style of your predecessor(s). For a very long time, the correct ‘stock attitude’ was shaped by methodologies developed in the late 19th century. Until recently, within the German-speaking context, the debate was strongly coloured by opinions developed by the art historian Georg Dehio (don’t restore,
and interpretations of the standpoints of the Austrian Alois Riegl, who was also an art historian, and his pleas for a cautious, respectful interaction with different style epochs without favouring one over the others. This was in fact all very modernist, honest and clear, and provided a counterbalance to the 19th-century eclecticism. Similar discourses and attitudes dating from this time can be found in most European countries. Two well-known representatives of this school are Heinz Döllgast (restoration of the Alte Pinakothek in Munich) and Carlo Scarpa.

The huge number of interventions and the increasing importance of reusing buildings together with the changing nature of the type of interventions in building stock call for a broader repertoire and perhaps more effective approaches, particularly when working with modernist buildings from the post WW2 era. Architects need a multiform repertoire of tools and methods to deal with themes such as substance, originality, honesty, and identity.

Of course, many architects have already adopted a critical position towards overly reverent interaction in handling our building stock, especially when the building to be transformed falls under the majority category of ‘everyday modernism’. Jacques Herzog and Pierre de
Meuron, for instance, refer to Eugène Viollet-le-Duc, representing the opposite camp of 19th-century thinkers on preservation. They describe their method as ‘non-dialectic’ with regard to juxtaposing the new with the old, proposing ‘a pinch of Asian martial arts, the Aikido strategy of using the opponent’s energy to gain the upper hand’ (Ursprung, 2003). In their opinion, these tactics should ‘lead to something new which, ideally is twice as effective.’ In his publication entitled ‘Preservation is overtaking us’ (Koolhaas, Otero-Pailos, & Carver, op. 2016), Rem Koolhaas warned against too much protection and preservation. The collage technique as practised by OMA in many of its transformation projects is a powerful architectural tool for dealing with reuse.

These two examples, which could be supplemented with many more comparable attitudes, show how the obligatory beautiful-not beautiful question can be avoided in decisions on reuse, restoration or demolition of our younger building stock as well as an excessively reverent dialogue with this younger heritage, which can easily frustrate or block successful reuse.

The works of Bernard Tschumi, especially his writing and works from the 1970s, offer a more theoretical background that could support innovation in architectural tools and
methods – especially when applied to the reuse of building stock – and also play a role as a catalyst in the debate on the role and function of architecture related to reuse.

In the preface to his book Architecture and Disjunction (Tschumi, 1996), Tschumi reflects on his essays from the early 1970s until the early ‘90s, concluding that what retroactively binds these essays is that ‘While their common starting point is today’s disjunction between use, form, and social values, they argue that this condition, instead of being a pejorative one, is highly “architectural”. Architecture is ‘a sometimes violent confrontation between spaces and activities’. This is of great interest to those who are constantly working on the changing relationship between the use and form of a building.

Tschumi goes on to examine the role of the architect. One conclusion drawn at the end of the 1960s concerned: ‘the adaptation of space to the existing socio-economic structure’. Thirty years later, for many, this might not have changed all that much. Of course, this was, and still is not very satisfying. Tschumi, alongside many others, kept on searching to find out how architecture can function in other ways, and how to understand the issue of architectural change and the effect it might have on society and vice versa.
To do so, it is necessary to go beyond the obvious and the known, because ‘Education and “the advice of experts” are means of maintaining the traditional structures, and questioning them is a necessary step towards any new approach’. One should bypass these limitations and avoid the trap of developing a new architectural language because: ‘If it is doubtful that the development of a new formal language ever had an effect on the structure of society, it is clear that the destruction of the old language had.’

In his 1975 text ‘Architecture and transgression’ (Tschumi, 1976), Tschumi takes a term from Georges Bataille – ‘transgression’ – and places it in an architectural context.

Transgression opens the door into what lies beyond the limits usually observed, but it maintains these limits all the same. Transgression is complementary to the profane world, exceeding its limits but not destroying it. (Georges Bataille, Eroticism) (Bataille & DALWOOD, 1962).

To transgress these rules, we need to find tools to do so. According to Tschumi, there is a paradox in how architecture works. There is the experience of space. This space is real, it can be touched, we can move through it, but that can never
school in the functioning of the social fabric where it was placed, and that the school facilities should be used by the general community. We considered this condition to be an essential support for our proposal for a new entrance to the school, with better coordination and a better relation to the surrounding urban fabric. We proposed moving it from the extreme west of the building to a more central position between the two wings which extend south, also considering that this option allows a reduction in internal movement and a more effective spatial relation between the different constituent parts of the curricular programme.

This space is defined by the building which extends longitudinally, the two perpendicular arms and the south side of the building, in continuity with an open large space used as a car park. We felt that it had unique conditions to give greater clarity and urban effectiveness to the relationship between school and city. Thus, we proposed the creation of two directly coordinating squares: one belonging to the city, instead of the current car park which would then be under this new public space, and another inside the school grounds. The flooring plan for these new squares should be the same so that the spaces could be considered continuous. However, the outer square was not approved due to a lack of political resolve on the part of municipal officials.

The new square inside the school precinct created an outdoor atrium for school users. In the visual finishing of this square, we proposed a new building that would extend this function of welcoming and receiving the users inside. We believed it essential to design the atrium in accordance with the institutional aspect that a school with this size and importance to the local social fabric should represent. In addition to this function, the new library, which, according to the prerequisites defined by the School Estate project should be understood as the heart of the school, a place of great centrality and representativeness, is also located here, alongside the mini auditorium. These spaces can also be used by the non-school community which is another reason for placing them here, as it allows them to be used autonomously from the normal functioning of the institution.

**Reorganization of the functions and internal organization**

This school was used over a long period of 50 years and was managed by various personalities responding to very different educational programmes. It is for this reason that the solutions for functional problems that had arisen were made on a case-by-case basis, without a vision for the whole school. This use resulted in a dispersal of the school’s curricular programmes and functions that we aimed to correct.

The new organization of the building’s functions was designed in conjunction with the school’s directors and faculty and the student and employee representatives. This organization sought to concentrate curricular programmes into organic and functional units.
Fig. 3  New entrance @ José Menezes
Fig. 4  School square @ José Menezes
Fig. 5 e 6  Library @ José Menezes

Fig. 7  New proposal for the distribution of functions @ Atelier do Corvo
PISO 3 (4º PAVIMENTO) PROGRAMA FUNCIONAL PROPOSTO

PISO 2 (3º PAVIMENTO) PROGRAMA FUNCIONAL PROPOSTO

PISO 1 (2º PAVIMENTO) PROGRAMA FUNCIONAL PROPOSTO

PISO 0 (1º PAVIMENTO) PROGRAMA FUNCIONAL PROPOSTO

GRUPOS

PEQ.

SALA

201 202 206

301

203

204

302

205 209

304

202 206

101 102 SALA

OFICINA

SALA DE

EDUCAÇÃO

TECNOLÓGICA

SALA DE

MULTIMÉDIA

DESIGN

SALA

ÁTRIO

GAB...
As previously mentioned, the atrium, the library and informal study room and the mini auditorium are located in the new central body. It is this block that allowed the distribution to the diverse functional units to be organized.

Included in more significant interventions, we should also mention the complete reformulation of the workshop block, the creation and installation of infrastructures of the laboratories, the rehabilitation of the gymnasium, along with a total reformulation of the canteen and the enlargement of the small gymnasium area and roofing for the sports fields to the east. The entire two-storey north-east wing, next to the workshops, was replaced by a new building as it lacked sufficient area, making the classrooms small and inadequate.

**Demolition of obsolete structures**

It was necessary to carry out a series of demolitions in order to implement the architectural solution. Some of them were made to ensure the energy efficiency of the building, others were the result of...
claryfing the new uses of existing blocks, achieve the requirements of regulations and also the need to increase the area of classrooms, gymnasium, cafetaria and refectory.

Altering the main entrance of the school no longer made it necessary to have walls and railings by the entrance, and thus this space can now be part of the interior of the school. This option enables a physical education circuit training route to be created around the whole school.

**Optimizing the use of the existing area and increasing the net area to allow the introduction of new programmes**

The Knowledge and Memory Space, a museum area at the end of the distribution corridor, was slated to be in the former atrium. This body brings together all spaces linked to teaching of the arts and other classrooms which need no special logistics or equipment.

The tympana that close the east portico was demolished, thus making a direct relationship with the new square, separated only by a glass panel with aluminium frame.

The administration department, attendance for parents/guardians and training courses for the non-school community are located in this building. Despite its unusual location, it is central to the school’s functions, a “learning street”, due to the curricular programmes it houses.

A new block was added to increase the gymnasium area, restructure the changing rooms and give the kitchen and dining room the technical areas which they needed to function properly.

The existing workshops block was completely reworked, with no significant changes in volume being made.

Basically, the aim was to clarify the space of the building by concentrating the workshop rooms into nuclei, separating them from the classrooms or design rooms.

The aim was to establish a visual relationship between the workshops body and the rest of the school buildings, replacing the existing wall with glass panes in a steel frame.

New reception atrium with distributes to the various working areas of the school to create a cadenced sequence between the outside and the inside, between the ground level and the upper gallery. This was done through different ceiling heights and measurements of structure and fenestration. The use of the concrete inside, along with iroko wood, gives it the institutional aspect that a place of this nature merits.

The covered sports fields, with a structure of prefabricated concrete beams supported on four pillars in the same material, executed in situ, and a canopy of polycarbonate honeycomb panels, fulfilled the purpose making their use possible regardless of the weather conditions.

A new gatehouse next to the main south entrance to the school does the transition between the two squares, the city and the school ones.

The outside areas were physically enclosed by railings that delimited the plot and by the existing buildings.
Fig. 10  Library, mini auditorium and informal study room atrium @ Atelier do Corvo

Fig. 11  New gatehouse @ José Menezes
The interior garden was designed in conjunction with the school community, to be enjoyed for both leisure and education. It was planted with garden species and small vegetable plots for research. However, this project is not complete, and has not been implemented yet.

**Improved passive and active energy efficiency of the whole construction system and renovation of all infrastructures**

The building had deficiencies in its structural behaviour, particularly serious regarding its energy efficiency.

In this new intervention, the building was equipped with all the technical infrastructures necessary for excellent energy efficiency and compliance with current standards of comfort.

The proposal catered for two generic solutions for facades:

For the facades of pre-existing buildings, the option was to clad the walls with the ETICS system on the higher floors and with GFRC on the ground floor. The application of the two coating systems proposed ensured a level surface.

The use of GFRC on the ground floor of pre-existing buildings, but also in the full cladding of the new constructions around the square, creating a regular cadence for the system of construction and infrastructure, provided a strong and striking image, simultaneously representative and austere, in an attempt to reinterpret the formal message that this school originally transmitted.
Modernization of the Batalha Basic and Secondary School and the Professional School of Arts and Crafts

1. Typological profile

Batalha’s Secondary and “Preparatory” schools, 1st and 2nd cycles, consist of a set of autonomous blocks connected by covered exterior walkways. They have buildings from the 70s, 80s and 90s, which are based on the “type project” models.

At the end of the 1960s, a limited set of “type projects” was developed for high schools, technical schools and preparatory schools. The projects were highly pragmatic in order to ensure speed and economy of execution and were designated Standard Type Projects. The construction strategies dictated an image for the buildings devoid of all ornamentation.

These type projects were constructed from a set of autonomous blocks, allowing the building to be adapted to plots of land with very...
diverse characteristics of geomorphology, exposure and access which were unknown a priori. The different blocks were connected by covered exterior walkways, the layout of which depended on the morphology of the land. This flexibility in adapting to the terrain allowed work to be done on the inner space of the blocks, by means of the unevenness of the various areas that constitute them, leading to a more complete adaptation to the local characteristics.

The Standardized Study of the preparatory school consisted of a block with one and a half storeys where the administration, reception, cafeteria, library and multipurpose hall were located. There were also blocks of classrooms with a single quadrangular floor and an open central quadrangle. Internal movement took place via the teaching spaces.

These solutions were reproduced in various parts of the country, specifically adapted to the size of the school and the plot where it was placed.

In the 80s, a new type project was developed that maintained the structure of pavilions with outside connections via walkways. This project, called “3x3”, consisted of two types of blocks:

1) a two-storey square block with a staircase located in the centre and natural light from skylights, intended for educational and administrative activities;
2) a single-storey rectangular block for the cafeteria, kitchen and student room.

In terms of construction, they are modular buildings with a porticoed structure of reinforced concrete and slabs of the same material, with the walls built in brick masonry, plastered and painted with some apparent concrete features. The roofing is flat and not intended for access or sloped with skylights and lined with fibre cement boards. The windows have wooden or aluminium frames and have a single-glazing pane with aluminium.

2. Project proposal

The main prerequisites of the proposal were:

- Defining the plot of land for intervention by opening up the street north of Rua do Freire and connecting it with the street parallel to Estrada do Casal Novo. This will make space for a road with clear distribution. To this end, the current 1st cycle block will be demolished.
- Creating a square parallel to Rua do Freire, giving visual continuity with the outside space of the school. This act will allow the street to be balanced by the creation of an outside reception atrium for school users.
can be (3) sharpened and that way will help to (4) open your eyes. It finally needs to be (5) hammered or forged with a powerful innovation. Later on, all outcomes of the process can be measured precisely and compared by using the metric ruler printed on the lower edge of the sheet. Obviously, the depicted objects are not directly design tools, they are rather symbolizing larger categories of tools which represent a sequence of fundamental activities in a design process.

Research on the history of physical design tools used by carpenters working in traditional ways dating back to Imperial China is more hands-on. This research has recently been undertaken by Adam Brillhart, a PhD student of Wang Shu at the Architecture Department of the China Academy of Arts in Hangzhou (Brillhart, 2018). As part of their traditional design and building process, each time a building is designed, these carpenters produce a four-sided wooden measuring stick termed “Zhàng Gān” (丈杆, literally: measuring stick) in Zhejiang province, which has all the measurements needed for the construction of a traditional wooden house structure (fig. 8). Markings are distributed on each face of the stick according to systematic knowledge. The stick with these measurements represents all the construction drawings that would be needed to construct any wooden structure (with the exception of animal shelters) consisting of columns, brackets, beams as well as a roof. It is used across the rural parts of Zhejiang and Fujian provinces. Measurements expressing the basic relationships of each transverse frame are transferred to the stick on the basis of a quickly constructed single-line drawing. The operation of the stick during the construction process establishes all the measurements needed to produce every structural element of the building. “The Zhàng Gān is essentially a preliminary full scale realization of the drawing (whether imagined or materialized) in one dimension. Each structural frame is “projected” onto a face of the Zhàng Gān.” (Brillhart, 2018, p. 77) According to Brillhart, these measuring sticks are still in use today. The carpenters continue to dismiss the reduced-scale drawings used in modern architecture for being not reliable enough for their purposes. This design tool epitomizes an interesting link between the purely physical tools used by craftsmen, and the drawings as well as other media produced by architects working in the European tradition.

Other doctoral dissertations were dedicated to “Designing (tools (for designing (tools (for...))))” (Fischer, 2008), or to design tools like models (Wendler, 2013 and Couto Duarte, 2016), color and drawing (Moutinho, 2016), concept and diagram (Stapenhorst, 2016), or a data-based design instrument for floor plans named Space Index (Dillenburger, 2016). Further titles are “Recurrence and Ambiguity, Design Tools of Architecture” (Hartmann, 2016), “Theorie der Städtebaumataphern. Peter Eisenman und Stadt als Text” (Gerber, 2012), “Design Things - Collecting as a Tool for Modern Architecture” (Froschauer, 2019, forthcoming), or, surprisingly, “Hiking as a Method of Cognition for Large-scale Landscape Design” (Schultz, 2014). Richly
illustrated monographs on design tools were published with titles like “The Working Drawing – Tool of the Architect” (Spiro, Ganzoni, 2013), “The Architectural Model – Tool, Fetish, Small Utopia” (Schmal, Elser, 2012), “Planbilder: Medien der Architekturgestaltung” (Hillnhütter, 2015). Frei Otto’s many ways of Thinking in Models was presented in an exhibition and a catalogue publication (Vrachliotis, Kleinmanns, Kunz, Kurz, 2017). Architectural photography as a design tool was discussed in “Architectural Photography and Its Uses” (Fitz, Lenz, 2015), and partly also in “Architektur Fotografie. Darstellung - Verwendung – Gestaltung” (Locher, Sachsse, 2016). Writing as an architectural design tool was examined in “Archiscripts”, the 11th edition of the Graz Architecture Magazine GAM (Gethmann, Eckhard, Wagner, 2015). Looking into traditional tools, not in the sense of design tools but as an inspiration for design is “The Hard Life”, a book on the things and objects of everyday rural life in Portugal (Morrison, 2017). They were collected and presented by British designer Jasper Morrison. In autumn 2011, even the catalogue cover of an architecture editorial house read: “Birkhäuser/tools”8.

As a minimum twelve symposia related to the topic of architectural design and its tools were held in Europe over the last twelve years:

1. “Kulturtechnik Entwerfen”, June 2006, TU Graz, joined with
Almost fully recognized was the topic of design tools in German-speaking academia with a Junior-Professorship and a chair named Tool Cultures, which was established in 2014 at the Architecture Faculty of RWTH Aachen and offered to Carolin Stapenhorst. The last symposium listed above was part of the most wide-ranging research program on design tools so far. This was undertaken from 2010 to 2013 at the Bauhaus-University in Weimar. Directed by art historian Barbara Wittmann, the Internationales Kolleg für Kulturtechnikforschung und Medienphilosophie (IKKM, International College for Cultural Technique Research and Media Philosophy) conducted a research fellowship program named Werkzeuge des Entwerfens (Design Tools), which comprised of 8 researchers in total, i.e. 7 research fellows and a junior professor leading the group. A number of additional external researchers were affiliated and contributed to the symposia and publications produced. One of the goals of this program was to invite research from disciplines other than architecture, including philosophy, art and architecture history, and cultural studies. The final outcome has recently been published as a collection of 13 essays covering a wide and somewhat varying range of topics related to architectural design: “Thinking and Making Tools, Animation, Diagrams, Experiment, Creativity Techniques, Model, Drawing the New, Notations, Parallel Projections, Participation, Grids, Reconstruction, Collecting” (Wittmann, 2018, p. 5, transl. cg).

Probably the most all-inclusive list of design tools so far is to be found in a book first published in 1985, titled Sun Wind and Light, architectural design strategies (DeKay and Brown, 1985, 2000, 2014). Even though the concept of design tools is not discussed in the book, its third edition contains a Design Tool Index of 15 pages (pp. 399–413), indicating all sorts of tables, graphs, design guidelines, building elements and so on. It seems that in the eyes of these authors, almost anything related to building and design can be called a design tool. With the book’s background in the US counterculture environmentalism of the 1960ies, and its broad understanding of the term tool, it could be influenced by the famous Whole Earth Catalogue, published by Stewart Brand (Brand, 1968). The cover displayed the first photograph of the whole earth and the slogan “access to tools”. The broad interpretation of the term tool this catalogue represents includes everything from books (mostly) to claw hammers.
In Search of a Design Tool Taxonomy

The research discussed above represents very different perspectives of design tools; still, all of them are somehow valid. In the end, it seems it is rather the use we make of something, more than the things we use, that defines design tools. The term “design tool” is, linguistically speaking, at times a metaphor without any binding scientific definition, and sometimes it can literally be a physical tool used for design purposes. Its openness emphasizes the potential instrumentality of all things regarding all sorts of design activities. Over the last decade, it has been used for things as different as simple objects, media used for design purposes, cultural techniques, materials, artifacts, computer programs, design activities, or more abstractly, formal principles or thinking strategies. With this in mind, does a term still make sense if it can be used for virtually anything? It certainly challenges our understanding of the term if it is used for activities like collecting or hiking. Nevertheless we can maintain that it does make sense, because it provides us with the very specific perspective of someone who is actively engaged in designing. In addition, it implies the challenge to better understand and represent the large range of possible design tools and uses.

Theoretically, we must conclude, anything can become a design tool, and in many different modes. Already a simple piece of stone, picked up from the border of a street, can be used in so many different ways: For sketching, drawing, in a gesture, throwing (to project…), hammering (i.e. as a medium transmitting an energetic impulse), cutting (depending on it’s shape), as a model (or part of), as a symbol, for aesthetic contemplation (like a Chinese scholar’s rock, Gōngshí, 供石, or a Chinese dream stone from Dali), as a color, material or texture sample, a stepping stone, to combine into a mosaic pattern, a stone garden, a street paving, a wall, an arc, a building, a city, etc. In practice, certainly there is more liberty in the choice and use of design tools than most of us previously imagined, but still many limitations and constraints are to be observed: practical, pragmatic, moral, legal, ethic, aesthetic, economic, intellectual ones.

If anything can be used for design, the next question is how the design tools available can be ordered, categorized, or classified, if we can imagine something like a design tool taxonomy. One of the main difficulties of the body of research produced over the last decade is the apparent randomness of themes and topics addressed. Now the only design tools that seem to be missing are the ones “drawn with a very fine camelhair brush”, or “that from a long way off look like flies”, or those “belonging to the emperor”, to quote from the arbitrary taxonomy of animals Jorge Luis Borges referred to an “unknown (or false) Chinese encyclopedia writer”, when discussing the ambiguities, redundancies and deficiencies of existing classifications (Borges, 1942). This randomness makes it difficult not only to accept and fully understand the concept of design tools, but also to see which areas might have
been overlooked, where contradictions or overlaps occur, and what importance in the larger field of design research should be given to single or groups of design tools, and if there are things currently called tools we should, for the sake of clarity, rather use other terms for.

What this research has demonstrated is that the initial table published in 2007, consisting of two columns, one of visual and one of verbal design tools (see fig. 4), can be expanded in several ways. The design cycle now becomes the core of a map of design tools, but besides the visual and the verbal ones, other groups should address the other senses: haptic, acoustic, olfactory and even gustatory groups could be defined (the latter being of no relevance for architecture though). Overarching all senses would be the group of synesthetic design tools, addressing the comprehensive architectural and atmospheric experience. The most important synesthetic design tool would be the human body, which carries the organs to perceive a situation simultaneously with the five Aristotelian senses, plus all the others, which have been identified since. Each one of these sensory design media/tool groups (A) can be used in many ways, most importantly the two fundamental modes of design thinking: creative and critical, the outcomes of which can be expressed and perceived. These columns become a matrix when combined with the spectrum of possible design use/tool categories (B), ranging from the immaterial through the medial to the most basic material uses of design tools. Without implying a hierarchy, the continuum would start on the immaterial side with philosophies (including ethics and aesthetics), theories, concepts, ideas and narratives, producing or influencing, next ways of design thinking like creative and critical, visual and verbal thinking. Then there would be the ways of design acting, on a more abstract level the cultural techniques and more concretely the media uses those are based on, which always are means of perception as much as means of expression, then all sorts of appurtenances, machines and physical tools. The works and artworks produced by these means would be the next category, followed by the simple objects (like for example bricks, boards or beams) and raw materials available for design uses.

In conclusion, we can propose to order design tools in a matrix where the columns are defined by groups of design media/tools (group A), grouped regarding the senses they address, and the rows by design use/tool categories (group B), according to the possible, observed or imagined uses we can make of them (fig.9). The media/tools (group A) are mostly the ones closer to the project and the manifold ways of representing it, the use/tools (group B) are nearer to the designing individuals and the things available to them. Theoretically, each design medium/tool has the potential to address all senses (but would have a tendency towards one or two of them) and to be used or reflected in all the different design use/tool categories mentioned above, from the most basic material ones to the most philosophical. Addressing these ambiguities might help us to be a little clearer and more explicit in the
many ways design tools are currently discussed. Even though this matrix needs to be considered as an open one, and one that theoretically has infinite numbers of columns and rows, and each column could also become a row and vice versa, the grouping of design tools according to (A) the senses they address and (B) the uses we make of them would allow us to better understand the structure of the research field and its inherent ambiguities.

**Design Tools for the Reuse of Modernist Buildings**

Even though some still maintain that, “the drawing is the architect’s tool,” it is obvious that the complexity of contemporary architecture practice requires more design tools than just one. Even nowadays, the way the term drawing is used encompasses everything from sketch, scale drawing, axonometric or perspective views to photorealistic renderings created by the latest software. Besides that, architects produce different types of scale models and write all sorts of texts, ranging from project descriptions to entire books, to develop and convey their ideas. They routinely rely on the calculations of engineers and the work of professional photographers. Discussing the use of drawings, models, sketches and computers, Álvaro Siza for example explains that those design tools have to be used in complementary ways, because each of them can be misleading (Couto Duarte, 2016, Anexos p. 34, 36). The contents of his archive at the Serralves Foundation in Porto reveal the instrumentality of “correspondence with his clients, the photographic record of the places where the works are to be built, relations with regulatory authorities and the opinions of the multiple actors involved in the construction processes, the models that support the perception of the proposals, the minutes of meetings and reports of the tensions arising at the building sites” for Siza’s architectural production (Tavares, 2017).

The research discussed above reveals a broad, at times confusing, range of design tools and practices used today. Here an important question comes up: How can we find the right design tool for a given task? The open matrix described above might be useful for that purpose, besides from providing a more coherent way of ordering and categorizing design tools (fig. 9). Mapping the spectrum of tools/uses on the categories of tools/media and vice versa allows one to search systematically for the most promising combinations. Showing only the larger or more general categories of tools, the matrix already adds up to 36 rows for tools/uses and 40 columns for tools/media, which combined result in more than a thousand different possibilities. Rows and columns left without text are indicating the openness of the matrix; they can be filled in as needed. The matrix would endlessly expand by going deeper into detail within the categories (for example the category of 2D drawing would then split up into plan, section, elevation, details, in different scales...).
Now we can use this matrix to tentatively map those combinations of design tools/media with design tools/uses we consider most interesting or especially useful for design tasks related to the reuse of modernist buildings. In the matrix diagram (fig. 9), those are marked with blue color. Red areas indicate combinations that are more conventionally used in architecture practice. Because of their availability, the habits and conventions of our profession they are often the first choice. Those “standard tools” are mostly in the group of visual design tools, used in many different ways, plus verbal descriptions and calculations. They represent a mindset that usually develops ideas for structures that do not exist yet, because of that it has to rely on rather abstract and reduced ways of representation. On the other hand, with a design for the reuse of an existing building, a whole range of other design media and uses comes into reach, which is much more concrete, complex, and closer to multidimensional reality. Obviously, the existing building itself is not only a challenge but also a great opportunity.

![Fig. 9 Open Matrix of Design Tools. Red: design tools use/media combinations which are conventionally used in architecture practice; Blue: combinations which are of additional/special interest for the reuse of modernist buildings (cg, 2018)](image)
It represents both, a wealth of information and possibilities, to be explored in combination with a series other than “standard” design tools. The most unavoidable constraints are represented by the existing structure, its history and pretended future uses.

To understand an existing building as a design tool requires adopting a different mindset, one that embraces the experience of immersing oneself in the built space and the atmosphere it creates, using one’s own body with all its senses as an exploratory device for synesthetic data collection. The existing building, which at the same time is the representation of an architectural project (awaiting improvement) and the project itself (demanding respect), invites the practice of design in close contact to a given spatial reality. A building also is an invaluable source of information, to be experienced, discussed, criticized, sketched, drawn, photographed, or 3D-Laser-scanned and transferred into BIM software. What is specific in modernist buildings are the modern, and sometimes problematic materials used (often in minimalized dimensions), a design narrowly conditioned by previously given functions, which makes a change of functions more difficult, and aesthetics that at times can be perceived as problematic.

On top of that, the existing building comes with a history, with (maybe forgotten) narratives based on its creation, and initial uses, which later on became obsolete. Because it is modernist, the building must also have some kind of relation (which might be strong or weak, positive or negative) to the architectural theory of the time it was created. This immaterial part of the building can become an important resource for the reuse-project to develop. It offers the possibility to use the verbal design tools in order to create a narrative based not only on its history and previous uses, but on the discussion, critique and theory of modernist architecture itself. A narrative, which then could become instrumental to establish the direction and the meaning of the reuse project.

**Conclusion**

Over the last decade, the question of what design tools are, how they work and how they can be used for architectural design has been responded to in many ways. Research on design tools since 2007 sums up to more than 25 books published, most of them doctoral dissertations, conference proceedings or exhibition catalogues (individual papers were not considered here). An evaluation of these publications led to the conclusion that the term design tool is mainly understood in two ways: Firstly, the visual, verbal, combined and synesthetic media used for design, and secondly the broad range of material, medial and immaterial uses made of them. An open matrix based on these categories has been proposed which can now be used to map, and identify promising combinations of design media and uses.

Applied to a reflection on tools for the reuse of modernist buildings, the matrix shows that besides the usual visual and verbal design tools,
synesthetic media like the building itself, the atmosphere it produces, and the human body exploring it are additional design tools to utilize, as much as critique, discussion and theory of modernist architecture. A narrative rising from the buildings history set in relation to modernist theory could become a strong conceptual basis for a design process.

For further research, the proposed matrix still needs to be tested, refined, and probably expanded. It can be used to map and compare existing design tools, or to identify areas for future research. Used within a design process, it may help to map the ongoing activities, and to identify the next steps to take. The matrix will hopefully raise the awareness for and facilitate positioning within the large range of available possibilities of design.

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7. The author would like to thank Dr. Adam Brillhart for his advice on this topic.

8. See: https://issuu.com/birkhauser.ch/docs/birkhauser_tools, accessed July 21, 2018


13. The author would like to thank Professor Thomas Fischer for this suggestion.

14. The author would like to thank Shayne Jones for this clarification.

15. See for example Peichel, 2013
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which the use of public spaces is the main determinant. We therefore propose (Fig. 7): the transformation of some existing sidewalks into accessible pedestrian paths with smooth, levelled and non-slippery pavements (for wheelchair and all users); introduction of some ramps for accessibility; handrails on existing stairs for a more comfortable and safer use; maintenance of the vintage benches and introduction of new ones (in stronger materials, for obese people) under tree shadows, because it is an important asset for public space use since older people get easily tired and need to rest often; dedicated car parking places for people with impairments; some more zebra crossings; the introduction of traffic lights with sound timer at busier streets for safer crossing; drinking fountains in the park. The introduction of all these elements is totally compatible with the existing public space due to its clever original design, thus not requiring major changes in infrastructural works. But one essential public facility (Hanson, 2004) that is still missing is public toilets: its absence in public space restrains older people from going far away from home. To solve this problem, we propose to create this facility inside the existing market warehouse, therefore providing a free public alternative to private ones in existing cafés or restaurants.
Avenida dos Estados Unidos da America, today: age-friendly apartments

We will consider for the purpose of this paper just the apartments of the five taller buildings (10 floors each) that face the avenue perpendicularly. While, therefore, in the previous case study we considered the reuse of urban space, now we will analyse in which ways the interior spaces can be adapted for older residents.

The longer life expectancy that modern medicine, as well as new habits and lifestyles, have brought to all of us (WHO, 2002), means among other things that people will be able to live longer in their homes and apartments – that is, if their spatial features allow it. In fact, most people would rather remain in their homes (Machado, 2007; Moreira, 2008) instead of moving into elderly facilities, so it is important that the space layout allows that to happen. Looking at the plan of the apartments at Av. E.U.A. (Fig. 8), we can conclude that the rational organization of the (not so big) spaces allows the access (dotted lines) and rotation (circles) of wheelchairs, with no need for demolitions. The only spaces that would require major adaptations would be the bathrooms and kitchens. But even in these complex and technical spaces, the most important aspect is to have the infrastructures (sewage, drains, water) in the correct positions, considering the expensive implications it would bring to the ten floor vertical pipe system. Thus, taking that into consideration, we can see that minor adaptations would allow flexibility of use throughout time for different people, of different ages, with different needs (Fig. 9): opening the door outwards would be recommendable for better circulation and safety (in case of need to break in for help after an accident); the shower placed in the centre, with a pavement drain, could easily have the cabin removed to be turned into a roll-in shower, accessible on a wheelchair; the double washbasin could be turned into a single basin, thus providing space to park a wheelchair parallel to the toilet. All these changes would not require alterations in the main vertical sewage pipes of the building, so they could be done individually according to each resident’s needs and decision. Actually, the proper positioning of each device would later require just the addition of supporting bars (Fig 10), easily removable later when not necessary anymore.

The kitchens, designed in a modernist “functional corridor” layout (Fig. 5), could be quite easily adapted (Maguire, M. et al, 2011) as well for the worst-case scenario, which will always be the wheelchair user needs (Fig. 11), without changing any walls. The solution would thus lie in the distribution and design of the kitchen cabinets, reminding us that the most important and basic need is to provide empty space under the counters so that a person sitting on a wheelchair can fit the legs and approach the counter, the stove, the taps. For that purpose, we think that movable cabinets on wheels could be used to fill the space under the counter and, whenever necessary to be used by someone on a wheelchair, they could be removed without changes in
the infrastructures. The lower cabinets should all be provided with drawers the person on a wheelchair can easily access (but also any other adult can, with the great advantage of not needing to kneel or bend over to catch something in the distant back of the low cabinet). The upper cabinets, if necessary, can also be articulated and provided with a suspension system that brings down the interior shelves. Anyway, the main purpose is to provide flexible solutions that everybody, even the most fragile persons, can use with autonomy, thereby allowing them to remain in their apartments for as long as they want or their health allows: apartments for life.

**Avenida do Brasil, today: residential facilities for intergenerational living**

This group of buildings has special features that would justify turning some of them into intergenerational residential facilities: its location, very close to the university campus, makes it very attractive for university students, while the vicinity of many urban facilities and trading places makes it very comfortable for older people (Fig. 12). Taking into consideration the lack of student housing in Lisbon and the very large dimensions of most of the apartments, which are now empty nests for lonely older people (whose children have grown and left home to start an adult life), matching both groups could be a good opportunity for urban and social renovation.

Considering that there are 8 apartment buildings (with 7 floors each) of two types, A (5 buildings) and B (3 buildings), and 7 commercial
buildings (with ground floor only), we will consider for this proposal the reuse of type A only because they have the largest apartments. Starting at ground floor (Fig. 13), therefore, all existing spaces would be preserved and reused: the main entrance, in its glass-box features, would become a waiting lounge where residents could sit while they wait for a taxi, a friend or a relative, comfortably watching life outside; the storage space on the left would become a parking place for bicycles and electric wheelchairs; the doorman’s apartment, on the right, would become a small reception (with a window for visual control of the lounge) and office for the new service providers working in the building, with a nurse/treatment room/doctor’s office connected to the sanitary facility. No demolitions would be required.

The existing typical floor clearly corresponds to other times (1958) and a society when families were big, with housemaid help: a domestic office at the entry (which could become an extra bedroom), a big living and dining room with a generous balcony, a transition hall connecting to the family dining room, and the corridor to the children’s and parents’ bedrooms and bathrooms; a service entrance door connected to the stairs was dedicated to the housemaid and deliveries, opening directly to the kitchen and pantry, to which the housemaid’s bedroom and sanitary facility are connected. This bourgeois housing structure is demonstrated by the simplified Space Syntax (Hillier and Hanson, 1984) analysis map and graph that show a deep space (seven
levels) and the maid’s facilities quite segregated from the rest of the house. Nevertheless, this can become an advantage for contemporary intergenerational reuse: these large apartments could easily be shared by university students and its original older residents, who would become hosts, benefitting from younger people’s company and help. This kind of experience, exchanging lodging for company and casual help, is not new and has proven to be successful (Fundação para o Desenvolvimento Social do Porto, 2003).

In our case, it would be a quite natural solution to organize the apartment into two sectors, eastern and western (Fig. 14). Students would have 3 individual bedrooms, sharing 2 sanitary facilities (the former corridor to the master bedroom is now reused for a shower space) and the big living room, good for group work and leisure, with the balcony. Older residents would use the western spaces: the master bedroom would gain a private bathroom (fully accessible with a roll-in shower for wheelchair use, in the worst-case scenario) and direct access to the smaller living-dining room and kitchen, therefore keeping within a short range the essential spaces for their daily living activities (Zimmerman, Sloane and Eckert, 2001), which we as architects must be attentive to (Buse et al., 2016). They would still keep for their own use the extra small room (the former housemaid’s bedroom), quite ideal to host relatives overnight or even a nurse or another caregiver. Nevertheless, some spaces would be shared by all, older and younger: the entrance hall that can immediately distribute the two parallel paths with full autonomy, and also the kitchen, pantry, and the sanitary facility. With this distribution and very minimal interventions (just closing and opening doors to connect existing spaces in a different way),
older and younger residents could have simultaneous activities without disturbing each other’s privacy and yet keep company by sharing the same big apartment.

We have mentioned before the importance of active and healthy ageing (WHO, 2002), which implies that people should not remain indoors (both young and old) but rather keep active, going out and socializing (Carvalho, 2017). But for very old and fragile people, this could be a problem though, because very often the sidewalk pavements are uneven, slippery, or poorly maintained (Machado, 2007), thus going out becomes a hazard and a risk. Fortunately, these buildings have flat roofs, where we can create an alternative for that (Carvalho, 2013), at least for the days when people do not feel like going outside the building, but can still socialize and do some soft exercise (Fig. 15). Back in 1958, this flat roof was dedicated to individual laundry and drying spaces for each apartment (Fig. 6) which the housemaids used on a daily base, being totally abandoned nowadays. Our proposal is accordingly to demolish those small partitions of the laundries and create some common spaces for all residents, so that this top floor can become a service and leisure area. We propose the creation of outside terraces where residents (young and old) can sit and socialize while watching others exercising on the walking path (Fig. 16), as well as the creation of a restaurant (Fig. 17) where residents could come and eat whenever they did not feel like cooking or eating alone. A small gym (Fig. 18) would be an attraction for residents of different ages, for some in-house exercise and socialization. A lounge (Fig. 19) would also be an alternative space to the terraces for indoor socialization, internet browsing, book exchanges or just friendly talk. The restaurant and all the other facilities would be managed and maintained by a professional team based on the ground floor office (Fig. 13), taking care
of the whole building in an assisted living facility logic, also providing some healthcare and psychological support, for which the vicinity (Fig. 12) of the Nurse School and Psychology College is very convenient, facilitating internships and protocols to be celebrated with the residents’ community.

**Conclusion**

In terms of reuse of modernist spaces, these three case studies can provide us some conclusions:

**Urban space** — the modernist option of wider and more visually transparent public spaces, with highly qualified landscape design, has proven to be a resilient solution, still used and appreciated today, almost seven decades later. In terms of reuse, the required elements and facilities can be easily added because the main asset exists already: public space. Therefore, it will be easy to add some more public benches, some dedicated car parking places for people with impairments, drinking fountains, ramps, handrails on stairs, traffic lights with sound timers, and zebra crossings. From the existing organic web of pedestrian paths, some should be selected to be repaved with smooth, even and non-slippery pavement connecting the main points of the neighbourhood. The existence of commercial spaces on the ground floor of the apartment buildings is a plus for urban life with the mix of functions, providing the possibility of new uses according to new needs.

**Apartment layouts** — the clear modernist organization of interior spaces makes it quite easy to adapt to new accessibility requirements, like wheelchair use (in the worst-case scenario) or walking aid devices (walkers, walking sticks, crutches, etc.) that older residents sometimes need even inside their homes. In fact, we can conclude that most spaces, even when not too big, are wide enough for accessibility, presenting a quite straightforward layout that helps older residents move around. The only spaces that will require deeper intervention will be bathrooms, where the doors should open to the outside (for safety reasons, in case of need to break-in for help) and bathtubs should be replaced by roll-in showers with pavement drains. The other sanitary devices, whenever correctly located, would just require the addition of supporting bars. Therefore, the strategic location of all sanitary devices is key for future flexibility of use. In the kitchens, accessibility has not only to do with wheelchairs, but also the simple reaching out to get something on a top shelf or lower cabin can be a daily strain. Therefore, ergonomics should be a key concern in kitchen design both for the free space and especially for the cabinets and furniture.

**Residential facilities** — modernist apartment buildings, whenever conceived for simple communal life, that is, having some shared spaces belonging to all residents, could be transformed into assisted living facilities because those common spaces are the basis to allocate the required services that will support the new needs of an ageing population. This way, some basic spaces such as a restaurant with
kitchen, a lounge, a laundry, and a treatment/nurse room, could be introduced in the existing spaces, reusing common areas such as the doorman’s apartment, storage spaces, and flat rooftop spaces. Whenever the larger dimensions allow it, some intergenerational and cohousing experiences could also be introduced, provided that the previous match of younger and older residents is supervised by psychology experts who should follow up the new housing partnership.

Considering these different features, we would therefore conclude that the reuse of modernist spaces to be adapted to older residents is a promising future for our ageing societies, preserving in new ways a highly qualified modernist heritage.

Fig. 16  Proposal for rooftop: terrace and walking path. Author: António Carvalho, 2015.

Fig. 17  Proposal for rooftop: restaurant space. Author: António Carvalho, 2015.

Fig. 18  Proposal for rooftop: gym. Author: António Carvalho, 2015.
A small gym space would attract people of different ages, promoting interaction and socialization.

Fig. 19  Proposal for rooftop: lounge space. Author: António Carvalho, 2015.
A relaxing area to meet neighbours, chat, browse the internet, and exchange some books and ideas.
Knowledge without bounderies
Norton de Matos School
Tutors
Ana Goes Monteiro (UNICAMP), Gonçalo Canto Moniz (UC)

Students
Gizem Mentese (ITU), Ivan Brito (UC), Jameele Eranpurwula (UA),
Monika Tylutka (UC), Ruby Ingwersen (UA), Tildem Kırtak (ITU)

Introduction
Norton de Matos School is nowadays a unique facility in the urban grid of the Norton de Matos Neighbourhood, in Coimbra. Located on the top of a the avenue, it is, without any doubt, an important nodal point. Although, with the ageing of the resident population in its surroundings, the number of students has been continually decreasing.

In this context, the challenge proposed to the students was to consider the Norton de Matos School as an urban facility capable of establishing the articulation between different parts of the neighbourhood, and as so, making the urban transformation that is necessary. Transforming it in an open school, opened to the community, so it can fulfil again is nodal role, and with mixed programs, identifying itself as a singular object in a defining axis, is in the base of thought.

The project aimed to be the more participative as possible, facing the needs of the population, students and teachers. Therefore, visits to the School and the neighbourhood were performed in order to understand the building and the urban environment. The first idea was to work the relation between the school and Vasco da Gama street.

In the next day, the team visited the school again. This time, to realize a series of activities with the students, children of 8 years old, which come from very different social realities. The first question made was: What would you change in your school? The answer was almost unanimous: we would reform the spaces related to leisure and sports.

The team of students could then realize a deeper diagnostic and identify the risen opportunities: school as a referential point; the existence of an open space; the use of school spaces by the citizens during the school counter-periods of classes. With these thoughts, the team could initiate the design proposal, where they prioritized the public space; the security of children; the leisure areas required by them; different scales for use by children and adults; the combination between public spaces, semi-public and of restrict usage to the School Norton de Matos community.

The walls, which usually, were seen as urban barriers, were in this case the boosters of the proposal, and upon which, the scheme unfold. The school walls define the frontier between the public/private and neighbourhood/school and the project explored the transition of spaces.

Since sport was an early concern to the School users, it had a preponderant role in the design decisions. The proposal made itself use of the altimetrical differences between the several interior levels, to guarantee diverse equipment and several ways of appropriation.
of space. Considering that most users of Norton de Matos School are children, the project took in consideration the scale and space relations, that are quite different from adults. The entrance to the schools used as a transition between them. All spaces are (re)think to the children so they can have spaces to play and to stay.

The school, instead of surging in its context as a barrier, transforms itself in the connection point between spaces, instead of closing in itself, passes to belong to the children and to the neighbourhood.
1. image elicitation

The children were given a model and icons of several activities, so they could point out where they like to do what. Not only did this give us visual data, but it was also a

2. student generated photo's

Giving the children a camera was a great tool to make us see through their eyes. They were limited to take three pictures of what they like inside and around the building.

3. student generated drawings

Furthermore, we asked the children to make a drawing of what they do when playing. This way we got a very extensive picture of their favorite activities. It was striking that on half of the drawings a football field was

Strengths
- Located at the end of an important street
- Large open space
- Open groundfloor

Weaknesses
- No facilities
- Separated staircase
- High windows in the corridors

Opportunities
- Possible reference point
- Wide space for a playground
- Only used during daytime, not in the evening

Threats
- Different scales for children and adults
- Safety for the children
- Combination of the semi-public school with a public surrounding
An architect's role is not to provide a complete solution, but to provide a spatial framework to be filled in by the users.

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