# Education for Adaptive Reuse — The TU Delft Heritage and Architecture Experience

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The Section for Heritage and Architecture of the Faculty of Architecture and the Built Environment at the Delft University of Technology specializes in architectural education for adaptive reuse of heritage buildings, with a specific focus on the built heritage of the 20th century. Our approach combines architectural design and technological knowledge with an approach that places values as central informants. Here we present our approach, explore the past and project a future evolution of our educational methodology. Finally, we reflect on the lasting relevance of the tangible and intangible heritage of the recent past as aim and source of our educational practice.



## Introduction

Educating future architects for the preservation and adaptive reuse of, especially, the built legacy of the 20th century, is different in essence from what Franz Graf (1954–) calls the "chronological process of genesis" in which "new construction begins with programmatic goals and ends with a finished object...". In contrast, adaptive reuse requires that "...we start from the existing object in order to arrive at a mode of existence that is in keeping with that object".[1]

This challenge of education for preservation and adaptive reuse, especially for the built legacy of the 20th century, has been explored at various International **docomomo** conferences, the last being the "Educating for Preservation and Reuse" session of **docomomo** 2018 held in Ljubljana, Slovenia. Despite decades of exploration, the challenge remains:

> *After three decades since the founding of* **docomomo***, education continues to be an essential matter when thinking about the future of modern heritage, but today it requires a critical reflection on the conceptual and methodological changes we need to face in the present context of complexity.*[2]

The challenge of educating for the preservation and adaptive reuse of the built legacy of the 20th century is compounded by the integrated nature of these buildings: conceived as composed of inseparable components. To add to the complexity, technology itself was often chosen for what it represented. These buildings therefore often have a preprogramed message that goes beyond architectural form. Understanding the way that technology is integrated with architecture is often essential to discovering this essence. The built legacy of the Modern Movement presents us with an architecture of matter intertwined with meaning for which an integrated approach is needed.

In education this calls for incrementally developing the capabilities of students within the strictures and limitations of an institutional program. The adaptive reuse of built heritage requires an understanding of both the ideas that generated the built fabric as well as the values that have accrued over time. At the same time students need to be able to make sometimes difficult decisions regarding where and how to intervene in the physical built fabric and spatial structures. These decisions need to be taken in a complex environment where the focus on sustainability and energy use reduction is becoming increasingly urgent, with the danger that if the built heritage cannot answer to ever-increasing demands, they will be sacrificed for new construction.

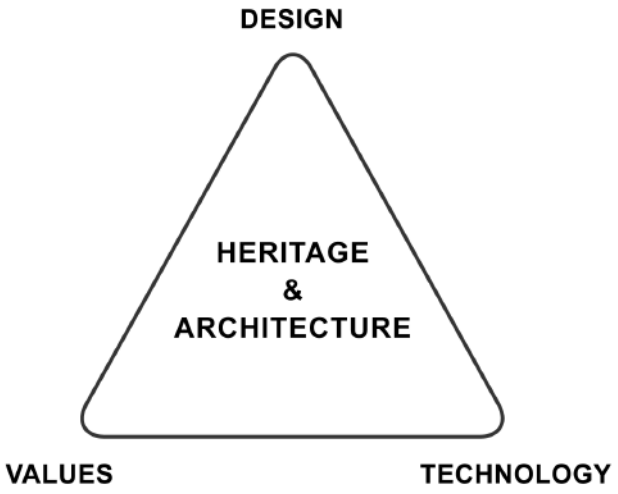
The Section for Heritage and Architecture (HA) of the Faculty of Architecture and the Built Environment, Delft University of Technology has taken on the challenge for education for adaptive reuse and maintains a continued focus on the challenge of preservation and adaptive reuse of Modern architecture. In this article we will outline the history of the development of our educational program, the process we have evolved, outline its main steps and features and reflect on the lacunae that need to be addressed.

## The Section for Heritage and Architecture (HA)

> *Conservation requires the ability to observe, analyze and synthesize.*[3]

Current conservation education at the TU Delft flows from long tradition. It evolved from addressing traditional architectural restoration practice (the maintenance of the status quo through the classical restoration and maintenance

**01** Students investigating the unique windows of the former US Embassy in The Hague, the Netherlands, by Marcel Breuer (1959). These kinds of engagement often challenge students' pre-existing positions on, for instance, material authenticity and present the dilemmas of preservation and re-use. © Nicholas Clarke.




**02** The Heritage and Architecture Triangle: three chairs of Heritage and Design, Heritage and Values and Heritage and Technology together form the section for Heritage and Architecture. © HA, TU Delft.

perspectives), to one of addressing conservation through adaptive reuse as a valid and proven method. This gradual shift has also focused our attention more and more on the built legacy of the 20th century.

An important milestone in this process was the creation of ®MIT in 2006. ®MIT continued to teach restoration, but addressed research and education in Modification, Intervention and Transformation of the built environment. These areas defined the field of enquiry of three aspects according to levels of scale: *Modification* focused on the use of materials and technology, *Intervention* on adaptive reuse and redesign of a building, and *Transformation* investigated the urban structure. These scale aspects structured design education: students were expected to undertake analyses of a building, its urban context and its technology. This analysis included the history of the design and the architect/s associated with the building, as well as changes that were made or occurred over time. The past and present served to inform the student's choice for a new program for the building, providing a springboard into the future. The investigation into values was implicit to this process, but experience soon highlighted the need to make values an explicit part of both investigation and education. The transition from ®MIT to HA in 2014 maintained the wide focus on scale levels, but restructured in three domains that together form HA: Heritage and Values, Heritage and Technology and Heritage and Design. These three chairs collaborate both in education and research, forming an integral focus on both the tangible and intangible.

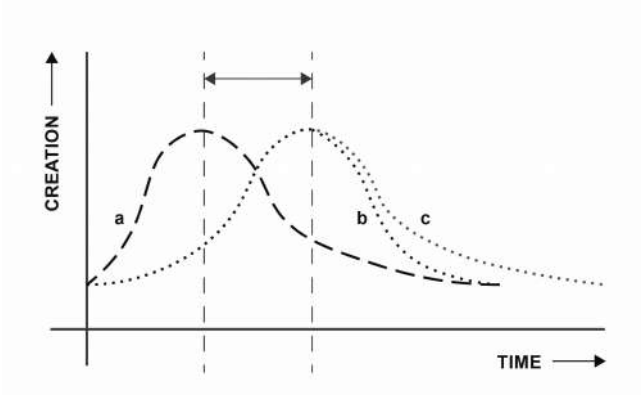
At HA we now expect our students to develop design proposals based in an understanding of the building, its technology and values. Further, the design should also result from the application of technology and present an active response to values. The HA approach is underpinned by the urgency of adaptive reuse, not only as an economically viable strategy, but as an essential strategy to limit environmental impact, nurture social resilience and contribute to the triple bottom line of sustainability. Education at HA is embedded in broader social thematic because "…architectural heritage education is essential to understanding sustainability, the social context and sense of place in building design".[4] HA does not shy away from demographic challenges presented by changing inhabitant profiles of, for instance, social housing in the Netherlands, and changing conceptions of value, space, time and reality. But the complexity of adaptive reuse within a real-world socio-economic and environmental scenario can prove to be too challenging for students. As educators we need to be able to guide students through their first and repeat adaptive reuse exercises that serve as a basis of their architectural education. We have over time developed an educational program as well as a methodology to assist students, who are novices, to demystify the process of analyses for valuation and adaptive reuse design and guide them in their design decision-making.

## The HA Method

The HA educational process aims to increase in complexity over time and stimulate individual independent growth. With this in mind, an education matrix was developed collaboratively by the three HA chairs, progressing from group work to individual exploration.

HA focuses on Masters-degree education. The Masters education spans two academic years, the first year dedicated to the MSc 1 and MSc 2 as distinct courses. The MSc 3 and MSc 4 together form the graduation project. In all these courses, HA presents students with a choice of at least two studios, of which one always focuses on the built legacy of the 20th century. We always select sites for investigation where a real-world question exists, often in collaboration with outside institutions or property owners. In the MSc 1 many of our students are introduced to built heritage as a theme for the first time. Many are international students for whom this is their first course at the TU Delft. We, therefore, select not overly complex buildings for them to study and modulate. They are also assisted by the presentation of a predefined brief and delimitations [20 weeks]. The MSc 2 is based on (group) research. It focuses on specific topics and typologies, for instance obsolete churches, industrial heritage or ideas such as the mid-20th century Dutch Neighborhood idea or the problem of depopulation, for which individual designs are developed [10 weeks]. Cases selected for the foundation courses (MSc 1 and MSc 2) are chosen to include pre-existing valuation reports or building-archaeological reports to expose students to values so that concept and form as first responses as a designer also include other values as an informant.

In the MSc 3/4 individual graduation project, more complex situation study sites are selected. This can take the form of a complex urban location or a more difficult adaptive reuse problem for which students need to develop a proposal that balances conservation with adaptive reuse. MSc 3/4 students are required to develop their own appropriate briefs, based on the analysis of the urban context,




**03** A comparison of the "creative curve" when designing (a) new buildings and (c) adaptive reuse design aimed at preservation, which often causes a certain level of delay in the design decision-making. In case the end date is fixed, there will be more time pressure on the phase after decision-making in order to complete the design development (b). © HA, TU Delft.

the building and its values, as well as the socio-cultural and economic and environmental context of the project. The education process develops from independent analysis on the basis of separate realms (Architecture, Building Technology and Values) to, at the MSc 3/4 level, integrating these into a single position on the inseparable values presented by the physical fabric, intangible qualities and associations of the case at hand. The final aim is a design based in a defined transformation framework that, in turn, is supported by critical analysis, synthesis and reflection, often through scenario-based iterative testing of design ideas. Student proposals are often presented to owners/municipal authorities, monuments care officials and communities, who provide real-world feedback to their hypothetical proposals. Communication is essential, also to present the evidence-based choices and logical argumentation that led to the proposed reuse interventions.

A challenge we face in our educational practice is that the HA courses form part of the larger Architecture track of the Faculty of Architecture. Students are free to migrate between the various Master courses, which means that not all students participate in all the HA courses in sequence. Often students enter the HA MSc 3/4 without having undergone any of the HA MSc 1 or MSc 2 courses (or having participated in the BSc 5/minor course presented by HA in the faculty-wide bachelor degree). This freedom enriches our design studios because students bring with them knowledge from different disciplines, but conversely provides HA with a dilemma in terms of educational continuity. It mandates a back to basics position at the start of each of the MSc 1, MSc 2 and MSc 3/4 and challenges staff to assist students to develop defendable evidence-based positions and cohesive design proposal in, in for instance the MSc 3/4, a period of 40 weeks. Group work at the start of each course has proven to be especially useful to bridge this gap.

### The HA process

At the 2018 **docomomo** "Educating for Preservation and Reuse" conference session, Wessel de Jonge (1957–) stated that: "One of the major challenges in educating professionals in modern conservation is the interpretation of the cultural values of structures that have been erected in the recent past, whether icons or ordinary buildings".[5] Modern conservation is short for the conservation of the heritage of the Modern Movement and the 20th century in general.

HA initiated a didactic experiment in our MSc 3/4 graduation studios in 2016 to test a process designed to assist students, including those without any background in heritage theory and practice, through a process that leads them from analysis to synthesis to evaluation to reflective criticism. Our position is that a successful adaptive reuse design aimed at preservation often asks for a certain level of delay in the design decision-making until in-depth analysis of the original design ideas, the spatial structure, the technological nature and state, the evolution/changes imposed by people etc[6] and the heritage values of the existing building have been undertaken.

The process – described in Marieke Kuipers and Wessel De Jonge[7] and further explored in Nicholas Clarke et al,[8] — aims at connecting matter and meaning; the physical urban and built structures encompassing inseparable components, with the socio-cultural, historical and economic values in a structured graphical process.

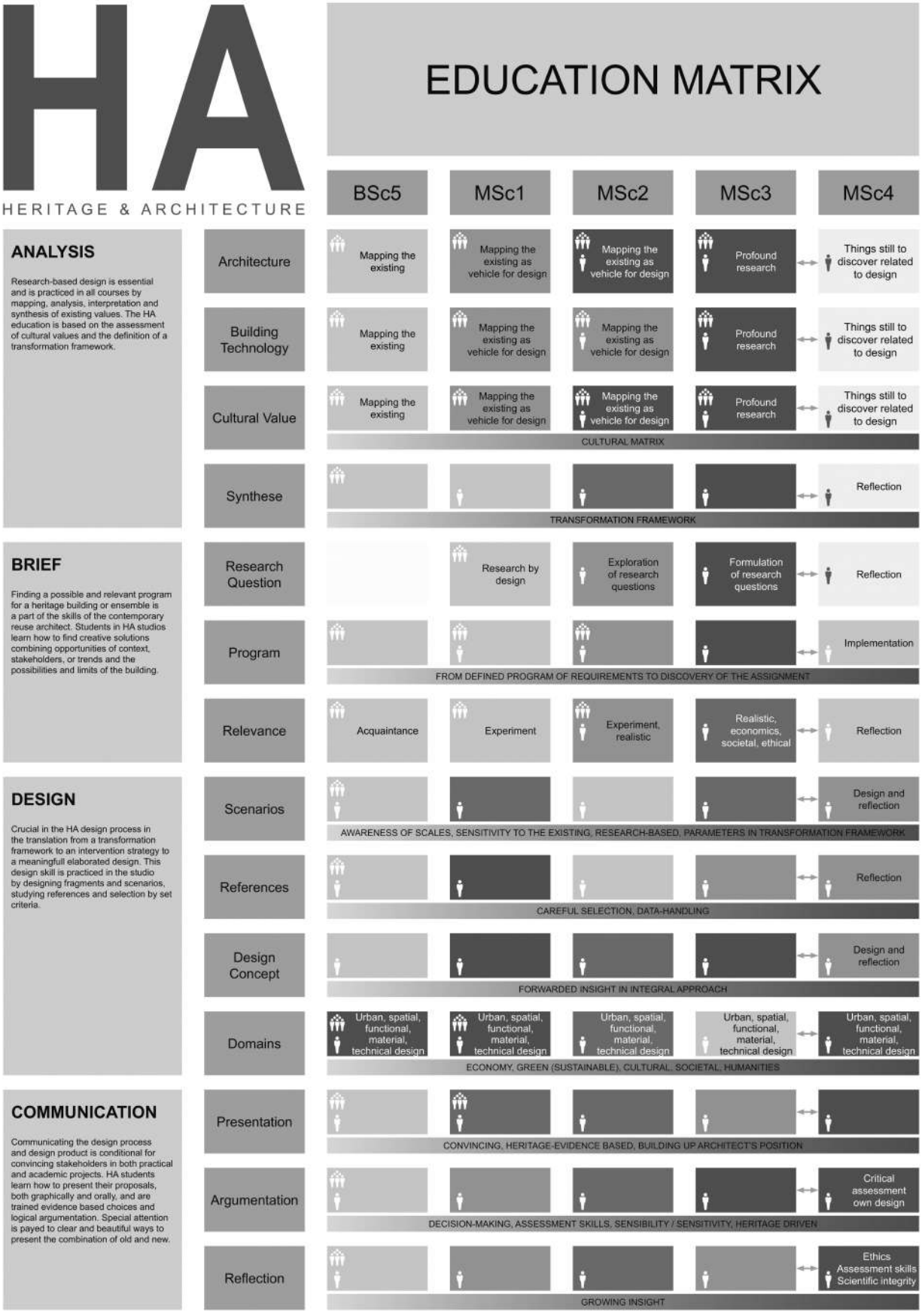
This process can be described in the following five steps, but is in fact a constantly self-enriching iterative process:

- Step 1: Collection of data including observation of the building, its technology and context as well as their histories.
- Step 2: Compilation of the construction history of a heritage site, including by means of so-called Chrono-mapping.
- Step 3: Identification and classification of the site-specific heritage features in relationship to value found by means of Heritage Value Mapping using the HV Matrix.
- Step 4. Assessment of the identified features on three levels of significance.
- Step 5. Based on outcomes of steps 1 to 4 above, distilling a position statement in the form of a Transformation Framework, addressing opportunities for possible interventions and obligations for conservation and restoration, and identifying crucial dilemmas for the continuation of the heritage building.

We have developed three tools or products as milestones to assist students: Chrono-mapping, the HV Matrix, and the Transformation Framework.

Chrono-mapping presents the evolution of a building or place over time in a graphic format. We do not prescribe a format for chrono-mapping, but students are given examples as guidance and inspiration. We only ask that the product be visual, show time layers and where relevant, indicate "lost" elements. Students themselves define the time intervals/layers. At this stage no judgment is made on building elements of any of the layers. Chrono-mapping simply presents the evolution of the building.

The HV Matrix is the second seemingly simple analysis and evaluation tool. The analysis adopts Stewart Brand's shearing layers model[9] for the tangible (shearing) layers of




**04** The HA education matrix. The horizontal sections represent the main steps required to respond to the design assignments, which increase in complexity with each phase of the curriculum. The intensity of the color red symbolizes the main focus within the context of the respective course indicating, for instance, the shift from Analysis and Brief in MSc 1 towards Design and Communication in MSc 4. Individual or group work is also indicated. © HA, TU Delft.

a building. However, we have extended Stewart Brand's model to include the physical Surroundings/Setting and the resultant Spirit of Place, thereby accommodating the breadth and depth of scale levels prescribed by the ICOMOS *Approaches to the Conservation of Twentieth-Century Cultural Heritage*.[10] Though a simple matrix, these are brought into direct relation with intangible values. In first trials these values were prescribed, but after testing, students are now first introduced to values in the built environment theoretically, after which they are given the opportunity to develop their own values sets appropriate to the building. Students are expected to populate (where values exist) the matrix through drawing — an essential method for architectural understanding[11] — naming and describing the elements, spaces or qualities of the building or the context, that embody values. It goes without saying that values can be represented in multiple layers and vice versa.

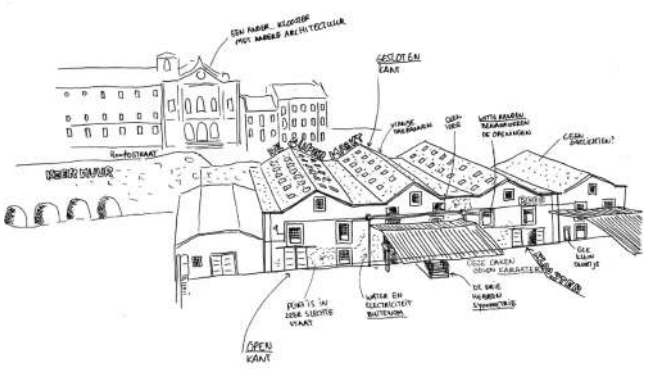
In practice, the HV Matrix is initially filled-out by student groups. This leads to peer debate, reflection and, ultimately, learning. After reaching a conclusion of which values are present and, importantly, what architectural or spatial elements or qualities are essential to their preservation, students then debate the weighting of the values: which are the most important, and which are less so. For this a simple stoplight method is used: (red — most important: to be safeguarded/developed) to green (can accept modulation or possibly be sacrificed). During the process of development of an own brief, individual students re-visit the HV Matrix and further refine it to come to a personal positioning regarding the values of the building.

Importantly, from the HV Matrix going forward, an integrated statement on the values leads to outlining a Transformation Framework, which includes opportunities and obligations as well as central dilemmas when relating the transformation framework and its limitations to the proposed adaptive reuse program. This Transformation Framework, a drawn representation using self-created simplifications/reduction drawings, photos, hatching and text, goes beyond the concept of "limits of acceptable change" defined by the ICOMOS International Committee on 20th Century Heritage[12] and present a vision to the future. Often issues relating to energy use reduction provide for technical dilemmas in dealing with valuable fabric.

Only now can solving the problem of adaptive reuse be addressed through a method of scenario design, iteratively tested against the Transformation Framework as a method of researching appropriate solutions and suggestions. In theory, students in the MSc 3/4 should complete the process up to the definition of the Transformation Framework within the first 15 weeks of the 40-week graduation project timeframe: in practice, it evolves throughout the longer process of investigation, since the design process is essentially cyclical by nature.

## Case study: The Manutenção Militar Complex, Lisbon

One of the first HA graduation studios in which the above outlined process was tested, continued on from 2016 Lisbon



**05** Sketch of a portion of the Manutenção Militar complex, Lisbon, with which the student captures unique qualities and characteristics of the multi-layered heritage buildings. Floor Hoogenboezem, 2017. © TU Delft.

*International* ***docomomo*** *Conference* student workshop: *The Adaptive Reuse of the Lisbon riverside area: the MMC case study.* This workshop explored perspectives on the adaptive reuse of the large Manutenção Militar complex; a multi-layered factory complex that originated as a medieval convent and saw expansive development as a foodstuff factory for the military during the 20th century.

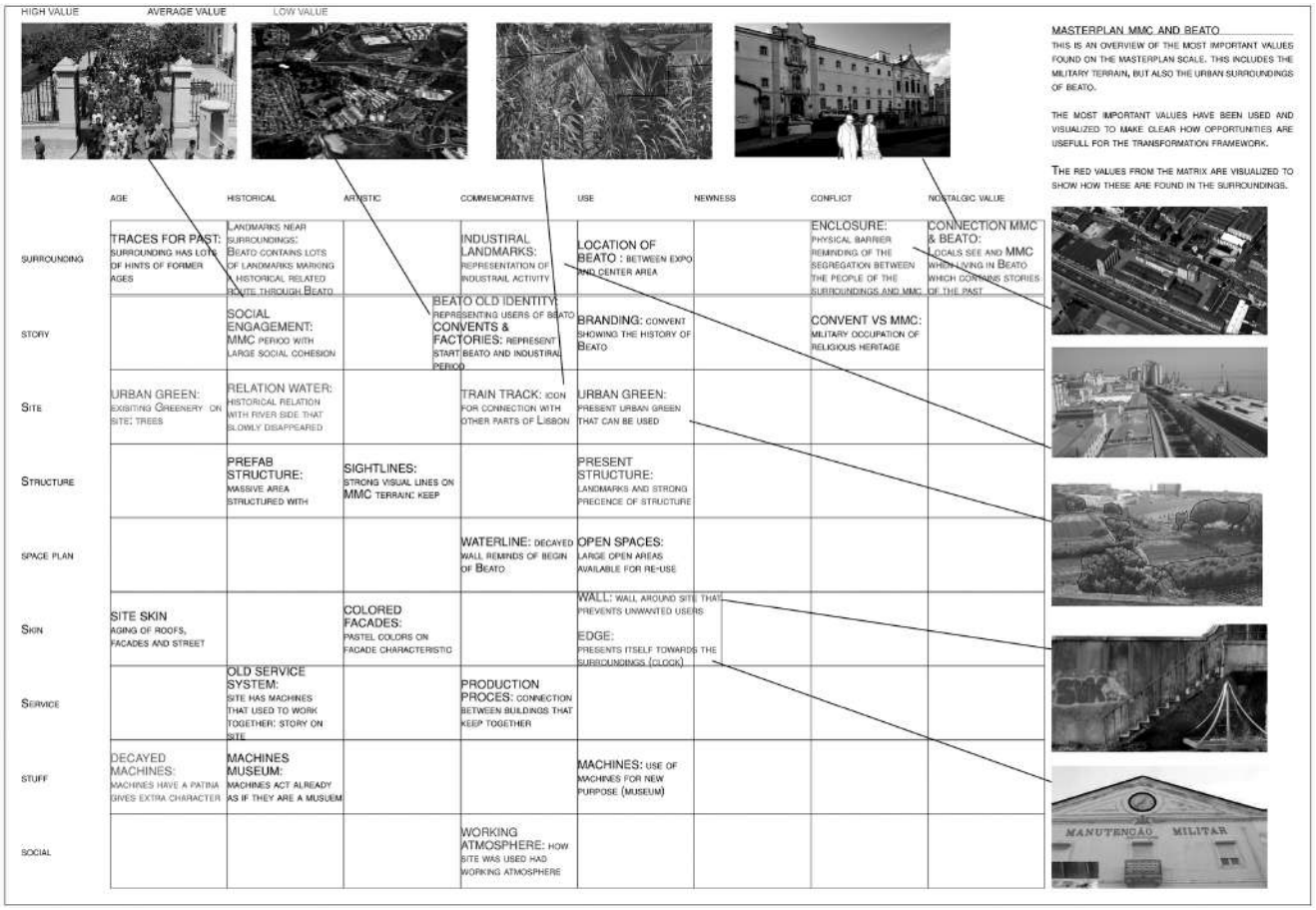
TU Delft MSc 3/4 students who participated in the **docomomo** student workshop continued with this case as their graduation project. Based on desktop research and on-site observation, the Chrono-mapping made the time layers of the former factory complex explicit. However, through application of the HV Matrix to the complex as a whole, as well as to individual buildings, students soon came to the conclusion that the oldest layers were not necessarily the most valuable, that the intangible traditions associated with the complex provided the key to its future and that, especially, age-value presents a dilemma when seen through the lens of maintenance of fabric. The process discovered great capacity for adaptive reuse and for change without sacrificing the key values of the factory.

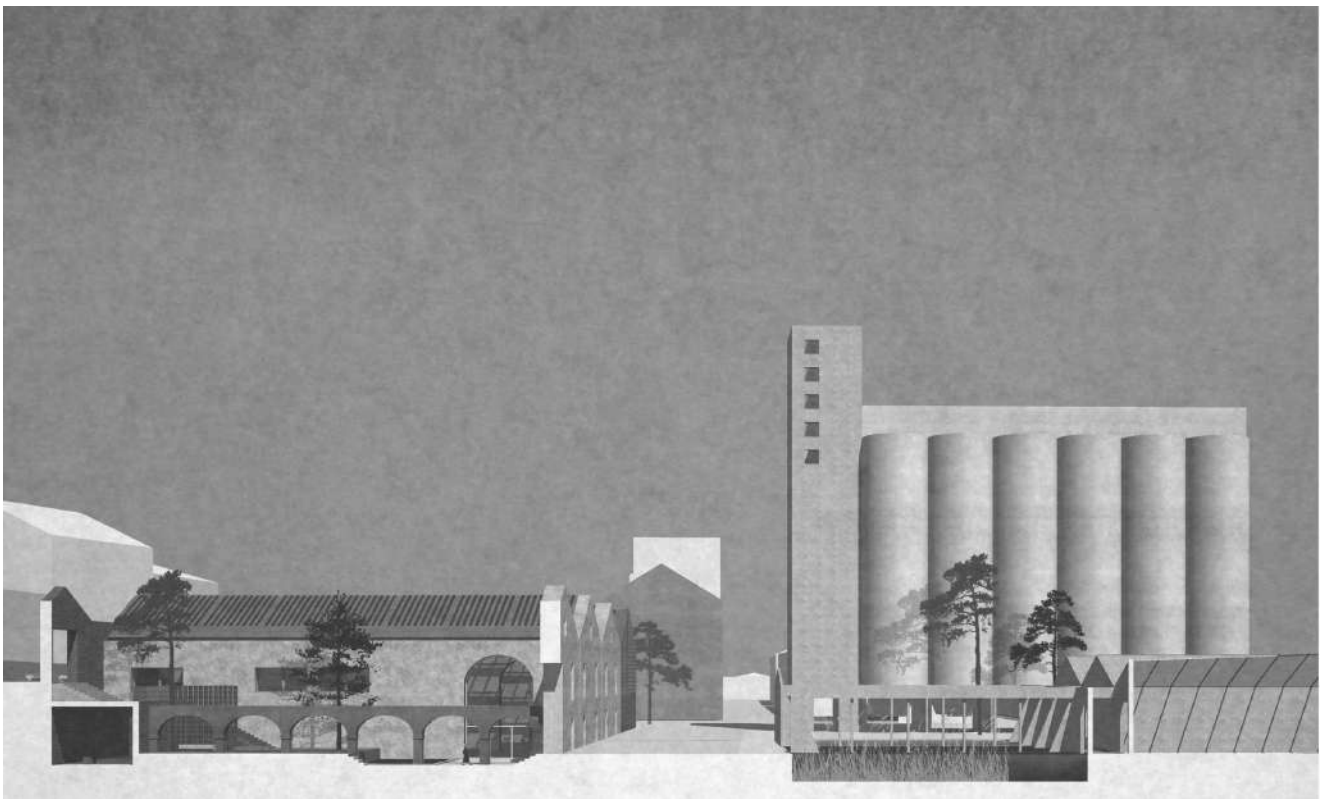
## Lessons learnt from the TU Delft experience and future action points

Our educational model is constantly evolving. The process we have devised for the MSc 3/4 has proven to be useful, providing students with a foothold and a manageable process in the face of an often-daunting challenge. Students feel the need for an earlier introduction to this method,[13] but due to the open inflow of students into the MSc 1, 2 and 3, this would be ineffective, or call for repetition throughout the education program.

Yet, more integration is required with non-building specific research topics, which could be linked to research being undertaken by the staff of HA. The three HA chairs have collectively and individually developed methods and tools as a result of research projects, but these have not yet found their place in the studio. More can be done to use these methods and tools in our education, and equally, to plug the results of student research back into them. A good example is the Monument Damage and

**06** An example of a HV Matrix analysis of the Manutenção Militar Complex, Lisbon. Jochem Hols, 2017. © TU Delft.



**07** Intervention proposal for adaptive reuse of the *Manutençao Militar* complex as an educational facility. The extant fabric is reshaped to generate meandered movement through sequences of intimate and open spaces. Floor Hoogenboezem, 2017. © TU Delft.

Conservation System (MDCS)[14] developed by the Heritage and Technology Chair. While the MDCS is used in the MSc 2 to assist students to identify causes of damage, and develop appropriately researched responses, it has not yet found application in the MSc 3/4 graduation course. We now need to find ways in which students can apply the MDCS in the graduation studio and explore ways in which MDCS can be augmented with student observations and documentation in the future. Further integration and collaboration with other Chairs in the Faculty, such as Real Estate or Architectural Engineering, Urbanism/Landscape, and Climate Design and Sustainability can add value to our education processes.

However, this wished-for integration with research, other tools and methods and other architectural fields of enquiry is difficult to achieve because of the limited time and the strictures of the deliverables for the Architecture graduation track, as well as the fact that each entry level brings students to the HA courses with no former experience with assessing heritage. We are actively searching for mechanisms through which more integration between the MSc 1 and 2, and the MSc 3/4 can be achieved in the future.

## Conclusions

Our engagement with values as a driver for decision-making has highlighted that values remain fluid and emergent and require constant engagement. This is especially so for the sometimes still unknown qualities of 20th century built heritage, which can attain a high appreciation within a community once discovered. Identification is only the first step: assessing where these values reside is important if we want to safeguard them for the future. We hope to teach students to delay the process of design, first look, listen, analyze and conclude, then develop red-lines before testing possible solutions to the problem of reuse.

The approach we have developed at HA by asking ourselves fundamental questions, while not overtly rooted in the tradition established by the educational program at the Bauhaus, certainly resonates with it. A pertinent principle is that of learning through doing; not by copying, but by engaging a problem through an iterative process. This also echoes the early Bauhaus education perspective developed by Johannes Itten (1888–1967), which was based on craftsmanship. The Bauhaus in its early years advocated bespoke designs, emerging from a unity of art and technology

**08** Former US Embassy in The Hague, the Netherlands, by Marcel Breuer (1959). © W. Willers/TU Delft.

in response to a clearly defined purpose and based on careful analysis and testing. This unity of art and technology produced matter that carried meaning. HA goes beyond acknowledging this unity; we engage and activate it.

The integral nature of 20th century built legacy internationally challenges us to develop methods to assess holistically and value the integrated technologies employed in buildings as an essential component of architectural heritage.

From our experiences, we have learnt and agree with our peers that the "value of modern heritage lies as much in materiality as in its intellectual achievements".[15] Faced with the problem of adaptive reuse, we have attempted to develop an integral approach in which matter and meaning are approached holistically, remains apolitical, but, like the Bauhaus program, has a strong ambition for social relevance.

### Notes

1 Franz Graf, "How should we Teach the Conservation of Modern and Contemporary Architecture", in Dirk van de Heuvel, Maarten Mesman, Wido Quist and Bert Lemmers, *The Challenge of Change. Dealing with the Legacy of the Modern Movement. Proceedings for the 10th International* ***docomomo*** *Conference*, Delft, IOS Press, 2010, 287.

2 Gonçalo Moniz et al, "Learning to Reuse Modernity: The Educational Challenge" in Ana Tostões and Nataša Koselj, *Metamorphisis. The Continuity of Change. Proceedings of the 15th International* ***docomomo*** *Conference (15IDC), 28-31 August 2018, Cankarjev Dom, Ljubljana, Slovenia*, Ljubljana, **docomomo**, 2018, 546.

3 ICOMOS, 1993, 1.

4 UIA/UNESCO, *Charter for Architectural Education,* Tokyo, UIA/UNESCO, 2011, 2.

5 Wessel De Jonge, "Educating for Preservation and Reuse", in Ana Tostões and Nataša Koselj, *Metamorphosis. The Continuity of Change. Proceedings of the 15th International* ***docomomo*** *Conference (15IDC), 28-31 August 2018, Cankarjev Dom, Ljubljana, Slovenia*, Ljubljana, **docomomo**, 2018, 530.

6 Gonçalo Moniz et al, op. cit., 832.

7 Marieke Kuipers & Wessel De Jonge, *Designing from Heritage: Strategies for Conservation and Conversion.* Delft, TU Delft - Heritage & Architecture, 2017.

8 Nicholas Clarke, Marieke Kuipers, Sara Stroux, "Embedding built heritage values in architectural design education", *International Journal of Technology and Design Education*, 2019.

9 Stewart Brand, *How Buildings Learn,* London, Penguin, 1994.

10 ICOMOS ISC20C, *Approaches to the Conservation of Twentieth-Century Cultural Heritage,* Paris, ICOMOS, 2017.

11 Inge Kirkeby, "Knowledge in the Making". *Architectural Research Quarterly*, 13(3-4), 2010.

12 ICOMOS ISC20C, op.cit., 5.

13 For more information refer to Nicholas Clarke et al, op. cit., which includes the results of a survey amongst students after their use of this method.

14 See: https://mdcs.monumentenkennis.nl.

15 Andrea Canziani et al, "Learning from Modern Heritage: Methodological Tools for Re-thinking Education in Conservation", in Ana Tostões & Zara Ferreira (Eds.) *Adaptive Reuse: The Modern Movement Towards the Future. 14th International* ***docomomo*** *Conference,* Lisboa, **docomomo** International/Casa da Arquitectura, 2016, 851.

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