scholar architect

english edition

2010

EDITURA UNIVERSITARĂ ION MINCU

SCHOLAR ARCHITECT 2021

English edition

COORDINATOR: Anda-Ioana SFINTEŞ
TRANSLATED BY Florina TUFESCU

Editura universitară "Ion Mincu"
Bucharest, 2022

This volume is the full translation of **Scholar Architect 2021**
(Romanian edition) ISBN: 978-606-638-231-1
https://doi.org/10.54508/9786066382311
First published 2021 (Romanian edition) by Editura universitară "Ion Mincu"

Developed within the framework of the **SCHOLAR ARCHITECT** project
"Ion Mincu" University of Architecture and Urban Planning

www.uauim.ro/cercetare/scholarh
www.facebook.com/scholarhuauim

© COORDINATOR: Anda-Ioana SFINTEȘ

© AUTHORS: Magdalena STĂNCULESCU, Oana Anca ABĂLARU OBANCEA, Anda-Ioana SFINTEȘ, Ionuț ANTON, Ana Daniela ANTON, Andrei MITREA, Dana MILEA, Ioana Elena ZACHARIAS VULTUR, Adrian MOLEAVIN, Marian MOICEANU, Tiberiu FLORESCU, Simona MUNTEANU, Georgică MITRACHE, Horia MOLDOVAN, Melania DULĂMEA, Anca MITRACHE, Niculae GRAMA, Dan MARIN

TRANSLATOR: Florina TUFESCU

DTP: Anda-Ioana SFINTEȘ / Diana RUSU

DESIGN: Anda-Ioana SFINTEȘ / Ioana BOGHIAN-NISTOR / Diana RUSU

COVER IMAGE: Diana RUSU

ISBN 978-606-638-246-5

https://doi.org/10.54508/9786066382465

Descrierea CIP a Bibliotecii Naţionale a României

Scholar Architect 2021 / coord.: Anda-Ioana Sfinteș;

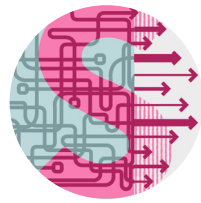
translated by Florina Tufescu. - English edition. -
București: Editura Universitară "Ion Mincu", 2022
ISBN 978-606-638-246-5

I. Sfinteș, Anda-Ioana (coord.)

II. Tufescu, Florina (trad.)

72

editura.uauim.ro / Tel.: 40.21.30.77.193



SCHOLAR ARCHITECT

The Romanian edition was developed within the framework of the project

SCHOLAR ARCHITECT 2021
Improving the quality of research and teaching in architectural education

Project financed by CNFIS-FDI-2021-0069

The English edition was translated from Romanian within the framework of the project

SCHOLAR ARCHITECT 2022
Research and implementation of new trends, innovations and experiments in architecture and related fields of education

Project financed by CNFIS-FDI-2022-0075

The Institutional Development Fund, Domain 5: Improving the quality of teaching, including the observance of professional and academic ethics

CONTENTS

FOREWORD

The *Scholar Architect* project took shape in 2020 and developed around the idea of increasing the educational effectiveness of UAUIM by promoting research as a foundational component of academic projects. The 2021 edition which provided the framework for the development of the present publication continued along the same lines by preserving access to relevant scientific resources and by informing and training UAUIM members in this regard; this time, however, the emphasis was on means of exploiting contemporary trends in the academic environment and in practice by pursuing different topics, from methods of teaching and assessment to various approaches understood in their specificity.

This volume brings together different approaches to architecture, urban planning and education in these fields, different modes of understanding, analysis, expression, representation and varied connections to practice, yet all of them gravitating around recurring keywords and inviting the reader to filter information on the basis of their own interests, to draw their own connections and above all to determine their own research direction and to pursue it.

Although each chapter pursues a specific stated objective of the *Scholar Architect – Improving the quality of research and teaching in architectural education* project, the diverse approaches find points of intersection while remaining self-standing and they can be read independently or jointly, in order or randomly.

The materials in this publication are related to the following three project objectives:

Objective 3: Promoting the quality of didactic and research activities by exploiting contemporary trends in teaching and research and supporting up-to-date national and international criteria of assessment and self-assessment.

Objective 4: Perfecting the means of learning by researching, informing on and testing the ways in which new trends and technologies influence the research, conception and building of architecture.

Objective 5: Optimising the means of learning specific to the profession by addressing the communication component within and without the academic environment and/or the profession.

Univ. Assist Anda-Ioana SFINTEŞ PhD Arch.

the academic environment

_education

_communication

_trends

Reflections on the desiderata of contemporary architecture, with implications for trends in architectural education, for the manner of improving the curriculum and the teaching methods and for the adaptation of spaces for high-quality architectural education.

https://doi.org/10.54508/9786066382465.01

A few reflections on the desiderata of contemporary architecture

Assoc. Prof. Magdalena STĂNCULESCU PhD Arch.

The subject I intend to discuss in this chapter is how we can simultaneously approach concepts like architecture, technology, social interaction and pedagogy in a perfect symbiosis, a symbiosis that will constantly evolve in accordance with social needs and practices.

The problems and needs of contemporary society change constantly and thus the traditional university curriculum must invariably adapt to correspond to the present. Education has become an engine of social development, which means that the ensemble of formative methods requires institutional coordination and structuring, especially when it comes to architectural education.

The manner of conceiving and designing a building is undergoing constant change. The architect must fulfil new requirements and possess a high level of technical and organisational skills; the buildings must fulfil an increasing number of desiderata: in addition to the traditional requirements related to aesthetics, resistance and functional durability, there are requirements related to efficiency, competitiveness and energy performance.

A single individual can no longer possess and control all these types of data which, correlated with the data derived from usage criteria and with management criteria, lead us to a new approach: that of multidisciplinary teams of specialists from the relevant fields, coordinated by an architect. This leads to the necessity of training students to work in a team, either by exercising these abilities in some of their university projects or by participating in workshops, roundtables or other extracurricular activities. The complex and topical problems that confront the student architect embarked on research for their project represent a contextual study full of questions, doubts and contradictions that are specific to such a complex and permanently alive organism as urbanity at the beginning of the XXIst century. The intention is to prepare, both theoretically and through practical applications in projects, for the

requirements of subsequent actual investments made by public, private or mixed entities by providing a methodology for launching the process of turning an idea into an architectural object, from setting up a team of specialists to choosing the site, establishing the design brief for the given location, establishing the criteria for the approach, conducting a comparative analysis of feasibility studies, up to supervising the construction work and including the post-construction follow-up modalities (feedback).

When there is a change in the way architecture is perceived, the fundamentals of the profession are also changed. At present, the types of activities that take place within buildings can be modified and they undergo constant change; programmes are accumulated and become increasingly complex or tend towards simplification, all of which constantly places the architect in front of new situations, leaving no time for them to experiment and to perfect their gradually acquired knowledge. As a consequence of the general evolution, we witness a change of philosophy, for example in the acceptance of the idea of constant change, of the study of border fields, of relative truths and of the new attitude with regard to values (the acceptance of values originating in different cultures, the renewed discussion of human needs) and we also observe the renewed attention to human beings, to the beneficiaries or users of architecture. Architecture tends towards the resolution of the problems of communities, of collectives, towards the acceptance of cultural differences and of different tastes; it reinstates the importance of human emotions and perceptions. The constant redefining of architectural themes and programmes, in line with ever changing necessities, is a desideratum of contemporary architectural education; to fulfil it, we must have solid knowledge of the past and use it as a constant source of inspiration in order to envisage the future. It is necessary to understand the different spaces – on the historical, geographical or conceptual level – via different approaches; over the course of the academic trajectory, some landmark moments, the great trials and successes, are captured as they appear in the uninterrupted metamorphoses of architectural space.

Architecture satisfies increasingly complex human needs that stem from a constantly changing way of life – let us consider only how much our life has changed as a result of the pandemic that spread in 2020; architectural programmes as an expression of the human also undergo continuous change. The building, or the space that contains these programmes, must also reflect change. Those who attempt to make predictions about the future look primarily at the latest trends, with implications for the way of thinking about and designing buildings or architectural spaces, from the following directions: user, technology, sustainability/ environmental issues, architectural expression.

There are fewer and fewer certainties in the transformation process of contemporary architecture; one of these is that the transformation of architecture is due to technological progress, to the new materials and technologies used in the construction field. Mastery of technological progress is one of the touchstones of today's architect; the

speed at which changes unfold is obvious all over the world; over only thirty years, the technologically advanced buildings that began as isolated, contested or neglected experiments have become ubiquitous and increasingly complex. Design-specific problems are influenced by the technological evolution; the building materials and techniques known at any given historical point have influenced the building structure of architectural spaces, interdependently with requirements of a practical, aesthetic, social or representational nature, generating mutations of planimetric forms and volumes. These types of spaces appear, are maintained, disappear or return in reinterpreted formulae. Modern technologies contribute to the level of physical comfort in modern buildings via installations, air conditioning, the use of IT and of advanced technology in the control, monitoring and management of buildings; at present, science and computerised technology enable the control of the acoustics and sound equipment in minute detail, with the modelling of different scenarios (fully occupied or empty hall, spoken sound, singing, instrumental music). The buildings of the future are smart buildings, programmed to self-manage. Technical solutions that are reflected in the creation of desired or sought psychological sensations, in the quality of perception distributed by zones, in acoustic control, in the limitation of openings or in the modification of the dimensions of partitions and of the air volume can be mentioned in turn.

Technological progress remains one of the few certainties in the evolution of construction science: the fact that today we build more quickly and easily than in the past. High-tech architecture begins and evolves alongside the technology of the means of production and scientific progress in general. It is a consequence of the need to solve practical problems: the large openings of interior spaces uninterrupted by structural elements, the speed of erecting buildings, lowered costs, easy maintenance, etc. Thus, we observe the transition, over the space of a century, from an architecture limited by formal and building constraints to a stage of boundless freedom, materialised in a wide range of possibilities at the level of architectural expression.

Environmental problems are, at present, one of humanity's sources of pessimism. They have emerged precisely from the human longing and striving for the better, from the continuous struggle to dominate nature, yet what we call progress today proves to be a dangerous path. So where is architecture headed from this perspective? New trends and attitudes emerged in the 80s, after the oil crisis, as a consequence of the environmental protection issues linked to the economisation of materials, the reduction of energy consumption, to recycling and the increased attention to the problem of waste, etc. Energy consumption and maintenance costs are now discussed already at the project stage. At present, all activity sectors, including architecture, must be sustainable and take into account the long-term consequences and environmental impact.

A number of avant-garde ideas arising from completed projects and from architectural studies and competitions are examples that highlight different approaches in contemporary buildings as well as architectural

trends (variable capacity, flexibility with regard to various aspects, architectural expression studied in relation to the urban context). There is a noticeable tendency to reconsider established patterns by formulating proposals suited to contemporary directions of development and to the social, economic and technological realities. Everything is seen from a restructuring perspective, with a constant return to terms such as:

_processes of sustainable development

_cultural networks, community, social inclusion

_variability and the capacity to adapt over time

_simplification of space and equipment, reduced to the essential

_reduction of investment and exploitation costs

_intensive exploitation of space.

The shaping of the programme and theme can be materialised in: functional schemes, functional modules, models of space allocation in accordance with the elements of interest in the field, with a view to the planning of buildings that have a reasonable price and aspect and that are flexible and functional for the entire day, allowing all users to pursue their activities in optimal fashion. By assimilating the complex forms of digital culture in the most accelerated fashion, the building reassembles its own panoply of means of artistic expression. A screen can mean the extension of space, the opening to a new series of universes.

This entire riveting search, which captures the plurality of means and of the issues raised, is the current and future basis of the educational process in architecture. Current theories on the necessity of dematerialising the concrete architectural spaces are launched precisely for the purpose of achieving the superposition of spiritual and material space, which can best be imagined in the transposition of the ideal architectural teaching space.

The creation of an adequate educational environment which stimulates learning and emphasises the intercultural and inclusive dimension in the context of contemporary society is one of the prerequisites of student development. Aspects of contemporary society such as globalisation, digitisation and the growth of the creative sector as well as the growth of innovation also require the rethinking of educational spaces.

The concept of school, albeit under different shapes, modelled by the socio-cultural context of its emergence, has remained essentially the same over thousands of years and designates a group of people who meet for educational purposes. Since the relationship between society and education has always been one of interdependence, the study of social needs will identify the correct mechanism for the functioning of education, based on the models and answers provided by predecessors, according to the following brief historical summary. From the training of apprentices for the completion of work (the scriptoriums of ancient Egypt) to the coaching of youth in sports competitions (Greek antiquity), from philosophical discussions between highly cultured people to

instructive discussions with children, from the informal teaching of a small group to the mass teaching of hundreds of people at once, the concept of school has remained essentially the same – a group that listens to someone with greater knowledge of a particular field. It is the educational practices and the physical environment that change constantly. The schools established at the time of the Industrial Revolution were meant to form adults who would constitute a workforce, employed in the production or services sector, a workforce that would support the economic growth of the war-afflicted countries. They required professionals in specific fields, not thinkers. Emphasis lay on theory and on practical work that entailed following the given instructions. Many educational systems have unfortunately remained anchored to this model[1]. The innovative idea that every student is different and has their own learning style and that curiosity and the desire to learn will come naturally if the child is in an accessible and interactive environment that allows exploration is the key concept of the revolutionary pedagogical model promoted by Maria Montessori, Italian educator and psychiatrist[2] (Montessori, 1992, p. 24). Experiential learning is another approach that relies on observing and analysing a phenomenon and interpreting its consequences[3]. The process unfolds thus: practical experience – observation – comprehension – practice. Throughout this process, error is seen as a stimulus to improvement. The American psychologist John Dewey, author of the famous phrase "learning by doing", founded around 1900 the University of Chicago Laboratory Schools where the architectural space itself is an experiment: open plan, mobile partition walls, moveable blackboards and furniture. The school is practically a single space which contains all the learning activities of the school day.

Learning is practical and relies on creativity and observation instead of memorisation. In the European context, experiential learning is included in the curriculum of the Waldorf School, set up in Stuttgart in 1919 by the Austrian educator Rudolf Steiner[4]. The aim of the Waldorf School is to create a curriculum appropriate to the development of the student, which holistically integrates practical, artistic, social and academic experiences. The concept developed by the Italian educator Loris Malaguzzi at the Reggio Emilia School is learning from the other; it explores the social dimension of education. The emphasis is on the

1 Parents and teachers are obsessed with outstanding achievement in theoretical subjects, the churning-out of Olympiad students and the comparison of schools on academic results. The results can be seen on the graduation of children who are socially ill adapted, lacking respect for the environment and for others and in constant competition with others; children who are materialistic, lack aesthetic sense and sensitivity to beauty and who are incapable of being creative.

2 "... children allowed to develop according to their inner laws of development would give rise to a more peaceful and enduring civilization." Maria Montessori

3 The individual learns 10% of what they read, 20% of what they hear, 30% of what they see and 80% of what they experience (Sprouts, 2015).

4 The Waldorf School lays emphasis on activities such as painting, music, theatre, sculpture, gardening and non-competitive games. Just like in the case of the Montessori School, there are no tests or homework and moral values such as friendship and empathy are promoted instead of competition and comparing oneself to others. The students do not study for high grades, they study because they are stimulated by the curiosity to discover.

importance of teamwork and on the development of cooperative and communicative abilities through debates, argumentation and acceptance of different views within the group.

The professional creative sector is constantly growing and society needs innovative people since the future can only be imagined by creative minds. Information is very easy to access via technology and what is required is no longer its memorisation but interpretation, correlation and adaptation. Theoretical, humanist and artistic fields must have equal importance and this equilibrium must be also reflected in the architecture of educational spaces. Innovation emerges when disciplines intersect, thus the school must allow for their collaboration through flexible spaces that enable grouping, regrouping and reconfiguration.

In the pedagogical model centred on school/university students, they are treated as equals; they are involved in team activities and they learn to collaborate, to communicate and to debate different ideas, having the freedom to choose what and how to study. Emphasis lies on interaction, interdisciplinarity, teamwork or self-learning. In the architectural space of educational institutions, these are transposed into shared spaces (yard, atrium, main hall), studios and flexible and transparent classrooms, auditorium for events and intermediary spaces that enable informal learning (Hoffman, 2014). The dynamic school is a concept that proposes flexible spaces which enable movement through the effortless rearrangement of furniture for various activities, the presence of different types of seating furniture (chairs, sofas, cushions, stools, etc.), adjustable chairs and benches. All of these prevent spending too much time seated in the same position, which has a negative impact on the spine and on the ability to concentrate (OWP/P Cannon Design, 2010). In *Multiple Inteligences: New Horizons in Theory and Practice*, psychologist Howard Gardner (2006) emphasises the need to learn in one's own fashion, stating that every child develops particular abilities to a higher degree and has an individual learning style, depending on the predominant type of intelligence: visual-spatial, naturalistic, logical-mathematical, interpersonal, intrapersonal, linguistic-verbal, existential, bodily-kinaesthetic or musical. The teacher has to adapt pedagogical methods so as to cover all the students' intelligence types and the educational environment must provide opportunities for learning through different means: visual, audio, tactile materials, etc.

STEM education (Science, Technology, Engineering, Mathematics) is a method initiated in the United States in 1957, originating from the wish of becoming world leaders in this area of innovation. STEM stands for an educational concept based on teaching the four disciplines that compose it by using an interdisciplinary, practical approach, with real-life applications. Creative STEM education entails using STEM principles + Arts, thus integrating humanist and artistic fields through a holistic approach. Robotics is a relatively new discipline that is being gradually introduced into schools, at present only as extracurricular activity under the form of competitions between teams of school/university students. STEM education requires specialised spaces and equipment.

The physical framework of the educational environment must be configured so as to allow the use of these pedagogical methods and so as not to hinder, through rigid and austere architecture, the user's development from all points of view. "We shape our buildings and afterwards our buildings shape us", Winston Churchill stated and this remark remains topical. New educational directions mention concepts such as **flexibility, adaptability, variety and multifunctionality and transparency**, to cover the widest possible range of needs and activities. These translate into the possibility of reconfiguring space through using furniture in different fashions, into the possibility of combining or separating spaces with the help of mobile partition elements or simply into the possibility of conducting activities in different spaces since, as architect Rosan Bosch stated, "the most flexible thing in a room is YOU!" (TEDx Talks, 2013).

Project-based learning relies on completing projects over a longer time period during which students investigate, discover and respond to a complex problem, demand or challenge. This method leaves behind the memorisation required for traditional exams, challenging the student to formulate an individual project that they will subsequently present in a discussion with specially invited guests. The projects focus on the learning objectives of the curriculum but also on the development of abilities such as critical thinking, comprehension, problem-solving, collaboration, expression and the individual management of time and resources.

Architecture is a **discipline that evolves through the adoption of a critical attitude and through the acquirement of knowledge**. It connects disciplines, it compels the re-creation of place, context and attitude through the understanding and professional in-depth study of the data of a built future. The following types of intervention are possible and can be materialised in case studies for student projects, especially during the later years of study:

_functional rehabilitation of spaces or buildings

_functional conversion of existing buildings

_insertion of a new building on a free site, on the basis of an urban plan

_temporary spaces and interventions.

In each case, concepts such as **place, site, space, context, regionalism** must not merely be understood, but also brought up to date through practical study. The optimal solutions must be found, with an exceptionally wide register made available to those involved in providing them.

On the other hand, the large number of aspects to be considered in the configuration of educational spaces has led to the concept of universal design or "universal size for all" – a single building that is also accessible to people with disabilities and that can be adapted to as many educational activities as possible, for school/university students as well as for the community. The design incorporates three principles of flexibility: **multiple presentation methods, multiple participation options,**

multiple expression possibilities. At the level of architectural space, these translate into multifunctional spaces that enable different uses and different educational activities. The most important aspect of teaching and learning is communication; the environment must facilitate this and offer the possibility of using different means of communication. Thus, Rosan Bosch defines five concepts that describe methods of achieving communication, which she transposes to architecture:

> _unidirectional communication with a listening public – the model of the lecture hall or of traditional classes
>
> _focused and individual quiet learning, in an environment where you can see others study – various informal spaces: cubicles, organic furniture and quiet study areas
>
> _meetings, group discussions, debates in small lecture halls, tables for several people
>
> _communication from all directions, which characterises all shared spaces (corridors, halls, canteen, etc.) where the noise level is high, but there is also rapid exchange of information
>
> _communication through movement and experimentation, which entails using the body.

Space is emancipated to make room for a free and interactive learning environment. In a flexible learning environment, where the library occupies a special place, all the other spaces are arranged in such a way as to enable students and teachers to move freely and to choose the most suitable sites for the learning activities. The living room style of furniture encourages conversation and teamwork while the quiet study areas provide a space for immersion in individual study. With a rich and flexible environment at their disposal, students are no longer forced to spend the entire day at their desks. They are free to choose the space where they spend their time and they want to stay even after school to socialise, to learn together or to read because the educational environment is pleasant and stimulating.

Technology is progressively replacing the traditional teaching tools. Even if they had not been rapidly introduced as a result of the pandemic, this would have been the inevitable evolution of working methods. The blackboard and writing with chalk have been replaced by the whiteboard for writing with markers and for the use of video projections or by digitally controlled screens; lessons and lectures are replaced by multimedia material – educational videos and documentaries; textbooks are replaced by tablets that contain e-books and that can be controlled and constantly updated by the teachers[5]. Conferences on Zoom Meeting, Google Classroom, online registers, video monitoring, touchscreen interactive boards – for games and competitions with multiple-choice answers that the children select on their tablets or phones, laser cutting

5 South Korea replaced all textbooks by tablets already in 2015. Software such as Smart Sync allows teachers to control the information on the electronic smart board and on children's tablets.

equipment and 3D printers, all of these represent new didactic materials and means of communication. The STEM education mentioned above requires the acquisition of technological equipment that enables the manufacturing of robots and scientific experiments[6]. European studies show that young people spend 6-8 hours daily in front of a screen and only 40 minutes daily on printed material. The majority state that they use the internet to talk to their classmates about homework, projects and tests. So we cannot exclude technology from the current educational environment; instead, we must understand how we can best use it in the architectural teaching process, without long-term repercussions.

To conclude, a current trend for the ideal space of an institution of architectural education would be a mixture of technology, nature, comfort and versatility. Sustainability and environmental responsibility are important aspects and thus the faculty becomes a social actor, tasked with educating the community also in this respect. The knowledge assimilated by the students in the course of the learning process contributes to developing their capacity of exercising their profession, to forming their personality, to the acquisition of the required theory and of the abilities that will help the future professionals integrate and contribute to the progress of society.

Fig. 1. The hall can serve as a temporary lecture space for the Project Theory course or for workshops.

This is why the project *SCHOLAR ARCHITECT – Improving the quality of research and teaching in architectural education* proposes a series of activities that facilitate the continuous professional development of

6 The School of the Future in Philadelphia scarcely uses paper.

teaching staff in the context of online or hybrid activities; this is why it gathers objectives aimed at supporting student access to academic research resources, to webinars and workshops on various themes, anchored in the previously mentioned issues, and this is why it proposes courses and lectures on topical subjects like sustainability in architecture, digitalisation and robotics or on more general aspects of communication, presentation and documentation. The aim is to sustain high-quality teaching and research activity, at the level of contemporary trends in international architectural education and grounded in professional and academic ethics. In addition, there is a focus on optimising the specific means of learning to facilitate communication in the professional environment. Not least, the project surveys the ways in which new trends and technologies influence research, the conception process and the construction of architecture. The goal is an academic space that is high-performing from all points of view, for a sustainable future.

Fig. 2. Informal atmosphere at the opening of an international workshop – 2018.

Fig. 3. The corridor is an ideal exhibition space in a school of architecture.

Fig. 4. A large-scale workshop model – the challenge of working as part of a team.

Fig. 5. Workspace on the faculty terrace.

Fig. 6. Presentation of master plan model, also in the corridor.

Fig. 7. Studio atmosphere.

References

Gardner H. (2006). *Multiple intelligences: new horizons.* New York: BasicBooks.

Hoffman, H.W. (2014). 5500 years of Detention. In Natascha Meuser (ed.). *Construction and Design Manual: School Buildings.* (pp. 10-33). DOM publishers. Berlin

Montessori, M. (1992). *Education and Peace.* Oxford: ANC-Clio.

OWP/P Cannon Design, Inc., VS Furniture, & Bruce Mau Design. (2010). *The third teacher: 79 ways you can use design to transform teaching & learning.* Abrams Books.

Sprouts (2015, 24 Sept.). *Experiential Learning: How We All Learn Naturally.* https://www.youtube.com/watch?v=5d71xhEbjDg&t=0s

TEDx Talks. (2013, 17 Nov.). *Designing for a better world starts at school: Rosan Bosch at TEDx Indianapolis.* https://www.youtube.com/watch?v=q5mpeEa_VZo

The portfolio is the architect's visiting card. Starting from the specificities of communication in architecture, the present chapter proposes an examination of this item, which is essential for professionals in the field. Firstly, the study details targets, categories, modes of organisation and principles for the selection and structuring of material that can reveal the abilities and competencies acquired in the course of the academic and professional trajectory. Secondly, it fully acknowledges the fact that the portfolio is a design object in itself, one that deserves our full attention and dedication.

https://doi.org/10.54508/9786066382465.02

A discussion about communication. Perspectives on the architecture portfolio

Univ. Assist. Oana Anca ABĂLARU OBANCEA PhD Arch.

Introduction

The relationship between architecture and the sphere of communication is as complex as it is important to our profession. Architectural education opens a horizon that the future professional architects will particularise and nuance upon. It is not by chance that Verzijl asserted that "architecture is above all about communication" (1997, p. ii). The importance of communication in architecture also derives from the fact that we are dealing with a border discipline, with implications in multiple areas of life. The complexity of the phenomena to which architecture must respond creates the necessity of a permanent dialogue both within and outside the profession. In his work titled *Scrisoare către un tânăr arhitect (Letter to a young architect)*, Alexandros N. Tombazis made the following appeal: "Remember that architecture means dialogue. To lead (and you will have to do this) first learn to listen and understand" (Tombazis, 2008, p. 57).

Starting from a few general observations on communication in architecture, this chapter aims to study in greater depth a particular form of communication that is specific to the profession – the student portfolio – by identifying perspectives, principles, directions and resources that can complete the learning methods specific to the profession through complementarity.

The premise – communication in architecture

From an etymological perspective, "communication" stems from the Latin "communis" with the sense of shared, general. A more recent and complex definition describes communication as a social and cognitive process with two components: conveying a message and generating meaning (Maier & Thalmann, 2008).

In a 2015 study, Nima Norouzi (2015) identifies three types of factors that influence communication in architecture. The semantic factors derive from the necessity of the interlocutor's correct decoding of the conveyed message. The second type of factors, namely the emotional, are based on the content of the message and its emotional impact. For successful communication, both types need to be equally addressed and potential discrepancies that can arise in the communication process need to be constantly observed. The third level of influence is the technical one and concerns the structuring of information and its mode of transmission.

From a more radical yet interesting perspective, *The Civilisation of Illiteracy* (Nadin, 1997) places contemporary civilisation beyond language. For Nadin, today's world is "a very fragmented reality of sub-languages, images, sounds, body gestures and new conventions" (Nadin, 1997, p. 26) while alphabets and language are a recent commitment in the history of our species. Visual forms of communication gradually replace written languages: "Images substitute text; sounds add rhythm or nuance; visual representations other than written words become dominant; animation introduces dynamics where written words could only suggest it" (Nadin, 1997, p. 22). On the other hand, the constantly evolving technologies and programs determine a "tangible visuality" (Breen, 2013, p. 27). Dutch professor Jack Breen claims that digital models have become part of the norm over the last decade.

In architecture, there are three categories of processes subjected to communication: descriptive, exploratory and empirical. Descriptive processes presuppose systematic explanation based on argumentation. From this point of view, the project must answer a few fundamental questions: What?, How?, Why?, thus becoming a way of questioning ideas for the development of design alternatives. And this happens also because architecture does not provide a single solution but infinite options of solving problems. The exploratory aspect starts from a series of hypotheses that can be pursued, tested and verified through empirical processes. These hypotheses concern characteristics, effects, conditions and relationships that are directly linked or collateral to the project. The final empirical category illustrates a choice as the consequence of the previous considerations. In architectural education, this testing is carried out through experiments, modelling, visualisations and models that simulate at true scale or at a different scale certain components of the project (relationship to the context, structural aspects, materiality, etc.).

Yet it is the language and the imagery (the text and the images) that remain dominant in the architectural thinking process. These types of language are used to describe and classify objects, to process and subsequently memorise information. As McGlynn (2013) noted, architectural imagery works with real and virtual objects; it thus plays "a role in thinking, allowing us to consider the results of possible transformations and arrangements of objects" (Kosslyn & Rosenberg, 2011, p. 204). The characteristics of imagery allow the extension of space, the limitation of the field of vision, the limitation of resolution as well as working with

visual perception (McGlynn, 2013). The visual, as a condensed form of information, facilitates the transfer of complex and ample information as synthetic, essentialised mental images. In addition to these information-processing mechanisms, architecture uses interactive drawing as a way of expanding cognitive abilities. Drawing is the means through which reality in its concrete form is turned into a more abstract, essentialised shape, through processes of selection and interpretation. Creating the drawing and then reading it presupposes a bidirectional translation process between representation and description (Fish & Scrivener, 1990). Herbert (1993) viewed drawing as a means of cyclical interaction between graphic and cognitive processes.

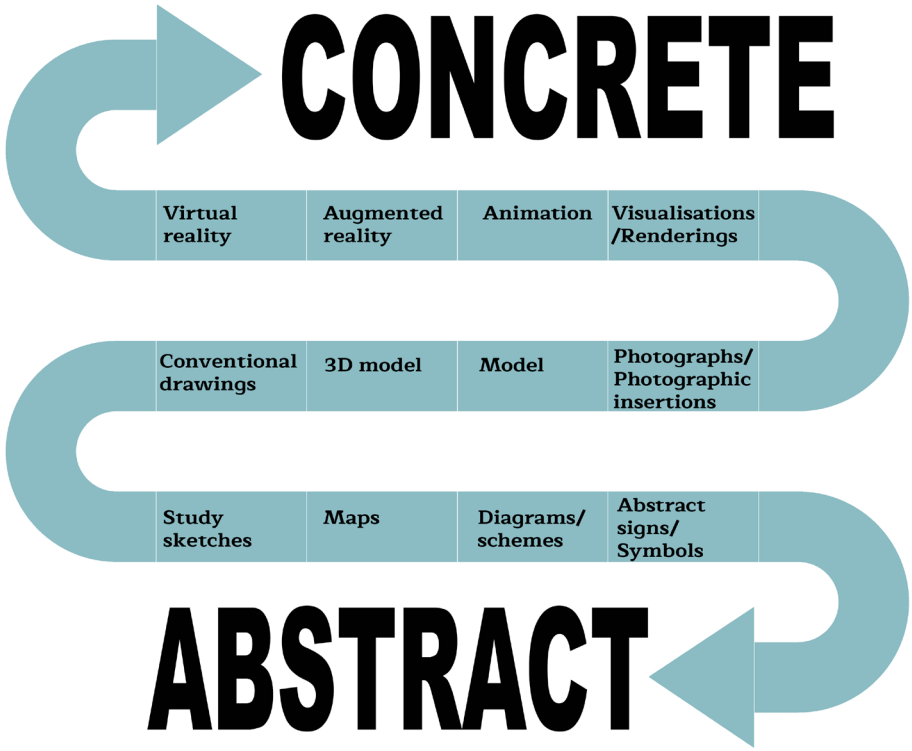


Fig. 1. Architectural representations – From the concrete to the abstract.
© Oana Anca Abălaru Obancea

The portfolio – a special form of communication

In architectural education and subsequently in the professional environment, the portfolio represents a visiting card, an element whose main role is to introduce us to an audience, most often an unknown one. Thus, a first goal of the portfolio is communication (Luescher, 2017). The portfolio therefore becomes an interface aimed at communicating not only achievements but also beliefs, ideas, concerns and aspirations that define the future professional. This process entails corroboration of the visual means (the imagery) by the text and viceversa through the finding of the optimal relation between them.

Simplifying slightly, we can define two main target audiences for the portfolio of a student architect: the academic one over the course of their studies and the professional one. Defining the two is the first and possibly most important step in the preparation of the portfolio since it requires a process of adaptation and adjustment to the particularities of the studio/school of architecture and preliminary research that will serve to guide the entire process of organising and selecting the material.

In addition, the form adopted for the portfolio (book, leaflet, online portfolio that uses dedicated platforms, website, etc.) will generate specific requirements with regard to organisation, presentation and selection.

The design of the portfolio itself is akin to an architectural object; it belongs to the sphere of creation and use (Luescher, 2017). It thus represents an opportunity to highlight the abilities acquired in different areas such as graphic design skills, technical abilities, mastery of complex and varied architectural programmes, curricular and extra-curricular interests from the sphere of architecture and beyond etc. The selection of materials and of projects becomes the primary tool for displaying these abilities.

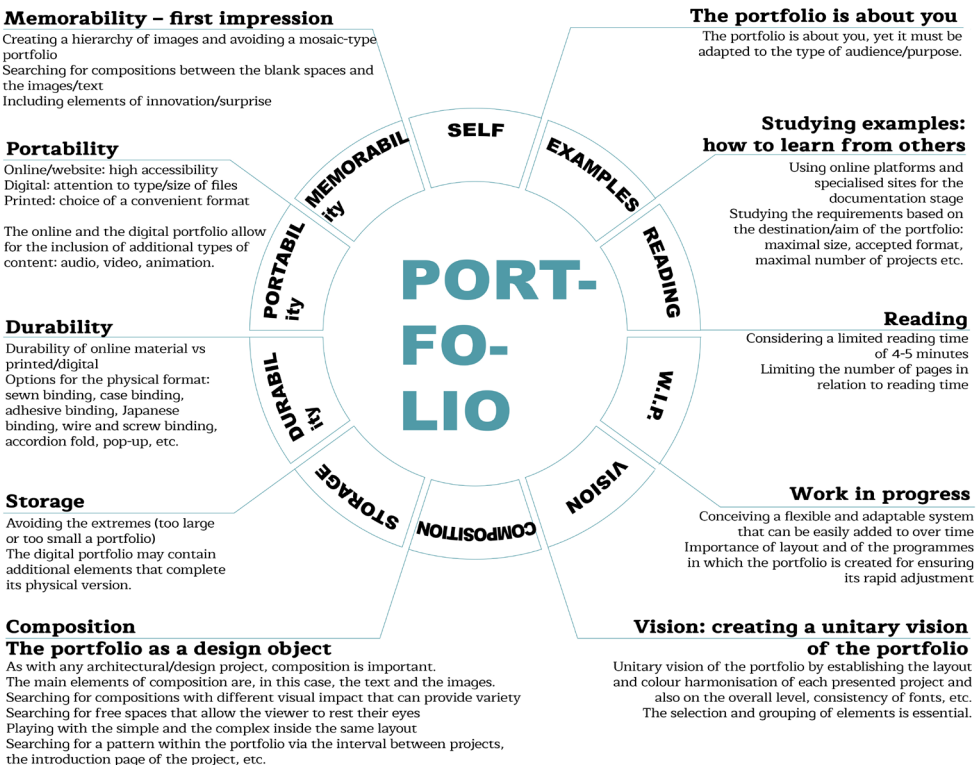


Fig. 2. Principles for the development of the portfolio. © Oana Anca Abălaru Obancea

General principles for the development of the portfolio

It is impossible to speak of a predefined path in the development of the portfolio. Everyone must strike their own path, which best expresses the academic and/or professional stage they are at. The fact that the portfolio mirrors our abilities, competences, interests and vision provides the premise for a unique and original product.

All the principles that will be stated and described in continuation must be related to the purpose and type of portfolio. This is exemplified in Jakob Nielson's book, *Designing Web Usability: The Practice of Simplicity* (2000). Referring in particular to online presentation content, the author mentions four essential principles that should guide this type of presentation interface, with three of these being easily applied to online portfolios: high-quality content, constant updating and ease of access and viewing of the material (Nielson, 2000).

While far from a complete guide, the diagram in Fig. 2 contains a few elements that have been identified as important in the preparation of an architecture portfolio and it states a few of their possible implications and applications.

Elements of structure, organisation and content

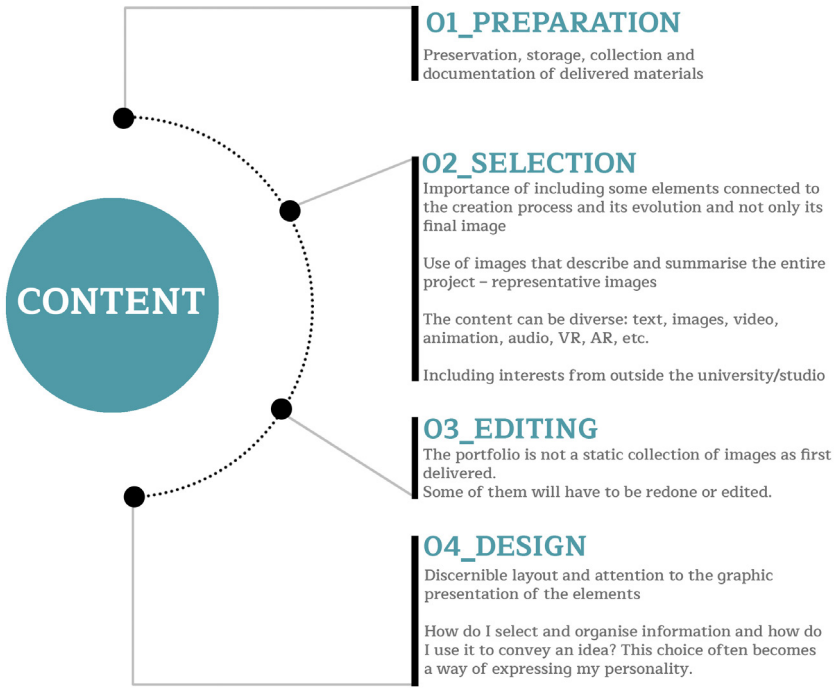


Fig. 3. The contents of the portfolio. © Oana Anca Abălaru Obancea

The portfolio is not a mere collection of projects. Including several projects and interests inside a unitary presentation entails activities of preparation, selection, editing and graphic design. Fig. 3 offers a schematic synthesis of a few processes undergone by the content, prior to the stages of organising and structuring the portfolio.

Structure is important because it establishes specific relationships between the elements without losing track of the goal of the material we are about to create. Defining the structure is a fundamental step in the actual creation of the portfolio. Five vital and recurrent elements can be identified for this particular type of presentation, captured in the illustration below.

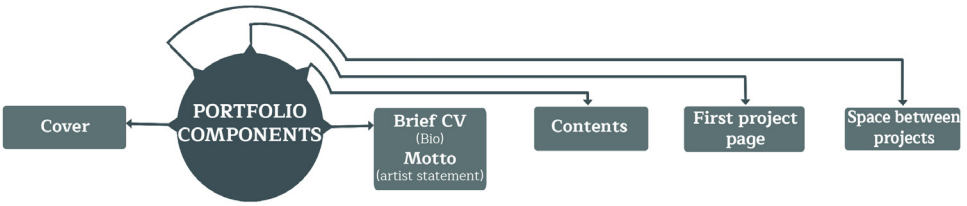


Fig. 4. Elements of structure. © Oana Anca Abălaru Obancea

The mode of organisation refers to setting criteria for the ordering of the previously selected projects. Each of the five types identified has a number of advantages that must be carefully weighed before making a choice:

_Organisation on the basis of complexity and abilities allows for the presentation of those projects that show the maximum level of abilities and competences.

_Organisation into types of work (academic, professional, internship, research, etc.) allows flexibility in the use of the portfolio for multiple purposes.

_Organisation into categories of architecture programmes is especially recommended in the case of very ample project content. It is also frequently the way of systematising projects on the websites of architectural bureaus, in the exhibitions of architectural competitions, etc.

_Organisation on the basis of project localisation is specific to the large architectural bureaus that wish to display their experience in diverse and multiple contexts.

Conclusions

The development of the portfolio is a process that accompanies our entire academic and professional activity. It is in itself a creative act that must, however, communicate experiences and acquired abilities, passions and interests that guide our activity. This particular form of communication has specific requirements and attributes, which should be known. The portfolio has been shown to adopt multiple shapes and contents whose study largely determines the creation of a successful product. This chapter has underlined, grouped and ranked a few elements that are deemed important, thus providing a basis from which the individual creative contribution can begin. Perhaps the most significant conclusion is that the portfolio is an ever perfectible and adaptable material, which evolves alongside the student and the architecture professional.

References

Breen, J. (2013). Designerly Visualisation: Conceptions, methods, models, perceptions. In Morello, E.P. & Piga, B. (Eds.), *EAEA11 2013. Envisioning Architecture: Design, Evaluation, Communication*. (pp. 11-31). Roma: Edizioni Nuova Cultura.

Fish, J., & Scrivener, S. (1990) Amplifying the Mind's Eye: Sketching and Visual Cognition. *Leonardo*. 23 (1). (pp.117-126). Cambridge: The MIT Press.

Herbert, D. (1993). *Architectural study drawings*. New York: Van Nostrand Reinhold.

Luescher, A. (2017). *The Architect's Portfolio: Planning, Design, Production*. London: Taylor and Francis.

Kosslyn, S. M. & Rosenberg, R. S. (2011). *Introducing Psychology: Brain, Person, Group* (4th ed.). Boston: Allyn & Bacon.

Maier, R. & Thalmann, S. (2008) Institutionalised collaborative tagging as an instrument for managing the maturing learning and knowledge resources, In *International Journal of Emerging Technologies in Learning,* Vol. 1. No. 1/2. (pp.70–84).

McGlynn, M.J. (2003). Thinking it through: the importance of study sketches and the implication for design education. In Morello, E.P. & Piga, B. (Ed.), EAEA11 2013. *Envisioning Architecture: Design, Evaluation, Communication*. Roma: Edizioni Cultura Nuova.

Nadin, M.(1997). *The Civilisation of Illiteracy.* Dresden: Dresden University Press. https://www.nadin.ws/archives/429

Nilson, J. (2000). *Designing Web Usability: The Practice of Simplicity*. Michigan: New Riders.

Norouzi, N., Shabak, M, Bin Embi, M., Khan, T. (2015) The Architect, the Client and Effective Communication in Architectural Design Practice. In *Procedia - Social and Behavioral Sciences*. Volume 172. (pp 635–642).

Tombazis, A. (2008). *Scrisoare către un tânăr arhitect.* Atena: Libro.

Verzijl, W. I. (1997). Introduction. In *Archidea*. XVI. (pp i-i)

contemporary trends

_teaching

_research

_assessment

The interviews on the subsequent pages bring up four keywords in approaching a diploma project: coherence, responsibility, complexity and innovation. The answers, given by teachers who are members of the UAUIM leadership board and/or presidents of diploma juries, highlight the diversity of the ways in which students could interpret and follow these criteria after their own fashion.

https://doi.org/10.54508/9786066382465.03

The diploma in four keywords. Interviews

Univ. Assist. Anda-Ioana SFINTEȘ PhD Arch.

Prof. **Marian MOICEANU** PhD Arch.

Rector of "Ion Mincu" University of Architecture and Urban Planning

What does the diploma represent from the point of view of the student's entire academic trajectory?

It is essential that the teacher and the student should understand, first of all, that the diploma project is the crowning achievement of continuous effort over at least six years of study and that it is the result of the knowledge accumulated during the years at the university, in the interaction with the teachers and through individual study.

Students should acknowledge the fact that the diploma is also a competition against oneself, that is to say, a personal project in which you want to prove to yourself and to an international jury, since the panel includes foreign as well as Romanian teachers, that you are worthy of the architect diploma. If the desire to prove this is absent, an error has been committed from the start. This is because in the diploma project the student architect should aim to demonstrate that they understand and love architecture and they should convey some of their knowledge to others.

The diploma is also an important event for the teachers, an opportunity to note the level of the university and of the students' competence. Not all juries are the same, just as not all students are equally knowledgeable. There are juries in which the students' projects are not so well developed and juries in which the presented projects have great complexity. This has always been the case. This is why it is important to have the final discussions in which the members of the jury, both Romanian and foreign, meet and attempt to briefly describe the students' level of competence, the subjects/themes they have come across in their panels, the difficulties and the positive and less positive aspects, before concluding with praise, criticism and recommendations. The university, its teaching staff, take all this into account and they attempt to improve the curriculum, the approach, the themes, etc.

The development of the diploma project is in fact a process during which the research issues are explored in progressively greater depth. How can coherence be maintained throughout the process, from the initial stages of research to the final presentation in front of a jury?

Coherence is first of all found in the way of conceiving the curriculum. This is why I would answer with a comparison. Before 1989, the university curriculum relied on covering a number of architectural programmes over the six years of study. Our university was a very pragmatic and functionalist one in which competences were acquired through the coherence of a hierarchically arranged study of the different architectural programmes. After 1989 and following a period of searching (and of course, stronger international connections) there was a shift of paradigm, in the sense that it was considered that architecture could be taught, learnt and understood by starting from the aim of acquiring competences specific to the architect and urban planner profession. As Dean, I was the one who formulated, on the basis of the 11 competencies of the architectural profession stipulated at the European level, the six competencies that appear at present on the graduation diplomas. Continuing tradition, the leadership of the "Ion Mincu" School of Architecture unequivocally stated that they intended to prepare students in the course of the six academic years so that they could acquire these competences and be ready, on graduation, to work in architecture, design and urbanism studios or in related fields that require the mastery and practical application of these competences. This pragmatism has never been abandoned by the university. I believe that ensuring the continuity of the educational approach is the main reason for the influence and competitiveness of our university. The very high number of graduates who work in prestigious architectural bureaus and who are known precisely for this pragmatic approach to architectural issues testifies to this competitiveness. Coming back to the coherence of the curriculum, it is worth highlighting that the design studio is given most weight since the credits and the hours allotted to it make up more than 50% of the curriculum. I would also say that the coherence of the approach is given by those who conceive the directions of development of the university, its orientation and the main areas of interest. We are talking about deans, heads of department and to the level of the coordinators of each design studio or of each discipline.

On the other hand, coherence must also be understood by the student. The coherence of the curriculum, of the manner in which the themes are expressed and of the way in which the student is asked to respond to them in the course of the six years of study should be reflected in the approach and in the coherence of the student's work on the diploma project. Coherence must also be sought and programmed. It starts with the choice of theme, with the analysis of situations and the formulation of questions, with the argumentation and with the artistic, expressive presentation of possible answers. All of this ensures the coherence

of the theoretical approach and the coherence of the discourse, which are thus capable of sustaining the student's answer as developed in the diploma project. This is why I tell my students from the very beginning that the choice of theme for the diploma project must be theoretically grounded in the dissertation. I explain to them that our artistic gestures must be contained within the scientific analysis and within a theoretical, sometimes even philosophical, framework. At the beginning, one must "dig deep", study, analyse and then one must try to understand.

The student must feel the need for this coherence, but the teacher should also pay attention and ensure that this requirement is met. In the absence of this coherence, projects may easily become dull and lack clarity and vision as well as complexity.

The diploma project requires one to demonstrate a certain level of maturity and an awareness of diverse professional responsibilities. What responsibilities should the student assume within the framework of the diploma project?

Architecture solves problems by responding to various needs: the need for beauty, the need for integrating the new with the old, the need for continuity in the city, the need for functionality, expressivity, etc. The student must understand these things and this comes gradually, through an understanding of architecture.

As teachers, we lay emphasis on the study of architecture at university as well as on individual study. In the course of the six years, we tell students about integration, specificity, identity, expressivity, function etc. We make the case for these values to the best of our ability. But they can all remain mere words in someone's vocabulary unless they are understood and applied in the university assignments or in the diploma project. When this happens, it means that we have done our duty and that the student has understood the responsibilities of the architectural profession.

I think responsibility also comes from realising that the diploma project is the culmination of all the knowledge acquired so far. Responsibility is also proved by the student's attitude towards the act of teaching, towards what is being taught, but also by the manner in which they wish to persuade the jury through their project.

Responsibility today, more than before, derives from an understanding of the need for sustainability, the need to respond to contemporary problems, or from the necessity of an identity for any architectural gesture. It is good when these kinds of problems are solved through the diploma project. As teachers, we encourage this type of diploma project, a less spectacular one perhaps but which tackles a present-day issue in depth and suggests solutions that are feasible for the community.

An essential requirement in approaching the diploma project is the attainment of a certain level of complexity, a certain depth of research, yet students are often unclear about what this implies. So what could the attainment of complexity refer to in the diploma project?

I would rather say where the errors are made. Sometimes students think that the site or the choice of theme, the function, the architectural programme have to be sizeable. And they choose concert halls, stadiums, museums. Yet complexity is not purely a question of size, most often it consists in the complexity of the approach, of the way in which you, as a student, come to analyse and to propose new concepts via the dissertation, the pre-diploma and the diploma. In reality, the project can be small-scale with regard to surfaces, heights, volumes as long as it is pursued to a high level of detail.

The teacher and the student must decide together upon the theme of the diploma project, on the programme and its dimensions, depending on the student's abilities and potential. Here the teacher plays an important role and has the responsibility of leading the student to an area where they can achieve maximum results and stretch their abilities.

The complexity of the approach should also be reflected in the final result. It is odd when one only encounters this complexity at the level of verbal expression and in the oral defence of the student's ideas, when it is not contained in the project itself, expressed and presented in the graphical manner specific to architecture, for example in plans, facades and sections. Yet sometimes a section can be more relevant than an architectural perspective and reveal a lot about a student architect's understanding and control of space...

Complexity consists of this entire process in which you analyse and understand before finally arriving at a personal architectural proposal that you present and defend in front of a specialist panel. And when a student has reached the stage of defending a project in which they truly believe, it means they have already started to understand and accept the purpose of their profession.

Innovation is a keyword in today's society, regardless of activity sector. In fact, the issue of innovation is frequently brought up by the external members of the diploma juries. Within the framework of the diploma project, what could innovation consist of?

Innovation is a must, in architectural creation as in other fields. It is not enough to limit yourself to citing or adopting illustrious examples or to the answers given by others. The architect is a scientist, but also an artist and thus they create and innovate. This is why innovation is also a must in research papers: dissertation, diploma, or doctoral thesis. It is simply that innovation does not happen by itself, in the absence of

analysis, knowledge and understanding. To innovate, you should know what has happened in the field so far; this would mean knowing a great deal of things, refusing some and believing in others and then starting to interpret and to develop them in your own manner. Innovation presupposes the ability to judge the valuable things that have been achieved so far, the noteworthy experiences of the past, and it continues with a new, personal and unique contribution to the sum of time-tested achievements.

Finally, would you like to give any advice to students about to embark on their diploma projects, or would you like to add anything to the points already discussed?

The diploma gives the students an opportunity but also the enormous responsibility of proposing a coherent, personal and innovative architectural answer to all the discontent and criticism they express, sometimes forcefully, in relation to the approaches and results of others. The diploma project gives them a chance to prove to themselves and to the members of the jury that they can create better architecture than others. They have the chance to prove that they have earned their architect diploma.

It would be wonderful if in the future, after a long career in the architectural field, the graduates of today would discover on reviewing their personal evolution that they have managed to become the architects of their own lives.

This is what I wish for my students.

Prof. **Tiberiu FLORESCU** PhD Arch.

Vice-Rector for Academic Development, Institutional Image and Student Relations

What does the diploma represent from the point of view of the student's entire academic trajectory?

The four keywords – coherence, responsibility, complexity and innovation – perfectly capture the key elements of the diploma and what the diploma represents, at the end of architectural studies. From my point of view, they refer to a double issue: the diploma project is in equal measure a reflection of the school of architecture and of the student – it is the expression of the ultimate study aims of all the graduates, of each of them individually and of all together. What I mean is that the responsibility for high-quality diplomas is shared by both parties. In my view, attaining the values encapsulated by the four keywords must be ensured first of all by the framework provided by the university for the development of this process called the diploma. I am not referring simply to the defence. The defence is the final stage, the moment of public debate and shall we say ...of public display ...of the student's qualities, of the future architect, in front of a jury that certifies the completion of their studies. Like the closing of a circle, this moment completes the student's trajectory.

The diploma, in the end, is an exam – let us not forget it. This means that everything you say, all the statements you make, the demonstration you give to the jury, illustrated by the project, is part of your exam performance, which is also a test of maturity. The diploma represents after all proof that the graduate has acquired the necessary knowledge and graphic expression abilities as well as the ability to persuade a jury. It demonstrates maturity by means of the work conceived and carried out by the student, which is presented as their personal vision in relation to a problem they have identified, constructed and solved by means of the diploma exercise, supported by the dissertation.

The development of the diploma project is in fact a process during which the research issues are explored in progressively greater depth. How can coherence be maintained throughout the process, from the initial stages of research to the final presentation in front of a jury?

The coherence of the approach represents the coherence of a trajectory, the continuity of approach or the continuity of interests (in the course of the pre-diploma foundational study, the pre-diploma, the dissertation and the diploma). During such a long process, which begins from the identification of a problem in a particular place and continues in directions linked to general issues of that specific place, of that particular context, or linked to the need for a particular programme

that arises from different considerations and so on, the coherence of the process or of the undertaking can be preserved by retaining the same objectives, which must be constantly pursued through the solutions that the student brings up for debate. Not necessarily through the result or through the actual solutions. The concept can change, but the perspective on the objectives should always be the same, with a focus on understanding the need to which the project must respond and on the accurate and complex diagnosis of the context where the intervention is made. The analysis of a site or a context is done by extracting the important elements we relate to, for which we seek solutions. The coherence of the approach is ensured by relating to these problems; it is not a question of formal coherence. It is important to steadily pursue the elements identified at the foundational study stage and which can be connected to certain functional, economic, social, cultural, contextual needs and so forth. The answers to all these needs ... and even to the same need... can be formulated in different ways, through different projects, through different concepts. A study of different versions, as required in the pre-diploma not so many years ago, presupposed two alternative approaches, two solutions, which enabled students to formulate the problem differently and to grasp the fact that in architectural creation the first thought, the first concept is rarely the best and thus, you must have the stamina to examine the alternatives in relation to the same requirements.

It will never be said that your undertaking is not coherent just because you change the solution or you come up with an alternative solution or with a new concept that you trial and experiment with, not as long as this undertaking is the one that has led to the new alternative, which means that it relates to the same functional requirements, to the same theoretical elements, not as long as it responds to the same needs etc. So coherence is about the main features of the approach to the subject, not about the form of the answer. Coherence is given by the means used and by your way of thinking, by the perspectives from which you approach the subject.

I place a strong emphasis on the initial stages of the project, that is to say, on the foundational study on the theme, on the theoretical grounding (the dissertation) and on the pre-diploma. If these stages are well understood in themselves and if they are carefully and perhaps even enthusiastically covered, it is impossible that the resulting approach should not be coherent. It becomes incoherent from the moment when these first stages are not taken seriously and the essential elements to which the project must respond are not clearly identified. There is every risk then for the entire undertaking to become incoherent because crucial elements that the project should respond to are lost to view.

Not least, the coherence of the approach could be maintained through a certain personal touch that the student can impose from the start; if, from the very beginning, they aim to approach the problem differently and if they do this consistently, then this can indicate a certain coherence.

The diploma project requires one to demonstrate a certain level of maturity and an awareness of diverse professional responsibilities. What responsibilities should the student assume within the framework of the diploma project?

First, they must assume the responsibility that this project represents them and belongs to them. The diploma project should constitute the highest-quality answer they are capable of giving. If the student thinks that they would be able to do more or to say and demonstrate more, then it means that they do not show sufficient responsibility given the importance of this moment of their professional life. So they must give their all, but they must also assume responsibility for the fact that everything they show, the solutions they present belong to them and that the potentialities of the project reflect their thinking. I am referring to aspects connected to contextual framing, the relationship to the city, to urban issues, to the theory of architecture as well as to technical aspects, the maturity of the architectural language, etc. All of these together, in their project, make up the quintessence, and the responsibility is theirs with regard to the personal, original or innovative answer they give, which turns it into a unique, authorial project. The supervisor only has the role of directing and guiding them. They must identify and make the most of the student's best qualities in order to channel their efforts and to guide them, both in the choice of subject and in the process of solving it.

Subsequently, the relationship between the responsibility and complexity entailed by the project is an aspect that must be carefully considered by students because the responsibility is theirs with regard to the choice of subject. With less complex subjects, the results will also be less eloquent; with challenging subjects that reflect the real problems of the society we live in, the impact of our actions on building a better-quality existential framework will come up for discussion and the degree of complexity will also be different.

An essential requirement in approaching the diploma project is the attainment of a certain level of complexity, a certain depth of research, yet students are often unclear about what this implies. So what could the attainment of complexity refer to in the diploma project?

A diploma project is complex when it offers answers related to a particular context and to specific constraints and not simply an answer related to a programme. A project is complex when it can answer a question one formulates from any of the perspectives taught in school, so it must touch upon: urban issues, architectural theory issues (discussions on space, volume, light, colour, materials and so forth), issues of architectural technique or technology, social issues (whether as a response to a society-wide problem or from the perspective of particular type of users, whether they are older, they have a physical illness or they

belong to a particular socio-professional category etc.). A diploma that does not refer to any problem and that does not touch on any issues connected to the environment, to sustainability, to urban design, to history, etc. is not sufficiently complex. A winery, a craft workshop, not even an airport is complex enough if it does not refer to these aspects. A dwelling can be a complex diploma project if it refers to these aspects and if it reaches the point where the coherence of the project and thus of the thinking moves from the object to the detail, from the context to the object, from the community to the context. And then it can indeed be a complex, coherent project which also brings a degree of innovation. But if one of these elements is absent, I do not think that complexity can truly be attained.

Let us not confuse a complicated or large-scale project with a complex one! Complexity is attained through issues that refer to all the architecture fundamentals. The importance of the programme, its surface, its degree of formalisation in the project are not a direct reflection of complexity. Sometimes complexity derives from a certain simplicity, too. An exceptional synthesis of a place, understood in a particular way, renders a diploma complex, but such an approach is far more intricate than the creation of a complex diploma by means of the multitude of issues it highlights and responds to.

Innovation is a keyword in today's society, regardless of activity sector. In fact, the issue of innovation is frequently brought up by the external members of the diploma juries. Within the framework of the diploma project, what could innovation consist of?

I would define innovation in the diploma project firstly as a personal interpretation and a personal answer. Innovation refers to a very great extent to the personal contribution, the individual vision that must not necessarily be innovative in the sense of inventing something or of discovery but in the sense of a new look, a fresh look, anchored in the reality of our society or of the place where the intervention is made.

Innovation may consist in identifying a particular problem, in the specificity of a solution, in an answer, an intervention that can be made today in a manner that differs from the past, in the answer given in relation to different types of users, or in responding to contemporary trends, aiming at a modern way of using space, etc. There are many areas where innovation can occur. Innovation can refer to form, to exterior design, to urban composition, to the combination of materials based on the knowledge of their technological attributes, to the association of materials, to new facade solutions, etc.

Yet innovation can only be implemented on the basis of a previous thorough study. It can only appear as a result of highly detailed knowledge ...And, at any rate, innovation cannot be really introduced for its own sake. I would not advise students to seek innovation at any cost. It

occurs when the answer they produce is focused on major components of the identified problems; it most often comes naturally, straight from the solution. It is not a purpose in itself. We state that diploma projects must have this component to ensure that students pay constant attention to the specificity of the answer. True innovation occurs when they understand the problem very well, as a result of in-depth study. Innovation is also a result of the coherence and complexity of the project.

Finally, would you like to give any advice to students about to embark on their diploma projects, or would you like to add anything to the points already discussed?

The advice I would give them is to take this diploma project most seriously because regardless of their academic trajectory (I am referring to their results, the marks), the diploma is a landmark project. It is the project that represents them at least until their first great architectural success – winning a competition, building their first projects. It is the most eloquent project that they will show everywhere and that they should be proud of. So, from this perspective, they should be highly invested in the diploma. The diploma is an important stage. It is an important stage because, in the understanding of most people, it reflects your level when you graduate from the university of architecture. This is what you start with.

I would advise them to choose their subject and their supervisor carefully so as to accomplish a project that truly represents them and not to be content with little, thinking that it does not matter. It matters a great deal! It matters a great deal what university you graduate from and it matters what projects you have completed. In life, there are two necessary (but not sufficient!) conditions for professional recognition: to have a degree from a good university and to have a portfolio of very good projects. Our university has an excellent reputation. It enjoys considerable international recognition and its students should be happy and proud that this is the case. This is connected to the quality of the teaching and of the teachers and students in general. So the first condition is met. The second depends on the qualities of each student and of each individual project. My recommendation is to treat this with utmost seriousness and dedication, especially in the diploma, so that they can truly consider that what they have there, in the proposals they make, the problems they discuss and which they solve and illustrate through the project, represents the highest degree of professionalism they are capable of.

Prof. **Simona MUNTEANU** PhD Arch.
Vice-Rector for Academic Operations Management

What does the diploma represent from the point of view of the student's entire academic trajectory?

The diploma is the last academic project. So we enjoy the total freedom of not being constrained by a social commission and of demonstrating what we are capable of, with an inventiveness pushed to the utmost. ...Or it is the first project of responsibility in which I, as an individual, demonstrate what I have learnt and I attempt to integrate all the knowledge, abilities and competences acquired at university by putting them to work in this, shall we say, first mature project. I think the truth is somewhere between these extremes. Both approaches can be equally correct. I think a lot depends on each student's personality and that it is important that they define their position, the status they want to give to the diploma, especially in the interaction with the supervisor.

I can say: I want this to be my last academic project! I am not bound, I have neither financial nor thematic constraints ...So I have this total freedom of choosing the subject, the theme, the site, the approach and so on.

Or the more practice-focused, more responsible, more mature students can view this stage of their professional life as their actual debut in the professional world and in this case the diploma project is a kind of visiting card which attempts to integrate what they can do. It may be the most interesting element of a professional portfolio.

...But it is not about the purpose. It is about the degree of freedom and the methodology chosen together, in the supervisor-student team. This is because we, as a university, have defined specific objectives for the diploma project and thus each supervisor, each teacher develops their own didactic activities in relation to redefined themes, connected to their work – in the disciplines they teach or in their professional experience.

The development of the diploma project is in fact a process during which the research issues are explored in progressively greater depth. How can coherence be maintained throughout the process, from the initial stages of research to the final presentation in front of a jury?

I think this answer has three parts. The first concerns attitude: the extent to which the student constantly relates to the diploma. As a jury member, I often encounter final-year students at three stages – the foundational study, the pre-diploma and the diploma – and every time I see students whose consistent approach resulted in a coherent perspective because this consistency, in one way or another, drove them to learn, to study the topics in greater depth and to revise. Of course, we have the other extreme as well where students work in stages, that is to say, they treat the subject as if it consisted of three unrelated deliveries.

The second part is the way in which they select the theme. The question that arises is: what determines students to take up a particular theme? Are they interested in a particular field, do they want to study an architectural programme in greater depth? Are they interested in a particular place, a site that has perhaps obsessed them throughout their studies ...or perhaps a place that is representative of their personal experience? ...Or a combination of the two. I would relate this again to coherence: attachment to the theme or to the motivations that led to its selection for the diploma prove or give a certain coherence to the approach because it presupposes investigation, and investigation, in one way or another, presupposes a methodology that generates a coherent approach to finding the solution.

The diploma project requires one to demonstrate a certain level of maturity and an awareness of diverse professional responsibilities. What responsibilities should the student assume within the framework of the diploma project?

I always try to bring students to the practical level in the Urban Law course I teach in year 5 and so we arrive at discussions related to responsibility. These discussions have made me realise that responsibility is generally viewed by our young students as a millstone around their very frail necks. I do not think that the students have a very clear sense of their responsibilities, yet making them aware of these at the diploma stage would render the process very difficult because they do not understand them. I think that students should rather be helped to realise that precisely everything they propose, the results of their work, of their study represent an attitude, an opinion that they must argue for. In the event that this attitude leads to particular results they need to understand them and to derive lessons from this experience.

The students are at a psychological stage of evolution where they view any kind of limitations as constraints and not at all as reference points

that can lead them to assume certain attitudes and so they would need, in fact, clearer ethical guidelines. The methodology I mentioned earlier could apply here as it involves some responsibilities from the start – the fact that they must carry out a particular task prompts a reaction and an action, which means they assume that stage.

There is another aspect that should fall under the notion of responsibility: understanding competition. We live in a very competitive university and this is positive, but I think no clear distinction is drawn between competitiveness and competition. The student competes with their colleagues; they do not set professional reference points that they wish to attain; they do not have ethical, moral or professional goals that they aspire to; they do not have a career plan that they intend to follow. I think this is a major problem and perhaps their assuming responsibility would mean creating this career plan. I think an interesting exercise for the students in year 6 would be to come up with a career plan until the age of 35; they should think about what they want and this would provide a form of guidance whose starting point is the diploma. They should tell themselves: My career starts now! The diploma is the first page of my professional portfolio and this is my career plan! I start with the diploma and I assume this responsibility towards myself. If we generated this transformation, then the diploma project might be seen in a far more favourable light by the students.

An essential requirement in approaching the diploma project is the attainment of a certain level of complexity, a certain depth of research, yet students are often unclear about what this implies. So what could the attainment of complexity refer to in the diploma project?

Students often choose the theme, the site, the approach without having any arguments, without being sufficiently aware of the need, in particular of the public need for the project. All these choices should be based on the very clear understanding of the fact that an authorial project (and the diploma is the first authorial project of these budding architects) represents an answer to a social commission and thus they should ask themselves: what might this commission be? Who is my beneficiary? Who would be interested in such a project? If the site is very close to my heart, then who could be the sponsor who would generate a commission for this project that I want to complete? The students usually bring up feelings to justify what they do, but you cannot feel what can be done on a site or how, what a good approach would look like, if you have not practiced a little in advance. So I think the diploma should be approached, from the very beginning, from the perspective of having to illustrate, in one way or another, a potential social commission, a potential beneficiary. In addition to this, the project, beyond the process and the option it offers, does not simply represent a vision. It does not simply represent rendering abilities. It actually represents a concept of life, a business concept, a community concept, that is to say,

each diploma project has users, a context that is generated and produces effects; it has an impact on the social, material, economic, personal and cultural levels. This impact should be defined and, at a given point, it might determine the choice of a specific degree of complexity. All the above are reference points which the student should constantly consider. I think that good architecture responds to a need and to a specific place. It does not even need to be aggressive, it should not shout: Look at me! I'm the biggest, I'm the mightiest, I'm the finest! I think that withdrawing to a neutral position, as required by the need to integrate within a context, to fulfil needs and to adapt to particular stages, would make students pay far more attention to details, in the attempt of discovering the significance of all the information they can receive at a given moment when they approach the site.

Innovation is a keyword in today's society, regardless of activity sector. In fact, the issue of innovation is frequently brought up by the external members of the diploma juries. Within the framework of the diploma project, what could innovation consist of?

Innovation goes hand in hand with science and technology. And here we begin with a deficiency. Europe cannot compete with the US in this respect because technology is a top priority in the US. You cannot finance research to a very substantial degree if you do not finance technology and if the latest technological approaches are not within your reach. If you do not experiment a little with technology, you cannot understand the freedom it can give and the approaches, sometimes outside the field, that you could take. Our students are innovative at the level of form and they may be innovative on the cultural level, but they are in a closed environment – akin to a septic environment where the same answer is infinitely replicated. To bring something new, the diplomas of the "Ion Mincu" University of Architecture and Urban Planning should somehow leave this septic environment. They need to be integrated into a multidisciplinary and highly technologised approach because architecture can never advance unless it joins hands with technology. The level of information and knowledge, the access to technology and to this technological expertise would, I think, give them far greater freedoms in approaching the form and concept of architecture.

At the same time, I think that when the diploma development process is a rich, complex one, with a sound basis and methodology, there is a kernel of innovation. It is obvious that the works examined by the student either at the time of preparing the dissertation or at the time of all the searches of the diploma stage lead them to explore further. Perhaps this is where this kernel of innovation, of added value, the need for transdisciplinarity, originates in the student's mind.

I always see this innovation – complexity relationship as a very direct one. If the diploma is treated like a box-ticking exercise, it is obvious that innovation cannot occur; there is no possibility of a new vision,

a new concept, a different approach. And then the searches and the interest for seeing further are absent and the degree of complexity of the answer, of the project, is obviously far, far lower. And this is visible despite the exceptional images produced by the students. A lot of these are fantastic posters, but they are only images. It is scenography, not an architectural project, not a diploma project with a concept and an answer to a question, to a social need, a project that can be clearly associated with a beneficiary. Once these aspects enter the equation, things obviously start to change.

Finally, would you like to give any advice to students about to embark on their diploma projects, or would you like to add anything to the points already discussed?

I think students are, in most cases, so keen to find out things, they are like sponges that absorb a great deal. So they relate to the context in which they find themselves. If we as teachers give them alternatives, if we give them options and if we are diverse, then each of us can deliver a very different experience and a different approach. At this point, I think they would start to think about the discovery of a professional self to a far greater extent than they do at present. And I think the diploma will then mean something else to them, or a lot more than it perhaps represents for many of the students at present.

I think they should create a career plan before they begin the diploma and this is what I would recommend. Perhaps if they tried to design all aspects of their lives, not only the strictly professional but also the personal ones, and if they identified all kinds of needs and curiosities that they might have by the age of 35, they would view the diploma differently, not as the last university assignment. Perhaps they would think of it as I said at the beginning, as the most important and the first element of their professional portfolio, which they can show anywhere in the world to obtain a job or with which they can begin a trajectory, they can begin to construct a professional identity that they will fight for during the remainder of their lives.

Prof. **Georgică MITRACHE** PhD Arch.
Vice-Rector for Education and International Relations

What does the diploma represent from the point of view of the student's entire academic trajectory?

The diploma is a means of verifying the coherent and competent completion of the formative process. In other words, we can refer to the diploma project as the final exercise in the academic environment, which confirms that the student is an independent thinker, capable of bringing together the theoretical and practical components of the architectural profession. At a different level, we view this exercise as a transition towards professional activity.

The development of the diploma project is in fact a process during which the research issues are explored in progressively greater depth. How can coherence be maintained throughout the process, from the initial stages of research to the final presentation in front of a jury?

The coherence of the diploma work is a result of the process involving two important factors: holistic thinking and a consistent attitude. In mentioning holistic thinking and consistency I am referring to the student's ability of viewing the theme as a whole, of restarting the study at the different levels at which the theme is understood and of materialising ideas in relation to the conclusions of the research.

Obviously, our desideratum as supervisors and that of the student as the main subject of the entire undertaking is for the stated idea to be carried out in unitary fashion, in the spirit of novelty and creativity. Depending on our perspective, this finality is a matter of teaching but also of professional self-development, which must be consistently pursued.

The problems arise when, for various reasons (linked to the interpretation of the research results, to the fact that the results of the study are not persuasive etc.), there are leaps or major shifts in thinking. Of course, the presence of these leaps does not mean that the approach cannot be coherent. From the teachers' point of view, we can admit smaller leaps, displacements, deviations from unity, provided there is a clear basis for each decision. On the other hand, "coherence" pursued as a goal in itself and merely for the sake of unity and continuity is simply the expression of a personal or borrowed mannerism.

Architectural discourse becomes coherent when it benefits from all the results of the research and when the student is aware of the need to use them.

The diploma project requires one to demonstrate a certain level of maturity and an awareness of diverse professional responsibilities. What responsibilities should the student assume within the framework of the diploma project?

The first responsibility, from my point of view, is to assume authorship of the project. The student is the author of this project, from the documentation and research stages to its defence in front of a jury and beyond.

Consequently, they are responsible for everything it contains. They need to assume the fact that they are the one to process and work on all the data and situations, to ask questions and to provide architectural answers. The others – teaching staff or experts from various fields – are supporting actors, with whom they interact while working on the project.

From the point of view of professional standards, it is important that the student should be aware of and assume one by one and to an increasingly greater extent the responsibilities that they will have in the future. The university provides a framework for becoming acquainted with them, but the student is the one who must prove that they have been understood. I will only name the following:

_The fact that the product of their work is intended for a numerous group of people and that it affects their quality of life. It thus becomes essential to assume responsibility for the entire scale of values used, the entire practical and theoretical content of the architectural answer.

_Technical responsibilities, namely understanding the fact that design is a complex activity and that even though each specialist's responsible and assumed contribution is fundamental, the architect must possess general knowledge of each field to be able to propose viable answers.

_Socio-cultural responsibilities; the student/architect must prove that they are aware of the socio-cultural space in which they act, seen from a historical and socio-economic perspective.

An essential requirement in approaching the diploma project is the attainment of a certain level of complexity, a certain depth of research, yet students are often unclear about what this implies. So what could the attainment of complexity refer to in the diploma project?

This problem can be viewed from two perspectives – that of the student and that of the evaluator.

From the evaluator's point of view and starting from the hypothesis that completing one's studies is only the beginning of a new process, the exercise must be complex enough to fit into the framework of current demands of professional life. In other words, the student must demonstrate that they possess the abilities and competencies required for professional performance.

Turning to the student's point of view, they need to be aware of the level of competencies and abilities they possess in relation to their possible positioning in the professional sphere.

While I answered the previous question by pointing out that the student needs to freely assume authorship, in the case of defining complexity the student is not on their own. On the one hand, the student needs to be aware of the minimal level of complexity that should be attained; on the other, the supervisor should impose a minimum level of complexity. Thus, the complexity of the project will increase gradually by expanding the scope and depth of the research.

Complexity entails bringing together architectural challenges and issues which will provide the project with adequate theoretical and practical

content, thus demonstrating its ability to connect to the professional and socio-cultural sphere through all its components.

Innovation is a keyword in today's society, regardless of activity sector. In fact, the issue of innovation is frequently brought up by the external members of the diploma juries. Within the framework of the diploma project, what could innovation consist of?

Architecture students should practice innovation at every stage since this is the only way they can begin to rely to an ever greater extent on their capacity to bring in the new.

Within the diploma project framework, innovation would consist in the courage and readiness to materialise an idea and to challenge others to a debate on it. I think readiness is a more comprehensive term here, but I would like to emphasise the content it carries, on the one hand the ability to allow yourself to be challenged on an intellectual and theoretical level by a certain subject and, on the other, the ability to challenge your interlocutors (the examination board and/or the professional milieu etc.) to a debate on a theme that has been developed in a specific and personal way.

Ultimately, any step in organising and shaping space can be considered an innovation insofar as it relates to a context that has been studied and understood in its full depth and complexity. Originality derives from processing/interpreting the specific traits of each contextual element and its characteristic nuances, by means of a personal architectural answer.

The students should start from the seemingly modest things, from the principles and achieve excellence with their help. I would use the word extraordinary, but in comparison with ordinary. In other words, they begin with ordinary things and arrive at extra-ordinary results, they surpass the ordinary. So they bring novelty, they innovate something in a specific field or direction or on a particular theme.

Finally, would you like to give any advice to students about to embark on their diploma projects, or would you like to add anything to the points already discussed?

The diploma project starts already in the second year... which is why I would convey the results of these interviews to early-year students as well. They will not achieve a complete diploma project if the four criteria discussed in this interview – coherence, complexity, responsibilities and innovation – have not been reflected in their practice.

You will note that two decisive factors for the student's path, regardless of the stage they are at, underpin everything we have discussed: awareness and commitment. Every step taken at university should be an opportunity for exploration and speculation and not merely a formality.

The diploma is not the last "manifesto of freedom" but the transition towards a new cycle of learning and development that will be managed solely by the professional, without the involvement of institutional structures.

Assoc. Prof. **Horia MOLDOVAN** PhD Arch.

Dean of the Faculty of Architecture

What does the diploma represent from the point of view of the student's entire academic trajectory?

The diploma project, the assessment at the end of an educational stage, serves a double purpose. On the one hand it reflects the student's maturity level in the choice and structuring of a theme and in the ability of formulating a coherent answer by means of the project; on the other, it is a measure of the student's open-mindedness and professional potential on the completion of their studies. The diploma project itself – as well as the preceding stages, the dissertation/theoretical grounding and the pre-diploma – represents a qualitative (not a quantitative) account of the extent to which the assimilated knowledge has been assumed and integrated in the construction, detailing and graphic illustration of an architectural concept within a given or imagined context.

The development of the diploma project is in fact a process during which the research issues are explored in progressively greater depth. How can coherence be maintained throughout the process, from the initial stages of research to the final presentation in front of a jury?

Defining the project theme as well as the directions of search and research of its theoretical framework determines the degree of coherence of the entire undertaking. The maturity shown in the decisions that must be taken at the beginning of this multi-stage process, which consists in the structuring and the actual formulation of the diploma project, is vital for the manner in which the potential of an idea can be exploited, nuanced upon and gradually detailed during the different stages of the project. The theoretical component (the dissertation) is frequently treated in a superficial manner, with a focus on secondary aspects pretentiously explained, so as to simulate a committed attitude; yet it plays an essential role in justifying and supporting the coherence of the project's development. The more profound, coherent and substantial the theoretical and documentary basis of the project, the more natural will the development of the research and of the issues it touches upon appear to be.

The diploma project requires one to demonstrate a certain level of maturity and an awareness of diverse professional responsibilities. What responsibilities should the student assume within the framework of the diploma project?

Diploma projects undoubtedly actualise not only the guidelines set for architectural education at our university but also the echoes of the students' inmost experiences in the course of their personal progress and the wagers assumed for their future career. Although it represents the conclusion of the academic trajectory, the diploma project remains a learning exercise, an architectural experiment formulated either as a

concrete answer to a specific situation (even if it is an imaginary one) or – less frequently, it is true – as a speculative discourse with reference to a widely relevant issue, viewed from a particular angle. Regardless of the situation, seriousness and the depth of commitment to the process represent the most important responsibilities, naturally accompanied by competence and accuracy in selecting and integrating specialist knowledge into the project. Thus, at the end of the years of academic study and before the years of apprenticeship (the stage of professional preparation), what should be pursued via the diploma project is perhaps not so much the undertaking of particular professional responsibilities but rather the consistency of the message and of the content and the ability to use specialist knowledge in a reasoned and well-argued fashion.

An essential requirement in approaching the diploma project is the attainment of a certain level of complexity, a certain depth of research, yet students are often unclear about what this implies. So what could the attainment of complexity refer to in the diploma project?

Viewpoints differ... The complexity of a diploma project is not confined to the complexity of the architectural theme, to the size or extension of the proposed object or ensemble or to the number and complexity of the constraints imposed by a particular urban scenario. Complexity is above all a qualitative attribute and not a quantitative one, as many are prone to believe. Complexity derives from the manner in which the project is initiated and from the way in which the process is structured/imagined, from the way in which its ultimate goals are envisaged. This may sound banal, yet we all know that in the majority of cases the theme and subsequently the diploma project itself are inextricably linked to aspects related to its extent in square meters, to the singularity of an architectural or urban context, to the number and appeal of 3D simulations and ever more infrequently to the consistency and creativity demonstrated in exploring the potential of a new idea or of new ideas.

Innovation is a keyword in today's society, regardless of activity sector. In fact, the issue of innovation is frequently brought up by the external members of the diploma juries. Within the framework of the diploma project, what could innovation consist of?

The impulse to be original, innovative, to create something that no one has achieved before, is an intrinsic part of the profile and perspectives of any artist... I say artist because the type of innovation we are discussing refers mainly to expressive, aesthetic aspects, the ways in which one can provide an answer by means of form, material, etc. The technical aspect undoubtedly plays a very important role. Yet we must admit that the architects' technical competence has been diluted over the last few decades while specialists from other fields have made a

crucial contribution to finalising and materialising the architects' ideas and projects. The broader the student architect's horizon of knowledge and the greater their ability to draw in a synthetic and creative manner on information from different fields, whether acquired at university or through individual study, the greater the innovative potential, which also includes technical solutions (referring to materials, construction techniques, sustainable, energy-efficient solutions, etc.) that are harmoniously and organically integrated into the formal proposals.

Finally, would you like to give any advice to students about to embark on their diploma projects, or would you like to add anything to the points already discussed?

There is a natural inclination to follow a pattern, a recipe that will allow us to provide a solid, correct and therefore valued answer. Yet it is equally natural for each of us, at a given moment, to attempt to surpass limits, to leave our comfort zone and to broaden our exploration beyond the familiar, the convenient and the available. After many years of training, the diploma project is one of these moments! Beyond the banality and the (sometimes difficult to grasp) precision of the requirements set forth in the university and exam regulations, beyond what the student believes or knows about the expectations of the diploma jury, the project represents first and foremost a free creative undertaking in which everyone displays not only their current level of expertise but also their aspirations.

Assoc. Prof. **Magdalena STĂNCULESCU** PhD Arch.

Director of the Synthesis of Architectural Design Department

What does the diploma represent from the point of view of the student's entire academic trajectory?

The diploma represents the crowning achievement of the six years of study – it is a very long trajectory compared to other faculties where the studies are completed in 3 to 5 years. This is the moment when the student must become aware that they need to stake absolutely everything they have learnt, all the knowledge accumulated and acquired up to that point. It is an important moment because it actually represents the first project in this trajectory where they have total freedom. Unlike the projects developed until the end of year 5 whose themes were set to a greater or lesser extent by the teaching team (an aspect I will return to), the diploma project is initiated by the student, most often on the basis of reasoned personal wishes, and the student is also the one who has to direct the entire process. Everyone finds a theme that reflects their personal inclinations. I usually tell students to strive to create a diploma project where they feel they showcase their abilities and the knowledge accumulated over the five previous years. Now is the time to spread their wings and fly. Although the completion of their studies will be followed by two more years of having someone who steers and monitors them until they truly take off, the diploma represents an important threshold from the point of view of acquiring autonomy.

Coming back to what I said earlier, about the themes over the course of the 5 years, it should be said that for the later years, i.e. years 4 to 6, we start to adopt a slightly different attitude compared to the way in which themes were introduced and taught before. We start to set themes that are intentionally left open, "unfinished", in order to develop the students' capacity of differentiating them through the manner in which they research a project and the context in which it will be integrated. In other words, already during the later years, a basis for autonomy is built through taking responsibility for the completion of the theme and implicitly through orienting the study towards particular areas of interest and providing justification for these choices.

The development of the diploma project is in fact a process during which the research issues are explored in progressively greater depth. How can coherence be maintained throughout the process, from the initial stages of research to the final presentation in front of a jury?

Maintaining coherence in the course of the diploma work can sometimes be difficult, yet its diligent pursuit must not be abandoned. Here, the diploma supervisor or supervisors play an important role as they support the student during this process with their own experience of design and research.

In this respect, the experience of the results obtained over the years have led to the conclusion that it would be beneficial to introduce an additional step in the diploma process – the foundational study. This is a year 6 project which lays the ground for the complex study consisting of the pre-diploma, the dissertation and the diploma. In addition, we can say that the final project of year 5 is also a form of training with a view to becoming familiar with this process since it tests the abilities and knowledge required for initiating the diploma. The diploma project has three different stages, three steps: as in any research process, there can be progress and setbacks, retakes, new ideas that require redoing all that has been studied so far. Coherence should result from the way in which the project is approached from the very first step. The foundational study is a very important stage as it ensures there is a clear idea from the outset. Good ideas often come intuitively, as a result of the experience accumulated over the years of study and these incipient ideas should not be forgotten but explored more deeply and re-evaluated after each stage of the study. The creation of the diploma is an active process and this is normal. This is why I think it is very important for the supervisor to reconnect you to the initial concept or idea (or the one set at a particular stage) in order to maintain coherence. This project is a research process in which the committed mentor understands that the protagonist must be placed in the right light. The supervisor is like a coach: their role is to bring the student back into the appropriate area of study.

The diploma project requires one to demonstrate a certain level of maturity and an awareness of diverse professional responsibilities. What responsibilities should the student assume within the framework of the diploma project?

The first major responsibility would be to choose a point of departure, whether it is a plot of land, a context, an idea, an architectural programme that they have studied at university or that they have not studied but are inclined to examine. This initial choice is a major responsibility in itself. Then, in my view, major responsibility passes to the sphere of spatiality – it is very important how the student solves the concrete situation in the chosen site while understanding that the gesture they make now on paper or screen could actually be built and thus mark that place for a significant number of years. It is very important for the students to understand that it will generate a dynamic in the area and a complex life, through the inserted building, which will dominate the respective area for a very long time. In the course of time, the zone will pass through modifications and changes, which is why another architectural responsibility is to foresee these changes or at least to be sufficiently modest so as to leave room for development over time, adaptation and modification over time of the proposed space and architecture.

At the same time, students must understand that they have a great responsibility with regard to the social and cultural impact of their architectural proposal. Through defending their ideas and through the project, today's architect has the capacity of educating several categories of people, towards a better, more sensible future. And I am referring here in particular to clients but also to the users of the buildings.

An essential requirement in approaching the diploma project is the attainment of a certain level of complexity, a certain depth of research, yet students are often unclear about what this implies. So what could the attainment of complexity refer to in the diploma project?

I would like to answer this question by exemplifying with two extreme cases of what can constitute a complex diploma project. One case is that of a theme on a relatively small scale. Such a project could be guided towards a careful study that would deepen the research layers one by one and reach a very high level of detail. I am reminded now of the houses of the architect Frank Lloyd Wright, which showed the pleasure of studying to detail level, for example in the carpentry work or the balustrades and even in the proposals for stained glass or custom-made (unique) light fittings. The other extreme would be the diplomas that propose very ample sites. These require from the beginning an effort of understanding at a larger scale, an approach that directs and articulates some general intentions, significant research on urban planning. In this case the diploma project will often only manage to

detail a far from large part of this study. Here, complexity derives from this global, innovative vision of a site. It is important to understand that the diploma can develop in any fashion between these two extremes, from tackling a very ample site to the architectural object as a single piece. In fact, the degree of development also depends on the scale and complexity of the initial approach because a site that is not necessarily large can frequently require deeper analysis in a broader context that encompasses more remote neighbourhoods. Using multiple criteria to research the context can lead to redefining the scale of approach of the entire study.

Complexity can also stem from the manner of approaching the project, for example relating to the viewpoints of different users and not merely to that of the client who initiates it. The project can also be influenced by the special requirements of the community or by sustainability ideas of e.g. retaining the existing buildings even if they are not heritage.

Innovation is a keyword in today's society, regardless of activity sector. In fact, the issue of innovation is frequently brought up by the external members of the diploma juries. Within the framework of the diploma project, what could innovation consist of?

"Innovative" in the diploma project can even refer to how you choose to treat a subject, how you describe the theme. For example, if a student chooses an office building as the diploma theme, it is clear that in the present context they must investigate all that has happened over the last two years as a result of the pandemic, what is happening with the existing buildings, how they are used or not etc. The way in which the student manages to integrate the understanding of the topic seen from many points of view, of several urban actors, with the personal and customised solution that they will bring, can also be innovative. The built environment should be explored and the conditions it imposes on the project must be understood in order to obtain innovative solutions and answers, suitable for several user categories. Innovation can also consist in the way in which the diploma project has been documented, the way in which the programme has been investigated or in which several programmes can be joined under the umbrella of a final project that will, perhaps, represent an innovative mix. In addition, the way in which the structure of the project is imagined or the way in which certain materials are used in the aesthetic of the facade can also be innovative. Architecture redefines itself as it discovers new materials, new technologies. These can spur creativity.

Innovation is sought in the diploma project, wherever it may find a place, in any of the above-mentioned aspects. ...Or in other areas that I do not foresee at the moment, but which some students undoubtedly will. ...This is what makes being a teacher so wonderful.

Finally, would you like to give any advice to students about to embark on their diploma projects, or would you like to add anything to the points already discussed?

My advice is that they should never give up their dreams in the diploma project. Personally, I would recommend that they make their boldest attempt as yet. Now is the time to do something that matters to them as a reference point in the career that is about to start, something they will remember with pleasure each time. Yet at the same time, architecture is a field anchored in reality and it has to remain connected to reason without, however, cutting off the wings of a bold project. The diploma does not need to be a project that is ready to deliver to city hall for building permission, but it must persuade that the young graduates and future professionals on the global architectural market will rise up to future challenges.

Best of luck!

Assoc. Prof. **Melania DULĂMEA** PhD Arch.
Director of the Basics of Architectural Design Department

What does the diploma represent from the point of view of the student's entire academic trajectory?

Firstly, it is an exam of maturity in which the students must demonstrate the assimilation of certain topics and their capacity to integrate this knowledge into a final project. It is a project through which the future architects must prove that they understand the challenges of the profession, a project which tests their ability to exercise their profession as such, more precisely their ability to understand and respond adequately to the problems they propose and identify in the diploma project. In addition, they must demonstrate maturity in their approach to the research theme. Ideally, their interests and personal choices throughout their time at university should lead to this project and open the path to an area of competence. For some students, the diploma happens to be the moment of crystallisation of certain interests, whether theoretical or professional. So it can open new perspectives for their professional development – for example, in some cases the dissertation or the diploma project can lead to doctoral research or to postgraduate specialisations and so on.

The development of the diploma project is in fact a process during which the research issues are explored in progressively greater depth. How can coherence be maintained throughout the process, from the initial stages of research to the final presentation in front of a jury?

Maintaining coherence is a key goal of any project, not only of the diploma. And this ability must be constantly honed during the six years of study. Whether it is a university project or an external project, the first step is to understand the selected field of research, to understand correctly the premises of the project or its starting points. The values of the context must be understood and its relationship to the project must be accurately established. Once the context has been understood, the author's positioning and the research questions need to be specified and the topics of research and theoretical study need to be defined. The research questions will subsequently lead to intervention opportunities, which need to be weighed against one another – to see what field of intervention is opened up by each opportunity.

It is very important that the students should ask themselves from the very beginning what they aim to solve by means of the diploma project. It is necessary to connect the project to the place in order to see how it helps, what it enhances, whether it adds a new layer or improves upon the initial situation. We often note that the diploma project leads one to spoil rather than solve something. And thus, the initial stakes are the most important because if they are mistaken, the result will not

be as expected, regardless of the project process. Many diplomas have this problem of not asking the questions correctly from the beginning. Coherence is about keeping these research questions in mind from the beginning until the very end. In the course of the project, you need to return to those questions and see if what you are doing in the project corresponds to your aims.

Last but not least, the role of the supervisor and of the juries (of the pre-diploma foundational study, dissertation and pre-diploma) should be that of steering and guiding the students and of checking whether coherence is maintained throughout the project.

The diploma project requires one to demonstrate a certain level of maturity and an awareness of diverse professional responsibilities. What responsibilities should the student assume within the framework of the diploma project?

First, we can talk about responsibilities connected to the context in which the students place themselves through their projects. They need to understand the context correctly, the stakes of the project, the private vs the public interests, their responsibility towards the city and towards the environment, towards heritage, etc.

With regard to the architect's tasks and the responsibilities of any practicing architect, the aim of the diploma project is not to mimic reality; it does not need to be a rehearsal before a real project, but rather to demonstrate the student's ability to respond correctly to research data and to take correct decisions on several levels – economic, social, urban, etc. The architect's role of coordinating and integrating all the different specialities into the project is also important.

An essential requirement in approaching the diploma project is the attainment of a certain level of complexity, a certain depth of research, yet students are often unclear about what this implies. So what could the attainment of complexity refer to in the diploma project?

For a long time, the complexity of a project has been wrongly identified with its scope and I do not think that this is the point. We are not referring here only to the complexity of the programme or to functional complexity. Rather, complexity emerges from the contextual data and the difficulties arising from a specific situation, from the mature understanding of what is at stake in the project. An architectural gesture that is not particularly large-scale can still be complex. A project can also be complex by virtue of the issues it raises. In the good diploma projects I have seen, the positive result often derived from this gradually accumulated complexity, from the link to the context and from the answer given to very difficult, not obvious, problems that were discovered through careful study.

Innovation is a keyword in today's society, regardless of activity sector. In fact, the issue of innovation is frequently brought up by the external members of the diploma juries. Within the framework of the diploma project, what could innovation consist of?

Let us start from what is not innovation – the thoughtless use of technology, for example, or its undifferentiated use. At the same time, innovation should not be purely formal. Innovation comes from finding new answers or creative answers to known problems while maintaining an attentive and respectful connection to the project's point of departure. That is to say, you need to understand what is valuable about the chosen place and context, what should be kept and then you need to conceive an answer in relation to previous ones by thinking about your positioning today, about what your role should be in relation to contemporary society, to the community you intervene upon. Asking a research question that has not been asked before or formulating the problem in an unprecedented way can also be innovative.

Finally, would you like to give any advice to students about to embark on their diploma projects, or would you like to add anything to the points already discussed?

Most important in my view is that, as they begin, they should think about their interests in as mature and personal a way as possible and they should aim for the diploma project to represent them. Not to think about what a diploma project should be like or what boxes they should tick for a successful project. From my experience as a supervisor, success belonged to those who took a personal approach to this process, those who were more concerned with adding a stage to their individual trajectory. To do this, they should take a retrospective look at all the years of study and think about what they enjoyed and were captivated by, what interested and preoccupied them in previous projects and what those interests could point towards. They could revisit a question they confronted or that they asked themselves in the course of their studies and which they wish to explore in greater depth. They should view the diploma project not as a conclusion, but as a stage that can open up new possibilities. Here, we come back to what I said at the beginning – the diploma can open the path to a particular specialisation or to an area of professional interest.

Prof. **Anca MITRACHE** PhD Arch.
President of diploma juries

What does the diploma represent from the point of view of the student's entire academic trajectory?

The diploma should be a "mirror" of the knowledge acquired over the entire period of their studies and it should exploit it in an advanced, innovative and inspired manner. The diploma project demonstrates, in a confident and imaginative key, the mastery of competencies tested over time, with the aim of proving the future professional's capacity for an applied and inspired technical solution. In other words, the student should demonstrate, on the occasion of the diploma project, that they have reached maturity in their approach to the chosen subject with regard to: the attitude to the site; the conceptual approach in relation to the anthropological, sociological and relational data, or to the identity explored in connection with the site; the form and use of the proposed space and the elements of sustainability and technology, but also with regard to modalities of representation that are clear and interesting, in line with current demands. Next to the gradually structured approach, the study accompanying the final project should be linked to the documentation activity on the theme, approached from a local and international perspective – defining particularities, proposed site(s) and architectural typologies – local and international, documentation on the sites considered in the study and the specific attributes conferred on the subject of study in each case and, most importantly, the additional quality brought to it by each particular situation.

The development of the diploma project is in fact a process during which the research issues are explored in progressively greater depth. How can coherence be maintained throughout the process, from the initial stages of research to the final presentation in front of a jury?

The diploma project should stand for a higher degree of complexity from all points of view. The completion of projects whose theme was described by the learning exercises associated with the assignments set for each academic year is followed, in the case of the diploma, by a stage of higher complexity. The diploma project explores a programme and theme of personal significance to the author, which should be studied in depth in order to prove the student's capacity to bring the research to a high, competitive level or, on the contrary, the inability to demonstrate minimal project qualities or a new architectural and urban quality. The diploma project proposes a higher degree of complexity than the general themes of each year. Its themes most often use existing architectural objects, which are associated to extensions or related programmes.

The architectural qualities of the newly proposed programme are related in a more or less successful and in a more or less coherent manner to the object chosen as reference point. On the one hand, this type of programme has the merit of sustainability, yet on the other, it can also indicate the lack of courage to take up an independent subject which would demonstrate architectural qualities through the assumed proposal.

The university supports the student through all the stages of the diploma project – the pre-diploma foundational study, the pre-diploma and finally

the diploma project itself. The evaluation and consultation moments throughout this process aim at the materialisation and the coherent development of the proposed project. During the first stage – that of the foundational study – the student should examine the broader context and propose a solution at the level of an initial study of a concrete site. Following this stage, there should be detailed exploration and in-depth study of the proposed programme – in the pre-diploma – where the project provides an answer from the point of view of local and overall organisation of the area by means of a solution study and illustration of the theme, with different options. Finally, the architectural object will be fully detailed in the diploma project.

The more thorough the study of the context and of the opportunities for intervention at each stage of the work and the more research directions it covers, the greater the likelihood of an answer that displays additional qualities.

The diploma project requires one to demonstrate a certain level of maturity and an awareness of diverse professional responsibilities. What responsibilities should the student assume within the framework of the diploma project?

I would say that the level of responsibility often depends on the maturity of each individual. The chosen approach is a reflection of responsibility as understood at that stage by the student. For some students, this responsibility grows as the research develops.

In any case, the first responsibility is knowing the site; this is also the first step forward, towards professional practice. Of equal importance is the investigation of the theme, of similar examples, with a focus on the adaptability of the approach to the particularities of the place in which it is applied. The site and the theme must be studied and known to detail level in order to discover what they can generate that is interesting and positive and that brings an additional quality to the new site. It needs to be shown how the proposed project (understood as the ensemble of site, function and proposal) works with the context in a "revealing" manner.

The quality of the proposed project is likely to improve in direct proportion to its increased level of complexity and to its ability to generate a vision or a stage of an evolving process or to suggest a potential direction of development in a new field of application. In other words, the project functions as an assumed, tangible witness of the diploma author's manner of understanding their chosen subject.

An essential requirement in approaching the diploma project is the attainment of a certain level of complexity, a certain depth of research, yet students are often unclear about what this implies. So what could the attainment of complexity refer to in the diploma project?

The diploma project is a mirror of the knowledge that has been acquired, assimilated and conveyed to the future graduate, under conditions of accessibility to a level of documentation and to a variety of means of

expression that are unprecedented in the history of the profession. Given these circumstances, the diploma project should constitute a "celebration" of complexities resolved in a revealing fashion. The facile resolution of a function would deprive the study author of a new experience. Complexity should encompass the cultural and technical aspects of the theme as well as a positioning with regard to the new quality proposed by the architecture of the project. Water, wind, stone and earth, proportion, dimension and scale, colour and light – actors in the memorable architectural drama. The complexity of the answer aims at positive attitudes, via gestures that find a natural resolution.

The way of approaching the diploma project and also its modality of providing answers, not necessarily final ones, point to a certain degree of complexity. Every student will relate differently to this complexity depending on their background. Yet it is worth mentioning that each assumed, tested and shared exercise should provide a benefit to the author and to the recipient of the message in question.

Innovation is a keyword in today's society, regardless of activity sector. In fact, the issue of innovation is frequently brought up by the external members of the diploma juries. Within the framework of the diploma project, what could innovation consist of?

Many diploma projects touch upon the issue of innovation and provide an answer related to sustainability and durability as part of the overall solution or they touch upon social themes and provide a community-oriented answer. Other topics are invested in new technologies, included in the solutions of the project itself – they imagine new, repetitive, modular structures or they integrate materials with special properties. Financial issues could also be tackled responsibly and boldly in the projects.

Expanding the exploration of social issues within the project themes could provide an extended framework for cross-border or international topics.

Finally, would you like to give any advice to students about to embark on their diploma projects, or would you like to add anything to the points already discussed?

I wish them success, patience and tenacity! Perseverance at any rate – since the experience gained on this occasion will give them the chance of delivering a project they believe in and the happy opportunity of overcoming situations that are not always clear-cut. The act of defending an architectural attitude they believe in in relation to a site and of presenting a theme in front of a not always favourable jury will constitute a valuable experience for the future practitioner.

I would encourage them to keep an open mind when speaking to anyone, to colleagues, collaborators or associated researchers. Sometimes the solution may take time to emerge despite all the efforts and study. Yet talking to a friend or to an acquaintance may yield a new angle, new types of approach that are interesting and ingenious.

Prof. **Niculae GRAMA** PhD Arch.
President of diploma juries

What does the diploma represent from the point of view of the student's entire academic trajectory?

The diploma represents each student's conceptual, personal, unique and demonstrative answer to the chosen topic on the basis of the knowledge, capacities and abilities acquired or developed during the years of study, an answer that encompasses various aspects of the site and of the object and up to the details of the execution, with a result that reflects the entire process.

The development of the diploma project is in fact a process during which the research issues are explored in progressively greater depth. How can coherence be maintained throughout the process, from the initial stages of research to the final presentation in front of a jury?

In my opinion, the coherence of the approach is given by the use of an acquired system which encompasses: urban, contextual, stylistic analysis etc... followed by conclusions (possibly highlighting appropriate functions for the site), the creation of a concept in harmony with the theme (obviously with the functions it implies), the proposal of a context-related volume, correlated with interior spatial configurations and following the process of the well-established and useful stages implemented at our university, namely the foundational study, the pre-diploma and the diploma project. This process ensures continuity and coherence da capo al fine (not with its musical connotations). Of equal importance is the presentation/analysis of examples of national or foreign architecture in preparation for the defence.

Maintaining coherence throughout the entire process depends firstly on how the priorities are set at the very beginning, and secondly on the capacity or rather the ability to make concessions while keeping the order of priorities (essentially so as not to alter the concept).

The diploma project requires one to demonstrate a certain level of maturity and an awareness of diverse professional responsibilities. What responsibilities should the student assume within the framework of the diploma project?

I think the first responsibility derives from the analysis – the identification of the functions that are compatible with the site. If these are imposed by external factors, analysis leads to the comparison and weighing of positive and negative aspects. Suitable functions are established on the basis of the analysis and a point of view is formulated.

Another important aspect is the conceptual approach, which entails assuming responsibility for a reasoned and context-related proposal. (It is the architect who formulates the concept; no other complementary profession can do this.) This is how I believe responsibilities are assumed in the diploma project, compared to the old, functionalist style of the university until the 2000s. This shift is mostly due to the participation (starting more than 20 years ago) of numerous well-established foreign architects, both teachers and practitioners, in the diploma exams as well as to the participation of numerous teachers from our university, as grant-holders, in the research and teaching activities of various European faculties of architecture; the sum of these exchanges is today the characteristic of the (still perfectible) "conversion". Over the last 20 years, the university has been transformed, in my view, by moving from an intuitive to a systematic approach; together with the conceptual approach I mentioned before, this facilitates, over a six-year trajectory, the understanding and assumption of professional responsibilities and implicitly of those connected to the diploma.

The third responsibility is discipline applied to the presentation, which they should have acquired over the years of study. Our former teacher Zoltan Takacs used to pay considerable attention to the accuracy of the drawings, always saying that very neat drawing will also be reflected in the architecture.

The fourth responsibility is the dullest part of a project, but it is part of our profession – half of any project is about the details so it is very important to master the principles and to apply them responsibly.

An essential requirement in approaching the diploma project is the attainment of a certain level of complexity, a certain depth of research, yet students are often unclear about what this implies. So what could the attainment of complexity refer to in the diploma project?

At the risk of repeating myself, I think that, regardless of the chosen subject, the same approach should be used (by applying the so-called "system"), namely compliance with urban norms and regulations with possible modifications, analyses of the context followed by conclusions, the creation of a concept followed by the proposal of a context-related volume, functional solutions, the control of interior spaces and finally architectural details.

In a way, the problem of complexity does not fall entirely on the student. The diploma project has to be directed somehow and this is the supervisor's role, that of helping students avoid the extremes (the chosen topic should not be too vast or too narrow).

Innovation is a keyword in today's society, regardless of activity sector. In fact, the issue of innovation is frequently brought up by the external members of the diploma juries. Within the framework of the diploma project, what could innovation consist of?

In the diploma, innovation can be found at the level of each separate element, both on the micro and on the macro level. At the micro level it can be found: on the conceptual level, in the elements of sustainability, in the relationship between functions, in the spatial configurations (including the interior ones), at the level of style, in the use of materials or even in the classification or application of certain principles. At the macro level we speak about the approach to the whole, which can also be revealed through comparison to various valuable architectural examples that can lead the student to an open path.

Finally, would you like to give any advice to students about to embark on their diploma projects, or would you like to add anything to the points already discussed?

My advice is that the diploma project should be preceded by self-assessment and by filling in any gaps in their knowledge of the curriculum. Only after this has been accomplished should they take the step towards the final, representative exercise.

Prof. **Dan MARIN** PhD Arch.
President of diploma juries

What does the diploma represent from the point of view of the student's entire academic trajectory?

The diploma is the outcome of a cycle of professional training at the end of which the student must be able to demonstrate critical thinking that is based on specific knowledge and cultural openness. Yet at the same time, the diploma is only a stage in a preparation process that takes longer than the actual university programme. It is an important stage which shows that one has reached the required level of maturity to understand architecture in the complexity and individuality of its autonomy as an academic discipline, as something other than artistic subjectivity or technical accuracy. We encounter both extremes fairly frequently, yet in fact architecture is neither while obviously having something of each. And this reality must be understood in its correct dimensions.

The development of the diploma project is in fact a process during which the research issues are explored in progressively greater depth. How can coherence be maintained throughout the process, from the initial stages of research to the final presentation in front of a jury?

A brief answer would be – by implementing a hierarchy of project criteria, dependent on the way in which the problem is formulated and on the ideas that are subsequently expressed through the project. I think the key prerequisite is the comprehensive understanding of the issues tackled by the diploma and of all the aspects that need to be examined and permanently questioned so as to achieve a well-rounded result that leaves no room for dispute or counter-arguments from any point of view. To achieve this, we must "circle around" the subject and consider the issue from as many perspectives as possible, constantly questioning the different options. When we are left without any doubts, it means the result is coherent. Of course, all this is easier said than done, but the diploma presupposes a certain "obstinacy" in not being content with the already existing, with what you have achieved up to that point.

The concept of coherence is very important because architecture is not created in a single manner. We can approach a certain problem from many different perspectives, which are equally valid; what matters is that the fundamental option or options should be developed in a coherent fashion to the very end.

The diploma project requires one to demonstrate a certain level of maturity and an awareness of diverse professional responsibilities. What responsibilities should the student assume within the framework of the diploma project?

As a matter of principle, the student should assume the same responsibilities that an architect would in the case of a commissioned project.

Just like in the case of a real building, the proposed building does not belong exclusively to the author but also to those it is intended for, so the author has a professional as well as moral responsibility to society, which they must be aware of. Of course, in addition to this general principle, one should bear in mind all the aspects that derive from it, including the technical and economical ones that are often not considered or marginalised. Here we go back to what I mentioned before, to the fact that one needs to understand all these criteria which in the first instance define the diploma project and, subsequently, a project that can be materialised.

I do not object to a certain "detachment" of the diploma – in the experimental or poetical sense – but few can attain this level under the current conditions of massification of education. What seems truly important to me is to achieve a good quality of the average.

An essential requirement in approaching the diploma project is the attainment of a certain level of complexity, a certain depth of research, yet students are often unclear about what this implies. So what could the attainment of complexity refer to in the diploma project?

There are four dimensions here which need to be kept in mind simultaneously and balanced in the diploma project. The first is the programmatic dimension: the one which refers to the subject, the purpose, the significance it has to society and the way in which we understand the usage of the building. Then there is the contextual dimension since no subject is self-standing and all are linked to a context. Of course, some diploma projects may be more theoretical or less connected to a particular place but in general diploma topics must attach great importance to this component. Then there is the formal, ineluctable dimension which is often either neglected or taken to an extreme. The fourth dimension is the technical – namely, what the project proposes must also be feasible.

At this point, we can start a broader debate on the relationship between the realistic and the reflective, philosophical or even utopian character of a diploma project: what should a diploma achieve? Should it simulate a real project, in concrete circumstances or should it on the contrary take a step forward towards a quasi-philosophical problematisation of architecture? The differences in perspective are in general related to the schools and their ideological orientations. And I think both must be combined although if we speak of the local context I think that in Romania's case "escapism" is not to be recommended. A global perspective and an open attitude are obviously necessary, but we should not forget the fact that the problems that a Romanian architect will face are quite distinct from those of an architect from a country at a different stage of development or from a different cultural zone. I think the way in which you do things is important, as well as your capacity to dream. The diploma must have an intellectual dimension, but it should not ignore the pragmatic component of architecture.

Finally, would you like to give any advice to students about to embark on their diploma projects, or would you like to add anything to the points already discussed?

My advice would be to always select the subjects relevant at that particular moment, connected to the problems that we must face, first of all, here in Romania. If they can create good architecture in Romania, they can do it anywhere; in a word, realism.

Then there are aspects connected to the manner of working – this should be unceasing and systematic, based on intellectual curiosity, on the ability to always ask questions and to find answers beyond the immediately apparent.

Innovation is a keyword in today's society, regardless of activity sector. In fact, the issue of innovation is frequently brought up by the external members of the diploma juries. Within the framework of the diploma project, what could innovation consist of?

The word "innovation" is frequently associated with technology. Architectural forms are not determined by a single factor, tied to the author's imagination; they are also technologically and socially conditioned. We are unavoidably subject to gravity, bound by materials and our way of working with them, bound by a certain technology. The forms have emerged as a direct reflection of these factors although degrees of freedom exist. I think innovation in architecture refers mainly to the existence of constraints: constructive, material, technological; any new material or technology can ultimately lead to the discovery of new forms.

We can also understand innovation in a broader sense – as the capacity to see things differently, to formulate the problem differently, to interpret things in a new manner. I think an inward look and an intensive exploration of the issues and of the architectural form is far more important – playing within a given rule, so inside the framework, not outside it; finding variety within the limits of a fairly strict system of regulations and working with the freedom that rules actually give.

Constantly asking questions gives you the chance to find new answers or solutions, which is also a form of innovation, except that innovation must be regarded with a certain well-meaning suspicion. The social and contextual dimensions of architecture, its relationships to the city, the landscape, etc. require a certain restraint. Architecture should not be understood, as it is often regarded – not only from outside but even from inside the profession – as the pure unleashing of fantasy.

Architecture, urban planning, design in general acquire new attributes and meanings through the lenses of approaches that use different criteria, values and types of problems as their reference points. In-depth exploration of such directions can lead these creative disciplines towards the (re) discovery and (re)assertion of their role and relevance to contemporary society.

https://doi.org/10.54508/9786066382465.04

Contemporary approaches

Univ. Assist. Anda-Ioana SFINTEȘ PhD Arch.
Assoc. Prof. Ionuț ANTON PhD Arch.
Univ. Assist. Ana-Daniela ANTON PhD Arch.

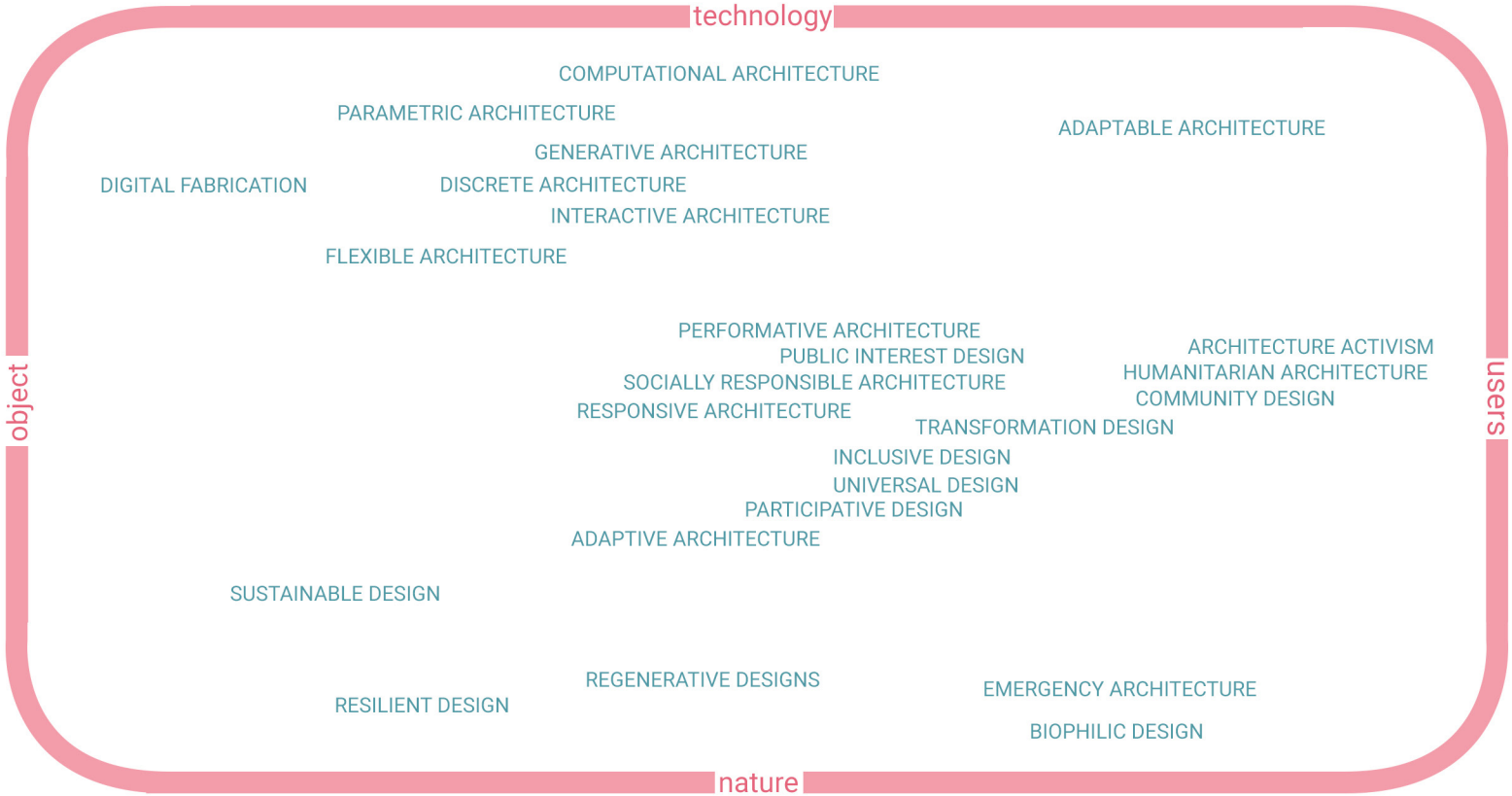


Diagram of contemporary approaches in architecture, urban planning, interior design and related disciplines, aligned in four directions to which they relate differently.

The approaches that will be mentioned in the subsequent pages and the categories in which they are included are by no means exhaustive; they are meant rather to draw attention to the diversity entailed by contemporary design, which springs from the problems it should respond to, and they provide a thread that might be followed in the attempt of finding one's own approach. As a matter of fact, many of these approaches could easily be included in other "architectures" categories, just as they might be superposed and lead to new types of approaches or be included in other categories, based on different criteria; these possibilities are noted, to some extent, in the diagram that opens this chapter. The following pages are thus an invitation to explore architecture, urban planning, interior design, etc. by considering the mentioned categories and approaches as first points of reference.

The terms ARCHITECTURES / ARCHITECTURE / PROJECT / DESIGN are used to designate built space and the objects that populate it, buildings and architectural ensembles, urban configurations, etc. from the point of view of design and they are easily interchangeable.

Each category and open list of approaches is followed by a few references to books from the de Gruyter database, which are permanently accessible to the members of UAUIM as a result of their acquisition through the *Scholar Architect* project. The inclusion of these references underlines the importance of documentation for the detailed understanding of the problems raised by each approach. Consulting these and other sources, identified by the researchers themselves, will lead them to the discovery of greater depth, superpositions, intersections, of characteristics, values, possibilities for dialogue and negotiation, etc., within as well as between the different approaches.

Innovating in today's society also means adding a personal touch; in creative fields such as architecture and the related disciplines, innovating can also mean approaching these disciplines through the lens of one's personal interests. The parameters of the chosen approach can encompass contextual aspects, aspects related to programme, functions, requirements and needs as well as aspects that concern the architect's identity and the directions they follow in search of professional and personal development. In some cases, the design theme allows for enough flexibility to enable the architect's self-discovery by means of the project while in others it tests their limits, forcing them to negotiate with themselves. Thus, the following approaches are also an invitation to the students to take advantage of the flexibility of university projects in order to seek and test as many directions as possible, but from a position of knowledge.

Architectures that respond to changes and stimuli

_architectures that respond to environmental changes, to changes in the users' needs, requirements and wishes or to different stimuli and which can be modified from the point of view of function, technology or aesthetics

ADAPTABLE ARCHITECTURE

ADAPTIVE ARCHITECTURE

FLEXIBLE ARCHITECTURE

INTERACTIVE ARCHITECTURE

RESPONSIVE ARCHITECTURE

...

References

Kretzer, M. & Hovestadt, L. (2014). *ALIVE: Advancements in adaptive architecture*. Wien: Birkhäuser. https://doi.org/10.1515/9783990436684

Schumacher, M., Schaeffer, O. & Vogt, M. (2012). *MOVE: Architecture in Motion - Dynamic Components and Elements*. Berlin, Boston: Birkhäuser. https://doi.org/10.1515/9783034608541

Wong, L. (2016). *Adaptive Reuse: Extending the Lives of Buildings*. Berlin, Boston: Birkhäuser. https://doi.org/10.1515/9783038213130

Architectures centred on social impact

_architectures centred on social issues and needs, which seek to support society, including disadvantaged groups, and which aim at non-discriminatory access to resources, at the common good, justice and social equity, the public interest, etc.

ARCHITECTURE ACTIVISM

HUMANITARIAN ARCHITECTURE

PUBLIC INTEREST DESIGN

SOCIALLY RESPONSIBLE ARCHITECTURE

TRANSFORMATION DESIGN

...

References

Clouette, B. & Wise, M. (2017). *Architectures of Humanitarian Space: Forms of Aid*. Berlin, Boston: Birkhäuser. https://doi.org/10.1515/9783035608267

GRAFT (2016). *Architecture Activism*. Berlin, Boston: Birkhäuser. https://doi.org/10.1515/9783035608540

Jonas, W., Zerwas, S. & von Anshelm, K. (2015). *Transformation Design: Perspectives on a New Design Attitude*. Berlin, München, Boston: Birkhäuser. https://doi.org/10.1515/9783035606539

_concern with designing buildings that are accessible to all and which respond in one way or another to the needs of all categories that the building has an impact on (from investors to users, from people grouped in communities to users with different types of special needs, etc.)

COMMUNITY DESIGN

INCLUSIVE DESIGN

PARTICIPATIVE DESIGN/CO-DESIGN

UNIVERSAL DESIGN

...

References

Christ, W. (2009). *Access for All: Approaches to the Built Environment*. Berlin, Boston: Birkhäuser. https://doi.org/10.1007/978-3-0346-0379-9

Herwig, O. (2012). *Universal Design: Solutions for Barrier-free Living*. Berlin, Boston: Birkhäuser. https://doi.org/10.1515/9783034609661

Michel, R. (2019). *Integrative Design: Essays and Projects on Design Research*. Berlin, Boston: Birkhäuser. https://doi.org/10.1515/9783038215318

Architectures that consider the impact of people on the environment and viceversa

_architectures which explicitly consider the impact of design on the environment and resources as well as the capacity of architecture to face or respond to the challenges posed by nature and the environment, without excluding the connection with nature as a human need

BIOPHILIC DESIGN

EMERGENCY ARCHITECTURE

REGENERATIVE DESIGNS

RESILIENT DESIGN

SUSTAINABLE DESIGN

...

References

Berardi, U. (2013). *Moving to Sustainable Buildings: Paths to Adopt Green Innovations in Developed Countries*. Versita, London: De Gruyter Open Poland. https://doi.org/10.2478/9788376560113

Bott, H., Grassl, G. & Anders, S. (2019). *Sustainable Urban Planning: Vibrant Neighbourhoods – Smart Cities – Resilience*. München: DETAIL. https://doi.org/10.11129/9783955534639

Kellert, S. (2018). *Nature by Design: The Practice of Biophilic Design*. New Haven: Yale University Press. https://doi.org/10.12987/9780300235432

Schröpfer, T. (2015). D*ense + Green: Innovative Building Types for Sustainable Urban Architecture*. Berlin, Boston: Birkhäuser. https://doi.org/10.1515/9783038210146

Architectures that use advanced digital tools

_architectures which use the digital environment in the design and building of architectural artefacts, in pursuit of a digital continuum from the first stages of conceptual development to documentation and component representation, up to the use of technologies with numerical control fabrication systems

COMPUTATIONAL ARCHITECTURE

DIGITAL FABRICATION

DISCRETE ARCHITECTURE

GENERATIVE ARCHITECTURE

PERFORMATIVE ARCHITECTURE

PARAMETRIC ARCHITECTURE

...

References

Bernstein, P. (2018). *Architecture | Design | Data: Practice Competency in the Era of Computation* (1st edition). Birkhäuser. https://doi.org/10.1515/9783035610444

Hauschild, M., & Karzel, R. (2012). *Digital Processes: Planning, Designing, Production* (1st edition). Birkhäuser. https://doi.org/10.11129/detail.9783034614351

Marble, S. M. S. (2012). *Digital Workflows in Architecture: Design – Assembly – Industry.* Birkhauser Architecture. https://doi.org/10.1515/9783034612173

Retsin, G., Jimenez, M., Claypool, M., & Soler, V. (Ed.). (2019). *Robotic Building: Architecture in the Age of Automation* (1st edition). DETAIL. https://doi.org/10.11129/9783955534257

Eidgenössische Technische Hochschule Zürich (ETH Zürich) is known as one of the best schools of architecture in the world. In the following pages we introduce two design textbooks created and tested here over the last three decades.

Two Swiss textbooks: 9x9 and the Netzstadt Method

Lect. Andrei MITREA PhD Urb., Arch.
Univ. Assist Dana MILEA PhD Urb.

9x9 Method

https://doi.org/10.54508/9786066382465.05

Chronology of the method **(Eberle & Aicher, 2018, pp. 28, 50)**

The 9x9 method, which we will present bellow, was born at ETH Zürich[1]. Its creation and development are connected to Dietmar Eberle and his design studio "Architecture and Design II". From 1999, when Eberle became a professor at ETH Zürich, until 2017, he taught architectural design to year II students. Over this period, more than one thousand students, that is between 50 and 70 students per year, were guided by him and his team of assistants.

In 2007, after eight years of experimental studio[2] work, Eberle, together with Pia Simmendinger, published the textbook *From City to House: A Design Theory* (Eberle & Simmendinger, 2007). The book helps students understand and familiarise themselves with the complex design process by presenting the working method of his studio.

The second-year studio activity continued and, with it, the working method continued to mature. After more than a decade, in 2018, Eberle published another design textbook, this time together with Florian Aicher, which was titled *9x9 – A Method of Design. From City to House Continued* (Eberle & Aicher, 2018). The book maintains the previously established goal while proposing a significantly refined method. A series of exercises with solved examples accompany the theoretical concepts, which are introduced one by one. The complexity of the theoretical grounding and of the practical applications increases gradually, as each set of new information is placed in the context of the already assimilated ones.

---

1 Eidgenössische Technische Hochschule Zürich.

2 In a school of architecture, the studio is the space where students conduct their design activities, together with a guiding team. In practice, we use the term studio for all the learning and design activities that take place in this space. Thus, it can be an umbrella term for the overlapping of the space with the activities. In our text, studio retains all three meanings, but the readers can easily infer the intended one from the context.

A short description of the method

At ETH Zürich, during the second year, the design studio activities take place over the two semesters. Both the autumn and the spring semester have 13 weeks each. Two days of each week are reserved for studio work. The activities of each semester end with a final project, presented during the last studio session.

At the beginning of each semester, students form 6 large teams, of 8 to 12 people. During the semester, each team is guided by a tutor. Depending on the exercises, the teams are kept or broken up, leaving the students to work in pairs or individually. The workspace is shared, but at the beginning of the year each student is assigned a drawing board that can also be used outside of class time.

All of this is reflected in the structure of the design method, together with three other premises:

1. We need structured architectural education (Eberle & Aicher, 2018, p. 10);

2. Architectural education is both a didactic activity and knowledge summarised into the principles that give birth to architecture (Eberle & Aicher, 2018, p. 14);

3. Architecture starts with defining a shape (Eberle & Aicher, 2018, p. 14).

Defining a shape has at least two dimensions, a physical and a social one. In the end, with any physical architectural object we arrive at the materialisation of the needs of society into a shape. To begin with, let us glance only at the physical dimension of architecture by looking at a building. What do we see?

_From 100 metres, a silhouette;

_From 50 metres, we start to see the geometry and the constructive principles;

_From 10 metres, we notice the materials, the surfaces and the details.

In other words, distance changes how we perceive shape.

Time does the same. For several decades now, we have accepted the fact that durability is a priority and that architecture consumes resources which are already limited. To avoid wasting them, we build things that last over time. Thus, longevity has become a criterion in evaluating the quality of architecture. In other words, the way in which we perceive shapes.

Starting from shape and connecting the two modifiers, distance and time, we end up looking at architecture while taking into account five aspects:

1. Place;

2. Structure;

3. Envelope;

4. Programme (use);

5. Materiality.

These aspects are in fact the five primitives at the basis of the 9x9 method. They guide both the understanding of architecture and the development of the design process. The method is easy to use. Over the course of the year, each primitive is presented to the students. A newly introduced primitive is explored in two steps, the first one dedicated to understanding the notion *per se*, and the second to the study of its relation to the previously explored ones. Since the first primitive in the series, namely place, lacks a predecessor, a total of nine steps is required for the introduction and theoretical grounding of the five parameters. Their succession, referenced by the first 9 in 9x9, can be followed in Fig. 1.

Each of the nine steps unfolds in similar fashion. The subject under discussion is explained in lectures. The students are then given one or several applications which test how architecture is seen through the lens of the primitive or of the relationships it establishes. The exercises are either independent or interrelated, in which case solving some of them conditions the solution of the following ones. In addition, each topic is viewed in relation to a series of nine concepts, meant to stimulate thinking. This accounts for the other 9 of the 9x9 method.

At each step, the applications generate diverse products such as pieces of drawing and writing, photo and video montages, models and public presentations. Solving an exercise always puts the students in the situation of creating at least four products from different categories, which must be harmonised in order to systematically argue for an answer.

The *9x9 – A Method of Design. From City to House Continued* textbook mirrors the structure of the working method. The book is divided into three sections preceded by an introduction. The first section, "Observations", sets the method in perspective; it provides a succinct description and explains its usefulness.

The second and most substantial section, titled "Method", explains the working method specific to each step. All nine chapters have the same structure:

1. Each chapter starts with a brief definition of the concept under study. Most often, this includes etymological references and references to key moments from the history of architecture;

2. The definition is followed by an ample exposition which provides the necessary theoretical grounding for understanding the primitive. This exposition contextualises the concept and references other nine concepts whose role is to train critical thinking;

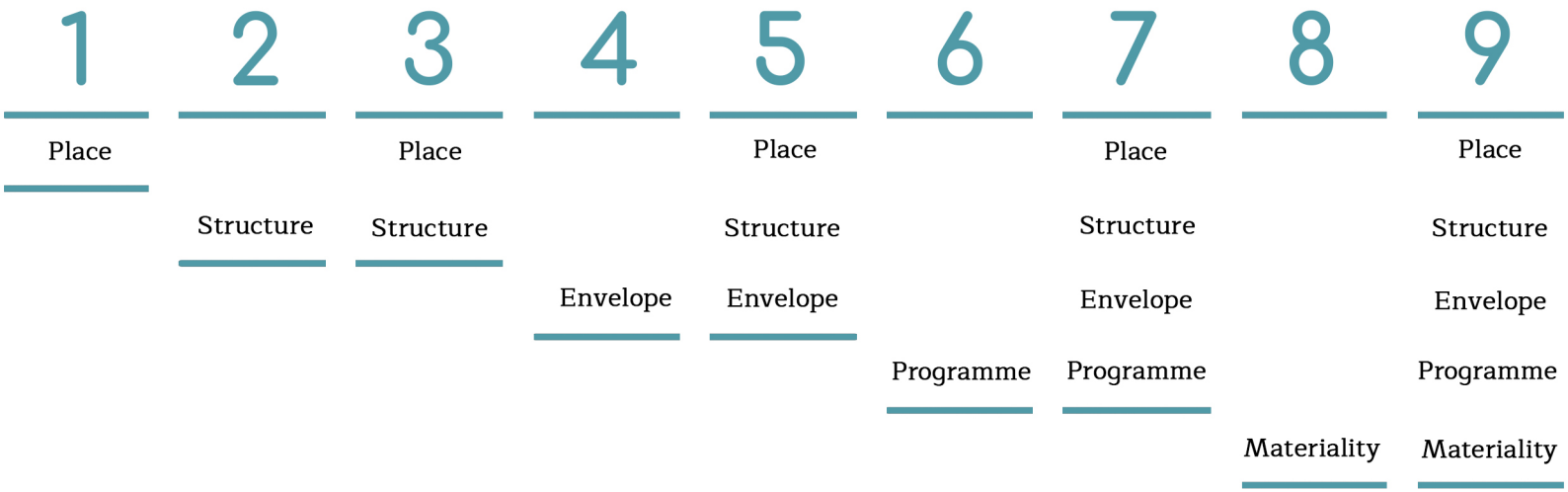


Fig. 1. The succession of the primitives used in the 9x9 method. Eberle & Aicher (2018, p. 54).

3. The key concepts of the theoretical framework are defined in a glossary;

4. The working definition of the concept under study is introduced. This operational definition will then be used in the course of the exercises.

5. The exercises, with their design briefs, are introduced. The brief refers to the following aspects: the problem to be solved and its specific context, the work set-up, the pieces (products) which have to be delivered, the requirements to be followed and the aim of the exercise;

6. The chapter concludes with a series of examples of solutions designed by previous generations of students.

The final section, "Perspectives", explores the pedagogical implications of the 9x9 method as well as its relation to other disciplines and work techniques.

The structure and the clear explanations as well as the concepts and exercises which are gradually introduced, with an increasing level of complexity, make this textbook a potentially interesting tool for a broad audience. We refer on the one hand to architecture students and to teachers and designers of architecture and, on the other, to non-specialists who have an interest in the field.

Definitions and explanations

As stated above, each of the five primitives is given a book chapter which includes one or several of its definitions. In addition, all nine chapters that explain the method feature a glossary focused on the concepts that are key to a correct understanding of the text. Based on these resources, the five primitives can be briefly explained as follows.

These are the basic remarks about the place:

"[The place is] a site that is singled out, that differentiates itself from the surroundings by being limited and easily defined."

(Eberle & Aicher, 2018, p. 118)

"Place is created by the context of physical elements such as geography, buildings, exterior spaces, and circulation, and also by societal elements such as social interaction, the economy, and the culture, mentality, and conventions of the inhabitants."

(Eberle & Aicher, 2018, p. 88)

Subsequently, we have the overview of the structure:

"[Structure is] a system that organizes a limited number of elements according to clear rules."

(Eberle & Aicher, 2018, p. 118)

> "A structure is an arrangement of different elements exhibiting patterns that can be understood as an ordering of the elements amongst each other and as a whole. Areas populated by humans are structured, increasingly complex, and increasingly dense. Cities are highly structured formations. [...] However, individual buildings are also structured; supporting structure and circulation structure both have lasting impacts. [...]
>
> In order to be sustainable, a building structure should allow the use to change, and adapt to the structure of the place."
>
> (Eberle & Aicher, 2018, p. 140)

This is followed by the comments about the envelope:

> "Together with the supporting structure and the circulation, the envelope completes the building structure. It divides interior and exterior space and ensures that the people within have a beneficial environment free of inhospitable climatic influences and all kinds of emissions. A building component with its own volume, the envelope achieves this through the interplay of insulation and retention. The envelope creates the façade, the face of the building, and profoundly marks its relationship to the context."
>
> (Eberle & Aicher, 2018, p. 218)

Then we have the observations about the programme:

> "The word program stems from the Greek prógramma: Something prescribed. This can mean two things: something that precedes all further statements, or something that mandates how something must proceed. [...]
>
> In today's architectural practice, the program is the foundation of a design – the spatial allocation program, the Raumprogramm. The client defines the 'content' the building project should contain – the architect puts this into a plan.
>
> Program and plan are mutually dependent; they relate to each other reasonably – in the sense of cause and effect – and systematically – in the sense of completeness and free of caprice and chance. Program and plan are rationally connected."
>
> (Eberle & Aicher, 2018, p. 284)

And finally, the notes about materiality, which is regarded as a feature of the physical object and is closely linked to the material on the surface of the object:

> "The materiality of things and the consistency of the elements are first conveyed by the surface of the objects."
>
> (Eberle & Aicher, 2018, p. 394)

With regard to the material:

"In German, Stoff, from French éstoffe: Fabric, cloth, stuff. Related to Latin stuppare: to plug with cotton, mend. Today: Textiles, cloth, content. What is material is – in contrast to spiritual or intellectual – physical, concrete, sensual. Material comes in various aggregates, pure and mixed, and is in a state of flux."

(Eberle & Aicher, 2018, p. 406)

It follows from this that the perception of materiality depends on the distance from which it is read:

"Physical proximity corresponds with bodily intimacy and is a precondition of atmosphere. From this, we can infer the privileged status of private spaces. The mood of buildings in an urban surrounding is more distanced in comparison. From this we derive the differentiation of the materiality of architecture and the materiality of the interior of the design. While the former is bound to the permanence of the place, the latter is aligned with the changing needs of the user."

(Eberle & Aicher, 2018, p. 408)

The method in detail and its implications

We know that the 9x9 method entails the completion of nine steps. Naturally, the students' level of knowledge grows with each completed step. The evolution and the implications of the method can be briefly described as follows (Eberle & Aicher, 2018, pp. 50-62):

1. Exploring the place

The students have understood how to read and express the character of a place. In addition, they have answered the question:

_How can an insertion improve the quality of the public space with minimal intervention?

2. Studying the structure

At this stage, the students know that architecture needs order; understanding the structure of an architectural element helps them reach reasoned decisions. Validation is carried out by finding the answer to the research question:

_What are the types of structure, relevant to my project, which I find in the building I study, in the urban fabric it is embedded in and in its vicinity?

3. Understanding the relationship between place and structure

The students have learnt that a correct intervention on a building cannot be made if one ignores the interdependence between the structure of the place and the structure of the building. This has been achieved by answering the following question:

> _How can I define the type of building by starting from the characteristics of the place, a structure that can support the adequate load for these characteristics as well as an efficient circulation system?

4. Researching the envelope

At this point, the students can read the envelope as an interface between exterior and interior spaces. They have acquired this ability by working on the following question:

> _How do the volume and the envelope of the building influence interior and exterior spaces?

5. Discovering the connections between place, structure and envelope

By the end of the first semester, the students are able to correctly design an addition to an existing building by following a spatial programme, a series of indicators and a set of requirements for facades, derived from the characteristics of the place. They have been guided in their design by two research questions:

> _How does the proposed facade respond to the attributes of the place?

> _Given these circumstances, how is the facade supported by the structure?

6. Knowing the programme

By this stage, the students understand the implications of the programme of a building and they have the ability to correctly design the associated functional diagram. They have been guided by the following questions:

> _Given the structure of a building and the image of the main facade, which programme would be most suitable for it?

> _How are building spaces organised for efficient access, horizontally and vertically?

7. Investigating the relationships between place, structure, envelope and programme

Students are now able to correctly design a building, aiming to balance the site characteristics with the constraints imposed by the structure, the envelope and the programme. To achieve this, they have answered the following questions:

_What factors influence the choice of a programme?

_What impact does the chosen programme have on the place, the structure and the envelope?

8. Examining materiality

At this point, the students know that materials alter the perception of space and that their choice must be reasoned and well-informed. The demonstration has been carried out by answering the question:

_How does materiality influence the atmosphere and quality of interior and exterior spaces?

9. Understanding the functioning of the whole formed by place, structure, envelope, programme and materiality

By the end of the second year, the students have come to understand the logic of an existing building and they are able to design an insertion into the urban fabric and to check its quality by pursuing the balance of the characteristics of the place with the constraints imposed by the structure, the envelope and materiality. The conditions with which they can operate are both measurable (quantitative), expressed by architectural and urban indicators, and immeasurable (qualitative). Finally, the last research questions used by the students are the following:

_How do the place, structure, envelope, programme and materiality contribute to the success of my project?

_Have I clearly answered all the requirements of the design brief?

For an overview, we have summed up in Table 1 the steps of the method and their implications, reflected on six levels: the nature of the research questions to be answered, the aim of the exercises, the exercise-specific questions, the scale at which the work is carried out, the expected products and the work set-up.

Table 1. Synthetic description of the nine steps of the 9x9 method
Source: The authors' adaptation of the information presented by Eberle & Aicher (2018, pp. 54-59, 88-91, 140-144, 176-177, 218-221, 252-253, 320-323, 356-357, 408-411, 454-455).

Step	Primitive	Research questions	Suggested exercises				
			Aim of the exercise	**Specific questions**	**The scale at which the work is carried out**	**Products**	**Work set-up**
1	**Place**	_How can an insertion improve the quality of public space, with minimal interventions?	Recognising, understanding and expressing the characteristics of a place.	_What is the character of a place? _How is observation conducted in the field? _How is the data collected? _How can the quality of public space be improved through an insertion?	Scale of the town / area	_Site plan, at different scales _A diagram of the urban design concept _A model of the studied site, inserted into another model which presents a larger area _A video that captures the character of the place _Field-collected data _Study journal	Working in a team of 8 to 12 students. Each team is allotted a site.
			Understanding and articulating the impact that the proposed extension of the building will have on the urban context.	_ How does my proposal improve the quality of the urban fabric?	Scale of the building	_Site plans, at different scales _A photomontage that shows the impact of the researched building before and after the extension _A model of the building with the proposed extension _Written explanation _Study journal	Working in a team of 2 students.

Step	Primitive	Research questions	Suggested exercises				
			Aim of the exercise	**Specific questions**	**The scale at which the work is carried out**	**Products**	**Work set-up**
2	**Structure**	_What are the types of structure, relevant to my project, which I find in the building I study, in the urban fabric that contains it and in its vicinity?	Demonstrating the following two aspects: _A place can only be understood if its structure has been analysed and understood; _In-depth knowledge leads to justified decisions.	_What are the relevant criteria for understanding a structure? _What characterises the structure of the district?	Scale of the town / area	_Plans of the analyses at different scales _A diagram of the urban design concept _Plans of existing buildings _Field-collected data _Study journal	Working in a team of 8 to 12 students. Each team is allotted a site.
			Understanding the fact that a functional building needs structural order.	_What is the relationship between static and spatial structure? _How are the two balanced with the transition between interior and exterior spaces? _How do I show the structural order in plans and sections?	The scale of the building	_Plans and sections of the building _Photographs of the interior _A sectional model of the building structure _Field-collected data _Written explanations _Study journal	Working in a team of 2 students.

Step	Primitive	Research questions	Suggested exercises				
			Aim of the exercise	**Specific questions**	**The scale at which the work is carried out**	**Products**	**Work set-up**
3	**Place** **Structure**	_How can I define the type of building by starting from the characteristics of the place, a structure that can support an adequate load for these characteristics and an efficient circulation system?	The correct design of the extension of a building by pursuing the clarification of structure and improvement in the quality of spaces.	_How is the organisational scheme of a building structured? _What is the relationship of the circulation systems to the rest of the spaces? _How does my proposal improve space quality in the existing building?	Scale of the building	_Site plans at different scales _Plans and sections of the building _A sectional model of the building structure _A model of the building with the proposed extension, at an appropriate scale for understanding its impact on the place _Photographs of the model _Written explanations _Study journal	Working in a team of 2 students.

Step	Primitive	Research questions	Suggested exercises				
			Aim of the exercise	**Specific questions**	**The scale at which the work is carried out**	**Products**	**Work set-up**
4	**Envelope**	_How do the volume and the envelope of the building influence interior and exterior spaces?	Learning the methods and techniques of spatial analysis by starting from two different elements: the street and the facade.	_What characterises a street? _What about a facade? _What impression is conveyed by the composition elements of a facade? _How do they relate to the space of the street and to facades nearby?	Scale of the town / area	_A photomontage of a street section _Sections and elevations of the street _Field-collected data _Study journal	Working in a team of 8 to 12 students. Each team is allotted a site.
			Mastering the methods of designing a facade, understanding its role as a link between interior and exterior space.	_How do you design a facade? _How does the proposed facade relate to the context? _How does it connect interior to exterior space? _What role does the level of access play in this?	Scale of the building	_Site plan _Existing and proposed building elevations at a large scale _Existing and proposed facades at detail scale _A photomontage of the existing situation _Written explanation _A model of the facade with all relevant details _Field-collected data _Study journal	Working in a team of 2 students.

Step	Primitive	Research questions	Suggested exercises				
			Aim of the exercise	Specific questions	The scale at which the work is carried out	Products	Work set-up
5	**Place** **Structure** **Envelope**	_How does the proposed facade respond to the attributes of the place? _Given this, how is the facade supported by the structure?	The correct design of the extension of an existing building by following a spatial programme and a set of indicators. In addition, by comparison to step 3, the interplay of envelope, structure and place is also explored.	_How is the interdependence of place, structure and envelope reflected in the design process? _Where is this interdependence visible in my project?	Scale of the building	Scale of the town _Site plans at different scales _Facades _Photographs of the study model built at the scale of the ensemble _Written explanations Scale of the building _Concept sketches _Photographs of the study model built at the scale of the building (exterior and interior) _Plans and sections of the building _The two study models _Centralisation of the norms and regulations to which the building is subject (Fire safety norms)	Individual work

Step	Primitive	Research questions	Suggested exercises				
			Aim of the exercise	**Specific questions**	**The scale at which the work is carried out**	**Products**	**Work set-up**
6	**Programme**	_Given the structure of a building and the image of the main facade, which programme would be most suitable for it? _How are building spaces organised for efficient access, horizontally and vertically?	Mastering the knowledge of urban and architectural indicators as assessment tools for the functionality of a building and of its economic impact.	_What are the relevant urban and architectural indicators in assessing the functionality of a building? _What do the indicators tell us about the relationships between the interior spaces of the building? _What about the relation of interior to exterior spaces? _How do I present clearly and succintly the results of the comparison of two or more buildings by using a set of indicators?	Scale of the town / area	_Plans and sections at different scales _A set of urban and architectural indicators, calculated and interpreted.	Working in a team of 8 to 12 students. Each team is allotted a site.
			Understanding the functional scheme of a building	_What is the relationship between the programme of the building and the site? _What are the main characteristics of the programme? _How can they be conveyed through drawings and through a series of indicators?	Scale of the building	_Study model _Photographs of the model which show the volumes, the floors and the characteristic sections _A series of urban and architectural indicators, calculated and interpreted _Centralisation of the norms and regulations to which the building is subject (Fire safety norms, SIA 4163, VSS4)	Working in a team of 2 students.

Step	Primitive	Research questions	Suggested exercises				
			Aim of the exercise	Specific questions	The scale at which the work is carried out	Products	Work set-up
7	**Place** **Structure** **Envelope** **Programme**	_What factors influence the choice of programme? _What impact does the chosen programme have on the place, the structure and the envelope?	The correct design of a building, pursuing the harmonisation of the site with the structure, the envelope and the programme. The complexity of the exercise is increased by the fact that students are free to choose the scenario and programme they work with. At the end of the exercise, students will obtain a first, preliminary version of the final project.	_How do I decide what programme and scenario to work with? _How do place, volume, its positioning, circulation systems and facades contribute to the success of the chosen programme?	Scale of the building	_Concept schemes _Site plans at different scales _Plans of the floors and sections at different scales _Facades _Written explanations _A study model _Centralisation of the norms and regulations to which the programme is subject (SIA[3] Norms 416)[4]	Individual work

3 SIA norms (Schweizerischer Ingenieur- und Architektenverein) i.e. the norms created by the Swiss Society of Engineers and Architects have imposed an indispensable set of standards for urban planning and architecture projects. In particular, SIA 416 norms specify the surfaces and volumes of buildings.
4 VSS norms (Verband der Strassen- und Verkehrsfachleute), created by the Swiss Association of Road and Transport Experts provide a series of standards and procedures specific to the design and use of roads.

Step	Primitive	Research questions	Suggested exercises				
			Aim of the exercise	**Specific questions**	**The scale at which the work is carried out**	**Products**	**Work set-up**
8	**Materiality**	_How does materiality influence the atmosphere and quality of interior and exterior spaces?	Detailed documentation of the set of materials associated to the proposed project.	_How do I study the qualities of the materials? _Which of their technical characteristics are important for my project?	Scale of the town / area	_A catalogue of materials _Photographical documentation of the texture and use of materials _Description of the technical characteristics of the materials	Working in a team of 2 students.
			The controlled detailing of the succession of spaces studied in the previous exercise.	_How do I choose the appropriate materials depending on the succession of spaces, on their proportion and on the style I wish to create? _How does light influence the perception of space?	Scale of the building	_Plans and sections of a succession of spaces including circulation nodes _A study model _Photographs of the study model which show the materials _Written explanations _Study journal	Working in a team of 2 students.

Step	Primitive	Research questions	Suggested exercises				
			Aim of the exercise	Specific questions	The scale at which the work is carried out	Products	Work set-up
9	**Place** **Structure** **Envelope** **Programme** **Materiality**	_How do place, structure, envelope, programme and materiality contribute to the success of my project? _Have I answered clearly all the requirements of the design brief?	The correct design of a building or ensemble of buildings by pursuing the harmonisation of the place with the structure, the envelope, the programme and with materiality.	_What are the elements that demonstrate the quality of my proposal ? _How are the five parameters harmonised in my proposal? _How do I present my project in an accessible manner?	Scale of the building	Scale of the town _Site plans at different scales _Facades _Groundfloor plan with the indication of open spaces _Photographs of the study model _Written explanations Scale of the building _Concept sketches _Plans and characteristic sections of the building _Photographs of the study model which illustrate a succession of spaces including the circulation nodes _A series of urban and architectural indicators, calculated and interpreted _Centralisation and representation of surfaces, calculated according to SIA 416 norms _The two study models _Study journal	Individual work

After analysing the 9x9 method, we come to the conclusion that it has been developed on the basis of three principles.

(P01) Architectural practice and theory go hand in hand:

"Architecture must leave theory behind itself; it must become practical, must undergo materialization. [...] The on site doing also needs a shape, an idea, in order for its practical advantages to develop. [...] If design is neglected, then the knowledge of production spins off, loses itself in mannerisms."

(Eberle & Aicher, 2018, p. 20)

(P02) The design process develops in the same manner regardless of scale. Students must work just as well regardless of scale.

No scale takes priority over another. Thus, studio exercises develop the students' ability to work on every scale. In fact, the exercises are similarly calibrated, regardless of scale. This approach gives depth to the resulting product and leads to high-quality architecture.

(P03) The exercises unfold from simple to complex and repetition is important not only in consolidating knowledge but also in stimulating critical thinking.

"Repetition is essential, practice creates space for personal interpretation and inspiration."

(Eberle & Aicher, 2018, p. 19)

On another note, let us look more carefully at how a student learns in a school of architecture. In the view of Jia Beisi (Eberle & Aicher, 2018, pp. 490-506) the efficiency of students' learning does not depend exclusively on the learning content, but also on the management of the interactions (whether social or of a different type). Beisi cites three sources to validate this observation, namely David A. Kolb, N. John Habraken and Donald A. Schön, each of them responsible for developing teaching methodology and the last two directly interested in how architecture is taught.

Kolb demonstrates that experiential learning has two dimensions: prehension or simply uptake and transformation, i.e. digested knowledge. He also speaks about four learning styles:

1. Concrete experience where you learn by doing;

2. Reflective observation, which takes place when you learn by reflecting on what you did, on your experience;

3. Abstract conceptualisation, in other words formulating conclusions based on what you did;

4. Active experimentation, i.e. planning and testing the hypotheses you have imagined.

The four learning styles are integrated in an experiential learning cycle, from concrete experience to active experimentation and then back to concrete experience, yet certain styles weigh more depending on what is being learnt.

In the case of architecture, experiential learning is defined by concrete experience and abstract conceptualisation. Nabraken shows that in prehension mundane, everyday examples are more important than exceptional ones, while Schön shows that transformation and reflective processes are frequent in experiential learning.

In fact, in this context, the studio[5] is the most important component of the learning experience in a school of architecture. It plays three major roles, being the place where the student learns and practices the following (Eberle & Aicher, 2018, p. 491):

1. The visualisation and representation of architecture;

2. Architectural languages;

3. Models of architectural thinking.

Thus, the studio is:

> "intended to be a simulation of the reality of the built environment as well as a socially interactive and creative environment [...]"
>
> (Eberle & Aicher, 2018, p. 491)

In other words, it is a safe environment where the students can learn by doing, experimenting, while avoiding the consequences of a real-life mistake. In addition, they receive guidance from a group of professionals who are experienced in designing and in explaining how one designs.

At the same time, the very nature of a studio determines its limitations and generates two problems that influence one another (Eberle & Aicher, 2018, p. 491):

1. There is a difference between reality and the studio simulation of reality;

2. There is a difference between what is taught and what is actually learnt by the student.

The 9x9 method has been developed and refined at ETH Zürich, one of the top 10 universities in the world (Lucien, 2021). The method is

5 The term "studio" refers both to the space where students work on projects, guided and evaluated by the tutors, and the totality of activities that take place in this space, from simple social interaction to the development of critical thinking.

well adapted to studio work and it relies on the knowledge provided by the tutors. We have shown this in "A short description of the method" and in presenting the three principles that underpin it. Meanwhile, we can assume that ETH Zürich met all the requirements of a successful studio where a highly competent teaching team and a group of curious, talented and dedicated students managed to reduce the two differences that can generate problems to a minimum. In this context, the method has been validated and it has contributed to a globally recognised process of learning[6] (Quacqualli Symonds, 2021). But if the parameters of the learning environment change, will all this still work? Tutors may be anachronistic just as students may not be dedicated to the task.

_Will the 9x9 method be as effective in this case?

Reviewing the method, for example by looking at Table 1, at the research questions, the specific questions and at the expected results, we note that they all demand action and practical experimentation. You learn by doing. Operationally, it negotiates the two learning styles that are specific to architecture: concrete experience and active experimentation, with a focus on the former. However, a few questions arise:

_How do you learn architecture when you cannot access concrete experience and active experimentation in order to learn?

_Can the method evolve and provide an effective solution to this situation or are there better alternatives?

And the final question:

_Can the method be adapted for use in other disciplines, for example in urban planning?

Conclusions

We are now ready to present our conclusions.

Due to the manner in which it has been developed by Eberle, the 9x9 method has implications that are reflected on two related levels: didactics and design procedure. We have chosen to group our findings in relation to these two themes for ease of reading.

First, by examining the teaching process we note the following:

1. The 9x9 method is adapted to studio work, which involves two interested parties: the teaching team and the students.

Both the introduction of new concepts and the assessment of student results depend on the tutors. They are the ones who guide the development of critical thinking.

6 The QS Graduate Employability Rankings 2022 place ETH Zürich as number 22 among the top 500 universities in the world.

In their absence, the 9x9 method is difficult to learn through self-study since there is no supporting frame of reference to validate the student's decisions.

2. The textbook associated with the method is a useful instrument both for learning the design method and for teaching it.

The textbook aims for two goals, which it mostly succeeds in accomplishing. The first is to systematise what the students need to know (theory) and what they need to do (procedure) in order to design correctly; the second is to show how studios work, in other words how the tutoring team manages the learning activity. Regrettably, the manual does not provide a precise reading key of the results; we find out the assessment criteria but we never achieve a practical understanding of how projects are evaluated or what standard has to be met. For this reason, the book is easier to use by someone who already possesses an advanced understanding of the field. Nevertheless, the textbook provides examples that the students can use for guidance.

Second, in relation to the design method, we note that:

1. The 9x9 method is flexible and stimulates creativity.

We have previously shown that learning to design with the 9x9 method is easier if there is someone who can show you how it is done, but that once the method has been mastered it can be used independently of the presence of a tutor. Although conceived to support students in the early years of study, the method remains valuable for the more experienced students as it encourages creativity. Due to the universal character of its primitives, it can be applied anywhere since it is not linked to the specificity of a geographical or cultural space. Furthermore, it does not depend on the pre-existence of a fixed set of data regarding the situation upon which one intervenes. Therefore, it can be successfully applied in the case of a real as well as of an imaginary space. The difficulties may arise when the projects results are validated, in the absence of a clear evaluation procedure. This procedure can be created separately for each project.

Finally, a few questions are left open with regard to the flexibility of the application range of the method:

1. How efficient is the method in a less than optimal studio environment? Can it evolve and address this situation or are there better alternatives?

2. Can the method be adapted for use in other disciplines e.g. urban planning? If so, then how?

References

Eberle, D. & Aicher, F. (Eds.) (2018). 9x9 – *A Method of Design. From City to House Continued*. Basel: Birkhäuser.

Eberle, D. & Simmendinger, P. (2007). *Von der Stadt zum Haus: Eine Entwurfslehre/ From City to House: A Design Theory*. Zürich: Gta Verlag.

Lucien, M. (2021). *Top 10 in the world for 8 years*. Available at: https:// bit.ly/3j8c6GL [16.10.2021].

Quacqualli Symonds (2021). *QS Graduate Employability Rankings 2022*. Available at: https://bit.ly/2ZOpkyu. [16.10.2021].

The Netzstadt Method / *Die Netzstadtmethode*

https://doi.org/10.54508/9786066382465.06

Chronology of the method **(Oswald & Baccini, 2003b, p. 6f)**

The story of the project which gave birth to the Netzstadt Method[1] began in 1993, when Franz Oswald first met Peter Baccini to discuss a research project dedicated to urban development.

Their reasons for meeting could not have been more different. Oswald, an architect who had taught architectural design at the Swiss Federal Institute of Technology in Zürich[2] (ETH Zürich), had just taken over as chair of urban design, thus entering a completely new field. Baccini, a natural scientist with broad research experience, had by that point completed two vast studies on the "metabolism" of the canton of Aargau and the town of St. Gallen and he had concluded that Swiss municipalities had become energetically and financially dependent on their "global" hinterlands to an ever-increasing degree.

The two concluded from their discussion that urban design would have to be systematically oriented towards the functional conversion of cities since this was the only professionally acceptable alternative from the point of view of sustainable development.

Over the following year, the two launched a curriculum reform at ETH Zürich which proved to be far too ambitious; the interdisciplinary collaboration project was substantially reduced because of this. At the end of 1994, Oswald and Baccini also began a series of discussions which led to two fundamental rules of work: the first rule established the full equality of the collaborators and, by implication, the absence of a dominant discipline in the analysis of the urban phenomenon while the second rule imposed the joint design, testing and implementation of all the instruments developed during their collaboration.

---

1 *Netzstadtmethode*. [Authors' translation: the Networked City Method]. Authors' note: When perusing the official English version of the book, we have encountered quite a few translations that do not do the German version justice. Hence, we have introduced our own translations between square brackets, to make the text more legible.

2 *Eidgenössische Technische Hochschule Zürich/ETH Zürich.*

The first project results emerged in 1998, when Oswald and Baccini published *Netzstadt. Transdisziplinäre Methoden zum Umbau urbaner Systeme. Ergebnisse aus dem ETH-Forschungsprojekt SYNOIKOS — Nachhaltigkeit und urbane Gestaltung im Raum Kreuzung Schweizer Mittelland* (Oswald & Baccini, 1998). The book is essentially dedicated to the creation of a common language between the two, but it also contains many of the research questions that are extensively explored in the book we are about to examine: *Netzstadt. Einführung in das Stadtentwerfen/ Netzstadt: Designing the Urban* (Oswald & Baccini, 2003b).

The method as such was tested in the winter semester of 2001–2002 at ETH Zürich (Oswald & Baccini, 2003b, p. 187). Yet Franz Oswald retired in the spring of 2003 and the method seems to be missing from the present-day toolkit of urban design at ETH.

A short description of the method

This research and design method requires substantial interdisciplinary work. Ideally, the work teams should include students specialised in architecture, urban design, natural sciences, and engineering. Here are the reasons:

"Design using the Netzstadt Method answers the following questions:

How do the four activities ("to nourish and recover," "to clean," "to reside [auth.n.: to live] and work," "to transport and communicate") manifest themselves morphologically and physiologically in three network elements, primarily related to the six territories (settlement, infrastructure, agriculture, forest, water, fallow land) and the four main resources (water, food, construction materials, energy)?

What effects do these characteristics have on urban quality, measured in terms of the five criteria (identification [auth.n.: identity], diversity, flexibility, degree of self-sufficiency, resource efficiency)?"

(Oswald & Baccini, 2003a, p. 182)

„Die Entwurfsarbeit mit der Netzstadtmethode beantwortet folgende Fragestellungen:

Wie manifestieren sich die vier Aktivitäten (Ernähren und Erholen, Reinigen, Wohnen und Arbeiten, Transportieren und Kommunizieren) morphologisch und physiologisch in drei Netzelementen [Knoten, Verbindungen, Skalen, n.n.], primär bezogen auf die sechs Territorien (Siedlung, Infrastruktur, Landwirtschaft, Wald, Wasser, Brache) und die vier Hauptressourcen (Wasser, Nahrungsmittel, Baumaterialien, Energie)?

Welche Auswirkungen haben diese Eigenschaften auf die urbane Qualität, gemessen an den fünf Kriterien (Identifikation, Diversität, Flexibilität, Versorgungsgrad, Ressourceneffizienz)?"

(Oswald & Baccini, 2003b, p. 182).

Before clarifying the terms in the previous quotes, let us examine more closely the general traits of the method (Fig. 1).

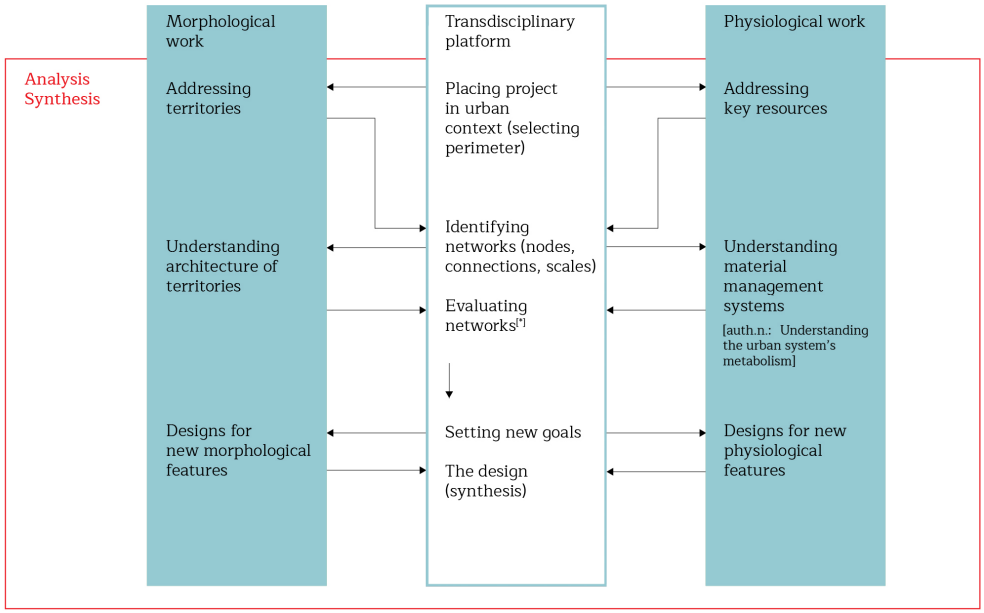


Fig. 1. An overview of the Netzstadt Method. Source: adapted from Oswald & Baccini (2003a, p. 183).

We notice three columns: the left-hand column covers the morphological study, which includes a preliminary analysis of the territory under scrutiny, the understanding of its architecture (anatomy), as well as proposals for altering its morphological features. Symmetrically, the right-hand column covers the physiological study, which entails the uncovering and analysis of the key resources that determine the inner workings of that territory, an understanding of the metabolism that underpins the urban system, as well as the proposals for changing its physiological features.

Essentially, the two columns frame the method proper: in brief, it begins by situating the project in its context or, in other words, by establishing the observation perimeter and the project perimeter.

This is followed by the identification of the network that crosses the project perimeter, that is to say, by classifying nodes, the connections between nodes and the different territorial scales of the network. Once identified, the network is subsequently evaluated from the perspective of one or several criteria that determine urban qualities, i.e., identity, diversity, flexibility, degree of self-sufficiency, and resource efficiency.

The teams then formulate new objectives, meant to improve the urban qualities of the project perimeter, both from a morphological and a physiological perspective. Finally, the method concludes with the actual proposals of urban projects, anchored in a systematic, yet flexible analysis.

Procedurally, the Netzstadt Method is made up of five steps (Fig. 2):

1. The first step consists in reading and understanding the observation perimeter and the project perimeter. The work is done in four stages: the first step implies the morphological identification of the network nodes within the project perimeter and throughout its neighbourhood. The second stage consists of the description and physiological profiling of both the project perimeter and the observation perimeter. It is followed by the classification of the territories[3] that make up the project perimeter. The first step then concludes with the historical analysis of the project perimeter and of the observation perimeter, to the extent that such an analysis is possible (Oswald & Baccini, 2003b, pp. 198f).

2. The second step consists in identifying the network that crosses the project perimeter. More specifically, the nodes, the connections between them and the territorial scales at which they manifest themselves must be identified. Once identified, they must be described both morphologically and physiologically, viz. the morphological and physiological features of the network must be systematised. The following research questions are worth noting (Oswald & Baccini, 2003b, p. 208):

> _What do the nodes, connections, and different territorial scales of the network that crosses the project perimeter look like?
>
> _Which morphological features describe the network?
>
> _ Which physiological features does the network reveal?

3. The third step focuses on a first assessment of the urban qualities of the project perimeter. Essentially, a hierarchy of strong and weak points of the project perimeter is created and these, in turn, provide a basis for both the vision and the goals of the project. The third step, in its turn, is accompanied by four research questions (Oswald & Baccini, 2003b, p. 218f):

> _Which traits of the network (visibly) contribute to the urban qualities of the project perimeter?
>
> _Which strong points of the project perimeter are well-suited for development?
>
> _Which traits of the network are weak points of the project perimeter?
>
> _Which weak points inhibit future developments of the project perimeter?

4. The fourth step sets the objectives for development and formulates the strategy for achieving them. In other words, the fourth step is entirely focused on the transition from the present state of the project perimeter to its expected future state (designed or planned).

3 Territories are classified in Fig. 3 and in Fig. 4.

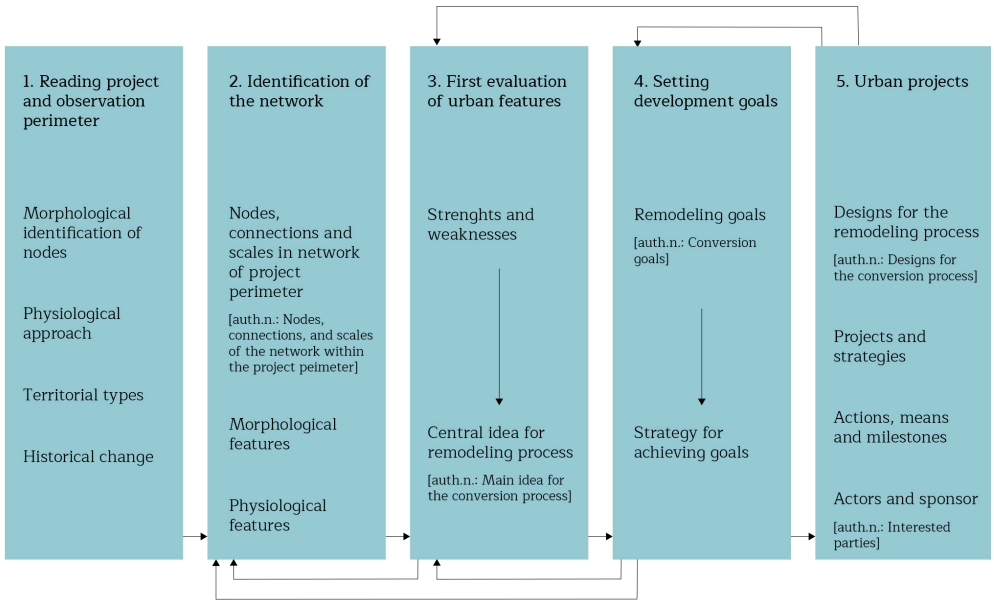


Fig. 2. The five steps of the Netzstadt Method. Source: adapted from Oswald & Baccini (2003a, p. 197).

Relying on common planning concepts, the fourth step explicitly formulates the project vision and goals by starting from the following research questions. They are closely linked to decision-making:[4]

_Who sets the project objectives? In other words, who formulates the vision for the project?

_Who decides the implementation strategy of the project and, implicitly, the strategy for reaching the set objectives? In other words, who defines the goal of the project?

5. The final step puts forward the actual urban projects, starting from the assessment of urban qualities conducted in the third step and from the vision formulated in the fourth step. Against this background, we encounter the following series of research questions:

_What do urban projects look like for the project perimeter? How do they contribute to the application of the strategy?

_What are the actions (or courses of action)[5], the means, and deadlines for implementing the strategy?

_Who are the parties involved in carrying out the projects and what are their mandates for implementing the strategy and for carrying out the actual urban projects?

4 While conversion objectives must be clearly formulated in the design brief, the answer to the two questions will depend on the institution or the parties involved in carrying out the project. They must be formulated nonetheless, even if only at a basic level.

5 In planning parlance, several actions aimed at fulfilling the same objective make up a “course of action”.

The feedback loops between the last four steps of the method are also visible in Fig. 2. We can easily notice that the assessment of urban qualities can be modified depending on the objectives set, the vision and purpose of the strategy, as well as on the actual urban projects. Furthermore, it also recalibrates the analysis of the morphological and physiological features of the project perimeter. This leads to a refining of the method, which gradually clarifies the final proposals of urban projects for the project perimeter.

Before going into more procedural details, we must define the method's limits. Hence:

"–**The Netzstadt Method itself does not generate designs**. It supports analysis and structures the work of designing.

–**The Netzstadt Method does not develop new quality objectives** for urban systems. For this, normative powers are required, which are assembled and carried out specific to the culture in which they are located. In democratic societies the quality objectives are worked out in participatory procedures with those affected [auth.n.: by discussing and negotiating] [...]. However, the Netzstadt Method does help to bring the objectives worked out in this manner into a systemic context. [auth.n.: However, the Netzstadt Method does help in calibrating objectives against a wider context, both when drafting the strategy and when designing the projects proper.]"

(Oswald & Baccini, 2003a, p. 182)

„Die Netzstadtmethode an sich generiert keine Entwürfe. Sie unterstützt die Analyse und strukturiert die Entwurfsarbeit.

Die Netzstadtmethode entwickelt keine neuen Qualitätsziele für urbane Systeme. Dazu werden normative Kräfte benötigt, die sich kulturspezifisch gruppieren und durchsetzen. In demokratischen Gesellschaften werden die Qualitätsziele mit den Betroffenen in partizipativen Verfahren erarbeitet [...]. Die Netzstadtmethode hilft jedoch, die auf diese Weise erarbeiteten Ziele in einen Systemzusammenhang zu bringen."

(Oswald & Baccini, 2003b, p. 182)

Definitions and explanations

We have seen the main terms used by the Netzstadt Method. It is now time to examine them more closely. We start with the definition of the method itself. Hence:

"[Netzstadt Method is] a tool used to analyse urban systems characterized in terms of the Netzstadt Model, and to provide a basis for shaping these systems."

(Oswald & Baccini, 2003a, p. 292)

„[Die Netzstadtmethode ist die] Bezeichnung für ein Instrumentarium, um urbane Systeme, welche mit dem Netzstadtmodell charakterisiert werden, für die Gestaltung zu analysieren und im Entwurf zu unterstützen."

(Oswald & Baccini, 2003b, p. 292)

The method is based on the Netzstadt Model:

"This model uses the metaphor of a network (Netz) to describe an urban system as a structure of nodes and the connections between them, which is spatially differentiated from a hinterland by a border (perimeter) and subdivided into scales with different organisational levels. An urban system is generated by four activities [auth.n.: eating and recreation; cleaning; living and working; transport and communication] and spatially ordered into six territories [auth.n.: water, forest, settlements, agricultural land, infrastructure and fallow land]."

(Oswald & Baccini, 2003a, p. 292)

„Das [Netzstadt-] Modell beschreibt ein urbanes System mit Hilfe der Netzmetapher als Gebilde aus Knoten und Verbindungen zwischen ihnen, das räumlich durch eine Grenze (Perimeter) gegenüber einem Hinterland differenziert und in Skalen mit unterschiedlichen Organisationsstufen gegliedert wird. Ein urbanes System wird durch vier Aktivitäten [Ernähren und Erholen, Reinigen, Wohnen und Arbeiten, Transportieren und Kommunizieren] generiert und auf sechs Territorien [Gewässer, Wald, Siedlung, Landwirtschaft, Infrastruktur und Brache] räumlich angeordnet."

(Oswald & Baccini, 2003b, p. 292)

The Netzstadt Method and the Netzstadt Model both focus on the urban system,[6] defined as follows:

"The urban system is a large system made up of geogenic (emergent with the earth) [auth.n.: i.e., natural] and anthropogenic (emergent with humankind) [auth.n.: i.e., human-made] subsystems. It covers an area of tens of thousands of square kilometres and has a population density of hundreds of inhabitants per square kilometre. It is an all-encompassing, three-dimensional network with variegated social and physical links. A relatively high concentration of people, goods and information exists at the nodes of this network, and there are massive flows of persons, goods, and information between the nodes. Colonized agricultural and forestry ecosystems and waterways are integrated components of the system."

(Oswald & Baccini, 2003a, p. 292)

„Das urbane System ist ein aus geogenen (erdgeschichtlich entstandenen) und anthropogenen (kulturell gestalteten) Subsystemen zusammengesetztes Großsystem auf einer Fläche von Hunderten bis Zehntausenden von Quadratkilometern und einer Dichte von Hunderten von Einwohnern pro Quadratkilometer. Es ist ein flächendeckendes dreidimensionales Netzwerk von vielfältigen sozialen und physischen Verknüpfungen. In den Knoten dieses Netzwerks bestehen relativ hohe Dichten von Menschen und Gütern. Zwischen diesen Knoten unterschiedlichen Dichten finden starke Flüsse von Personen, Gütern und Informationen statt. Die kolonisierten Ökosysteme der Land- und Forstwirtschaft und die Gewässer sind integrierte Teile dieses Systems."

(Oswald & Baccini, 2003b, p. 292)

The network that forms the urban system is composed of nodes and connections, which appear at different territorial scales. More specifically, a node is:

"marked by a high density of people, goods and information. Nodes can be assigned to selected scale levels."

(Oswald & Baccini, 2003a, p. 291)

„[Ein Knoten ist] ein Ort von gleichzeitig hoher Dichte an Personen, Gütern und Informationen. Knoten können ausgewählten Skalenstufen zugeordnet werden."

(Oswald & Baccini, 2003b, p. 291)

6 It is worth noting here that Romanian legislation uses a slightly different definition of the urban system: "[The urban system is] a system of neighbouring municipalities that establish relationships of cooperation on economic, social and cultural matters as well as on territorial planning, environmental protection and on transport and utilities infrastructure while retaining their administrative autonomy" (point 15 in Annex 1 of Law 351/2001, on the Land Management Plan of the National Territory – Section IV: The network of localities, in the form consolidated by 31 Oct. 2021). At present, this definition only applies to the urban system formed by the municipalities of Brăila and Galați.

Similarly, a connection is defined as a:

"Flow of people, goods and information between nodes. Connections can be assigned to specific nodes and scale levels."

(Oswald & Baccini, 2003a, p. 292)

„[Eine Verbindung ist ein] Fluss von Personen, Gütern und Informationen zwischen den Knoten. Verbindungen können ausgewählten Knoten und Skalenstufen zugeordnet werden."

(Oswald & Baccini, 2003b, p. 292)

And finally, the territorial scale is:

"[an] organizational unit defined in political-economic and administrative terms indicating the unity of persons, territories and resources. Scale size is defined quantitatively. Small scales are scales classified as low, large scales as high. High scales are aggregates of low ones, and low scales form the basic units of higher ones."

(Oswald & Baccini, 2003a, p. 292)

„[Eine Skala/Skalengröße ist eine] politisch-ökonomische und administrativ definierte Organisationseinheit für die Zusammengehörigkeit von Personen, Territorien und Ressourcen. Die Skalengröße wird quantitativ definiert. Kleine Skalen sind niedrig, große sind hoch eingestufte Skalen. Hohe Skalen sind aus niedrigen aggregiert, und niedrige Skalen bilden die Grundeinheit von größeren."

(Oswald & Baccini, 2003b, p. 292)

Each territorial scale is separated by borders, which are also called "demarcations". The Netzstadt Method works with five territorial scales: "house" [auth.n.: dwellings[7]], "local unit" [auth.n.: neighbourhoods[8]], communities[9] ,regions[10] and, finally, the whole country[11].

Thus, the house [auth.n.: dwelling] represents:

"The smallest unit of urban life in an individual household and an integrated part of the local unit. It makes connections to other networks in the entire system possible."

(Oswald & Baccini, 2003a, p. 55)

„Sie ist die kleinste Einheit für urbanes Leben in einem individuellen Haushalt und integrierter Teil eines Quartiers, das die Verbindung mit allen anderen Netzwerken des Gesamtsystems ermöglicht."

(Oswald & Baccini, 2003b, p. 55)

7 *Wohnung.*
8 *Quartier.*
9 *Gemeinde.*
10 *Region.*
11 *Land/Nation.*

Turning now to the "local unit" [auth.n.: neighbourhood]:

"As the 'local' scale, it covers the basic needs of urban life, both physiologically and sociologically. The local unit's [auth.n.: the neighbourhood's] morphological quality enables inhabitants to identify with their neighborhood [auth.n.: enables inhabitants to identify with their surroundings]."

(Oswald & Baccini, 2003a, p. 55)

„Die „lokale Skala", bietet die Grundversorgung des urbanen Lebens – sowohl physiologisch als auch soziologisch. Die morphologische Qualität des Quartiers erlaubt die erste Identifikation der Einwohner mit ihrer Nachbarschaft."

(Oswald & Baccini, 2003b, p. 55)

Likewise, the community[12] means:

"the first tier of collectively organized educational, construction and social tasks, which are self-administered in sub-areas. In large communities, some of these tasks can be delegated to local units (districts, counties) [auth.n.: delegated to local administrations]."

(Oswald & Baccini, 2003a, p. 55)

„Die kommunale Stufe ist die erste Stufe der gemeinschaftlich organisierten und in Teilbereichen selbst verwalteten Aufgaben im Bau-, Bildungs- und Sozialbereich. Im Falle sehr großer Kommunen können Teile dieser Aufgaben auch an Quartiere (Kreise, Bezirke) delegiert werden."

(Oswald & Baccini, 2003b, p. 55)

At a higher level, we have the region

"The region is composed of several communities requiring central coordination of educational, social, resource management and transportation. It is able to carry these out as a politically and economically independent unit. Examples of regions are federal states, Départements, cantons, etc."

(Oswald & Baccini, 2003a, p. 55)

„Die Region umfasst mehrere Kommunen, für die größere Aufgaben im Bildungs-, Sozial-, Ressourcen- und Verkehrsbereich zentral gelöst werden. Sie ist in der Lage, diese Aufgaben in politischer und ökonomischer Souveränität zu lösen. Beispiele für Regionen sind Bundesländer, Departemente, Kantone etc., aber auch Regionen der Europäischen Union nach dem Maastricht Vertrag von 1993."

(Oswald & Baccini, 2003b, p. 55)

12 Or, sometimes, the municipality.

Finally, we have the definition of the country:[13]

„Das Land ist ein Regionenverbund, welcher sich über eine Verfassung den Status eines souveränen Staates gibt."

(Oswald & Baccini, 2003b, p. 55)

"The country is a confederation of regions whose constitution gives it the status of a sovereign state."

(Oswald & Baccini, 2003a, p. 55)

Returning to the four activity types, they are:

"All actions by human beings that serve to satisfy their needs. The Netzstadt Method focuses on four basic needs: eating and recreation, hygiene, residing [auth. n.: living] and working, transportation and communication."

(Oswald & Baccini, 2003a, p. 291)

„[Aktivitäten sind] alle Handlungen des Menschen, die dazu dienen, seine Bedürfnisse zu befriedigen. In der Netzstadtmethode wird mit vier Grundbedürfnissen gearbeitet: Ernähren und Erholen, Reinigen, Wohnen und Arbeiten, Transportieren und Kommunizieren."

(Oswald & Baccini, 2003b, p. 291)

Going into a bit more detail:

"Eating as an activity encompasses all territories, processes and goods needed to produce, distribute and consume solid and liquid foods. It includes agricultural production, food processing (industrial, commercial) and food preparation in the household. Food consumption also covers the products of human metabolism (exhaled air, faeces and urine). Recreation (recovery) as an activity is linked to the processes, goods and territories used for daily leisure-time activities, e.g., sports of all kinds."

(Oswald & Baccini, 2003a, p. 60)

„Die Aktivität Ernähren umfasst alle Territorien, Prozesse und Güter, die notwendig sind, um feste und flüssige Nahrungsmittel herzustellen, zu verteilen und zu konsumieren. Zu ihr gehören die landwirtschaftliche Produktion, die Aufarbeitung der Nahrungsmittel (industriell, gewerblich) und die Zubereitung im Haushalt. Der Konsum der Nahrungsmittel schließt auch die Stoffwechselprodukte des Menschen (Atemluft, Fäkalien und Urin) mit ein. Die Aktivität Erholen beinhaltet hier vor allem die mit der täglichen Freizeitgestaltung verbundenen Prozesse und Güter auf allen Territorien, man denke an sportliche Betätigung jeglicher Art."

(Oswald & Baccini, 2003b, p. 60)

13 In the Romanian case, this would apply to counties, as development regions do not have legal status.

Then comes the definition of cleaning:

"Cleaning pertains to all processes and goods necessary to maintain human health and to protect the environment from damaging waste materials. It entails washing the body and clothes, as well as cleaning residential and working spaces, streets, etc. It covers all processes in which wastes (exhaust air, wastewater, solid and sludge wastes) are treated, including sewage and waste incinerator plants."

(Oswald & Baccini, 2003a, p. 60)

„Dieser Bereich umfasst alle Territorien, Prozesse und Güter, die notwendig sind, um die Gesundheit des Menschen zu erhalten und die Umwelt vor schädlichen Abfällen zu schützen. Dazu gehören das Waschen von Körper und Kleidungsstücken, das Reinigen der Wohn- und Arbeitsräume, der Straßen etc. Eingeschlossen sind sämtliche Prozesse zur Behandlung von „Abgüter" (Abluft, Abwasser, feste und schlammförmige Abfälle), also auch Kläranlagen und Müllverbrennungsanlagen."

(Oswald & Baccini, 2003b, p. 60)

Likewise, living and working:

"pertain to territories, processes and goods used for construction and operation of residential and working facilities (e.g. cement production, furniture manufacture, oil burners for central heating, electric power for lighting)."

(Oswald & Baccini, 2003a, p. 60)

„Hier sind alle Territorien, Prozesse und Güter zusammengefasst, die zum Bau von Wohn- und Arbeitsanlagen und deren Betrieb verwendet werden (z.B. Zementherstellung, Möbelfabrikation, Ölbrenner für die Zentralheizung, elektrischer Strom für die Beleuchtung)."

(Oswald & Baccini, 2003b, p. 60)

And finally, transport and communication:

"This field encompasses all territories, processes and goods used to transport people and to exchange information. It covers street and cable construction as well as the operation of schools and administrations. Goods such as cars, locomotives, telephones and computers are also included [auth. n.: in this category]."

(Oswald & Baccini, 2003a, p. 61)

„Dieser Bereich umfasst alle Territorien, Prozesse und Güter, welche zum Transport von Menschen und Materiale und zum Austausch von Informationen eingesetzt werden. Dazu gehören Prozesse wie Straßen- und Kabelbau, Schule und Verwaltung oder Güter wie Automobil, Lokomotive, Telefon und Computer."

(Oswald & Baccini, 2003b, p. 61)

The four types of activities unfold in different territories. More specifically, the Netzstadt Method uses six types of territories:

"[The types of territory are] the morphological basic elements in the architecture of urban systems. They provide living spaces and are the resources of all activities. The Netzstadt Method distinguishes between six types of territories: water, forest, settlement, agriculture, infrastructure and fallow land."

(Oswald & Baccini, 2003a, p. 293)

„[Territorientypen] sind die morphologischen Basiselemente in der Architektur urbaner Systeme, bieten Lebensplätze und sind die Ressourcen aller Aktivitäten. In der Netzstadtmethode werden sechs Territorientypen unterschieden: Gewässer, Wald, Siedlung, Landwirtschaft, Infrastruktur und Brache."

(Oswald & Baccini, 2003b, p. 293)

It is worth noting that the architecture of territory is defined as:

"Structural ordering of territorial types [auth.n.: settlements, infrastructure, agricultural land, forests, water and fallow land within the selected perimeter]."

(Oswald & Baccini, 2003a, p. 292)

„[Die Architektur des Territoriums ist die] gestalterische Ordnung der Territorientypen innerhalb des ausgewählten Perimeters."

(Oswald & Baccini, 2003b, p. 292)

We now come to the five assessment criteria of urban qualities: the identity[14] of urban systems, their diversity[15] , flexibility[16], degree of self-sufficiency[17] and their resource efficiency[18].

14 *Identifikation/Identität.*
15 *Diversität.*
16 *Flexibilität.*
17 *Versorgungsgrad.*
18 *Ressourceneffizienz.*

The identity of an urban system is described as follows:

"Identification [auth.n.: identity] refers to the identifying [auth.n.: particular] characteristics of an urban system, communicated by various media. These characteristics create orientation and order within space and time and are therefore essential for urban existence.

Identification [auth.n.: identity], in this sense, is a gauge of the urban system's ability to provide people (inhabitants and guests) with unmistakable images (icons) of its essential features, to which residents can relate and which create a sense of home, security, appeal, well-being and creative inspiration."

(Oswald & Baccini, 2003a, p. 52)

„Es sind medial vermittelte Erkennungsmerkmale[,] im Sinne von Orientierung und Ordnung im Raum und in der Zeit, die für das urbane Zusammenleben notwendig sind.

Identifikation [Identität] ist in diesem Sinne ein Maß für die Kapazität eines urbanen Systems, den Menschen (Einwohnern und Gästen) unverwechselbare Bilder (Ikonen) seiner wesentlichen Eigenschaften zu geben, in denen sie sich [wiederfinden] (und [das] Heimatgefühl, Geborgenheit, Anziehungskraft, Wohlbefinden oder ein schöpferisches Stimulans erzeugen) und mit denen sie sich von anderen unterscheiden."

(Oswald & Baccini, 2003b, p. 52)

Turning now to diversity:

"Diversity describes the different ways a certain function in an urban system can be performed, e.g., the different ways people can be fed and transported, a house built or a consumer product manufactured."

(Oswald & Baccini, 2003a, p. 52)

„Sie bezeichnet die Zahl von unterschiedlichen Möglichkeiten, eine bestimmte Funktion in einem urbanen System zu erfüllen, etwa die Möglichkeiten, eine Person zu transportieren, zu ernähren, ein Haus zu bauen oder ein Konsumgut zu erzeugen."

(Oswald & Baccini, 2003b, p. 52)

Then there is flexibility:

"Flexibility (synonyms: potential to change, adaptability)

Flexibility describes the system's ability to handle internal and external change in two ways:

– the system does not change (homeostasis, buffer capacity);

– the system is renewed or improved (evolution, potential for innovation)."

(Oswald & Baccini, 2003a, p. 52)

„[Flexibilität (syn. Veränderungspotenziale, Anpassungsfähigkeit)] bezeichnet die Eigenschaft eines Systems, auf Veränderungen im Äußeren und im Inneren in zwei Richtungen zu reagieren:

• Dass sich das System nicht verändert (Homöostasis, Pufferkapazitäten);

• Dass sich das System erneuert oder verbessert (Evolution, Innovationspotenziale)."

(Oswald & Baccini, 2003b, p. 52)

Concerning the degree of self-sufficiency:

"This describes the relationship between available regional resources and the resources that the region requires to meet its needs."

(Oswald & Baccini, 2003a, p. 52)

„[Der Versorgungsgrad] bezeichnet das Verhältnis zwischen den regionalen Ressourcen und den insgesamt notwendigen Ressourcen der Region zur Deckung ihres Bedarfes."

(Oswald & Baccini, 2003b, p. 52f.)

And finally, on resource efficiency:

"In a nutshell, resource efficiency denotes the relationship between the quantity of a resource utilized and the quantity that is available."

(Oswald & Baccini, 2003a, p. 53)

„In einer Formel gefasst, bedeutet Ressourceneffizienz das Verhältnis zwischen Nutzmenge einer Ressource und ihre Primärmenge."

(Oswald & Baccini, 2003b, p. 53)

In other words, resource efficiency describes the relationship between the necessary consumption of resources for a human activity, such as transport of people, food production or housing, and the related monetary and energy costs, including the use of land. In other words, the more efficiently an urban system uses its resources, the "stronger" it will be.[19]

19 Resource efficiency can be increased through technical means, through improvements in production and transport systems, as well as through changing people's behaviour (Oswald & Baccini, 2003b, p. 53).

The final two concepts that need defining are also the most general: the morphology and physiology of the territory. Thus, the morphology of a given territory is:

"Literally the theory of form. In this context it refers to the territory. In morphological terms, territories are the basic elements of urban systems. The morphology of the territory investigates the formal features that continually develop in urban systems through geogenic and anthropogenic influences. Their development is referred to as morphogenesis and their transformation as metamorphosis."

(Oswald & Baccini, 2003a, p. 292)

„Wörtlich die Lehre von Form, [Morphologie] bezieht sich hier auf das Territorium. Territorien sind morphologisch die Basiselemente urbaner Systeme. Die Morphologie des Territoriums untersucht die formalen Eigenschaften, die durch geo- und anthropogene Einflüsse in urbanen Systemen fortwährend neu entstehen. Deren Entstehung wird Morphogenese und deren Veränderung Metamorphose genannt."

(Oswald & Baccini, 2003b, p. 292)

In turn, the physiology of a territory is:

"The theory of life processes which are comprehensible using physical and chemical methods. In the Netzstadt Method, the term refers to the physiological processes (material and energy flows) in urban systems."

(Oswald & Baccini, 2003a, p. 292)

„[Die Physiologie ist] die Lehre von Lebensvorgängen, die mit physikalischen und chemischen Methoden erfassbar sind. In der Netzstadtmethode bezeichnet der Begriff die Lehre von den Stoffwechselprozessen (Materie- und Energieflüsse) in urbanen Systemen."

(Oswald & Baccini, 2003b, p. 292)

Two supplementary concepts emerge in connection to the physiology of a territory, namely the metabolism of urban systems and its study:

"[The] physiology of urban systems refers to all physiological processes (transport and transformation of material and energy) in anthropogenic [auth.n.: man-made] ecosystems."

(Oswald & Baccini, 2003a, p. 293)

„[Der Stoffwechsel urbaner Systeme] umfasst sämtliche physiologischen Vorgänge (Transport und Transformationen von Materie und Energie) in anthropogenen Ökosystemen."

(Oswald & Baccini, 2003b, p. 293)

The term "material flow analysis" designates:

„[Die Stoffflußanalyse ist die] Methode zur Erfassung der Materie- und Energieflüsse sowie der Energielager in einem gegebenen Raum in einem definierten Zeitabschnitt."

(Oswald & Baccini, 2003b, p. 293)

"A method for the recording of material and energy flow as well as energy storage in a given space over a defined time period."

(Oswald & Baccini, 2003a, p. 293)

Finally, analysing the metabolism of urban systems leads to the creation of "material management systems" [auth.n.: material budgeting systems]. These are:

„[Die Stoffhaushaltsysteme sind] die mit Hilfe der Stoffflußanalyse entwickelten Systeme. Diese zeigen die relevanten Prozesse und Güter- und Stoffflüsse für einen vorbestimmten Ausschnitt des Stoffwechsels (qualitative Aussage) und die Größen der Flüsse und Lager (quantitative Aussage)."

(Oswald & Baccini, 2003b, p. 293)

"Systems developed using material flow analysis. They show the relevant processes and flows of materials and goods for a predetermined segment of the physiology (qualitative expression) and the size of the flows and storage (quantitative expression)."

(Oswald & Baccini, 2003a, p. 293)

Morphological and physiological indicators

This section constitutes the technical part of the Netzstadt Method and provides the calculation basis for both morphological and physiological analyses. Unfortunately, however, a few of the calculation formulae are not fully explained within the text. For this reason, we have kept only the description of the indicators. We intend to verify the correctness of the formulae sometime in the future[20]. Nonetheless, the descriptions are sufficiently rich to be used in creating one's own indicators.

Hence, we have divided the indicators into two categories: we will first discuss the morphological measures and subsequently the physiological ones.

Morphological indicators

The Netzstadt Method uses four morphological indicators: building density[21], fragmentation[22], granulation[23] and accessibility[24]. All the morphological indicators can be graphically represented. However, measuring them is not always simple. Thus, density and fragmentation can be measured directly, while granulation and accessibility can only be measured indirectly (Oswald & Baccini, 2003b, p. 132).

20 Nevertheless, we have always referenced the pages where the calculations appear.
21 *Baudichte.*
22 *Zerstückelung.*
23 *Körnung.*
24 *Erschließung.*

Density

Of all morphological indicators, building density is the most intuitive.[25] Thus:

"The building density index [...] shows the ratio between the gross floor space realized (GFS) with respect to sealed surface and the node field selected specific to the scale [auth.n.: the node field selected at a particular scale].

The building density index can be applied to all types of buildings and scales."

(Oswald & Baccini, 2003a, p. 132)

„Der Baudichteindex [...] zeigt das Verhältnis zwischen realisierten Bruttogeschossfläche (BGF) respektive versiegelter Oberfläche und dem skalenspezifisch gewählten Knotenfeld.

Der Baudichteindex kann für alle Gebäudetypen und Skalen angewendet werden."

(Oswald & Baccini, 2003b, p. 132)

Furthermore:

"In order to increase resource efficiency in land use, a minimum building density must be observed. In other words, the efficiency of land use may not fall below a certain threshold."

(Oswald & Baccini, 2003a, p. 136)

„Um Ressourceneffizienz in der Bodennutzung zu erhöhen, ist eine Mindestbaudichte einzuhalten. Mit anderen Worten darf eine Effizienzschwelle der Bodenbesetzung nicht unterschritten werden."

(Oswald & Baccini, 2003b, p. 136)

Obviously, this degree of efficiency must be established separately for each observation perimeter.

Fragmentation

The second morphological indicator is fragmentation:[26]

"The objective of the shredding [auth.n.: fragmentation] index is to estimate the appropriate degree of coherence of [auth.n.: across] selected fields. [...] It proceeds from the following hypothesis:

– The higher the threshold for overcoming a border, the more indirect the connection and exchange between adjacent fields."

(Oswald & Baccini, 2003a, p. 138)

„Ziel des Zerstückelungsindex ist es, den angemessenen Grad für Kohärenz oder Zusammenhalt gewählter Felder abzuschätzen [...]. Dabei wird von der folgenden Hypothese ausgegangen:

Je höher die Schwelle zur Überwindung einer Grenze ist, desto indirekter sind Verbindung und Austausch zwischen benachbarten Feldern."

(Oswald & Baccini, 2003b, p. 138)

25 The formulae for density and for its derived indicators are given in Oswald & Baccini (2003b, p. 144f).

26 The formulae for fragmentation and for its derived indicators are given in Oswald & Baccini (2003b, p. 146f).

This is followed by an example:

„Sichtbare und nicht sichtbare Schwellen zerteilen vielgestaltig die Erdoberfläche. Zu ihnen zählen Verkehrsverbindungen, Leitungen aller Art, An- und Abflugschneisen[,] sowie politisch-administrative Grenzlinien mit Bauzonen- und Parzellengrenzen. Der extensive Ausbau der Infrastruktur seit den 1950er Jahren hat hochgradig zu Gebietszerstückelung geführt. Dadurch kann sich das Paradox ergeben, dass durch den hohen Teilungsgrad und die schlechte Anordnung und Formgebung von Verbindungen die freie Bewegung, Kommunikation und der Austausch für alle Lebewesen behindert oder sogar unterbunden werden. In solchen Fällen werden Verbindungen zu Barrieren und stark einschränkenden Faktoren, etwa in der Förderung oder Erhaltung der Vielfalt.

Der Grad des Widerstands oder Zusammenhalts, lässt sich durch die Berechnung der Wahrscheinlichkeit von Begegnungen oder Kontaktbehinderungen innerhalb des Untersuchungsgebiets ermitteln. Auf diese Weise kann auch festgestellt werden, ob eine bestimmte Parzellierung zu klein- oder großmaßstäblich gewählt ist und daher die erwünschte Kommunikation und die Austauschbewegungen innerhalb des gewählten Feldes entweder ein- oder ausschließt. Die Zuordnung der Skala, politisch-rechtliche Konventionen und die physisch-plastische Form der Grenzen sind für die Bewertung des Zerstückelungsindex wichtige Merkmale.“

(Oswald & Baccini, 2003b, p. 138)

“Visible and invisible thresholds divide the surface of the earth in many different ways. They include traffic connections, pipes and wires of all kinds, flight paths, and political-administrative boundaries with building zones and allotment boundaries. The extensive expansion of infrastructure since the 1950s has led to a high degree of shredding [auth.n.: fragmentation] in some areas. This may produce the paradox that connections have hindered or even thwarted free movement, communication, and exchange for all living beings through their high degree of division and poor organization and shapes. In such cases, connections become barriers and severely restricting factors, especially as regards the encouragement or conservation of biodiversity.

The degree of resistance or coherence can be determined by calculating the probability of encounters or prevented contacts within the area under study. This can also determine whether the scale selected for a system of allotment is too small or too large and therefore includes or excludes the communication and exchange movements desired within the selected field. The assignment of scales, political-legal conventions and the physical-plastic shape of the boundaries are important features to be considered in estimating the shredding [auth.n.: fragmentation] index.”

(Oswald & Baccini, 2003a, p. 138)

Granulation

The third morphological indicator is granulation:[27]

„Das Ziel des Körnungsindex ist gestalterischer Natur. Dabei gilt es, den angemessenen Grad der Durchlässigkeit für das ausgewählte Feld in seinem territorialen Kontext zu finden. Durchlässigkeit bezieht sich auf Bewegungen von Personen und nicht menschlichen Lebewesen, Licht (Sonnenenergie), Luft und Schall. Sie ist eine kulturell stark vorgeprägte Größe und wird von Gewohnheiten, sehr unterschiedlichen Vorstellungen von Privatsphäre, Sicherheit und Komfort[,] sowie von reglementierenden Normen geprägt. Durchlässigkeit trägt unverkennbar zur Lebensqualität und zum Gedächtniswert eines Ortes bei.

Körnung ist ein anthropogenes oder geogenes Merkmal, das durch die zählbare Menge von Materialbrocken oder Körnern unterschiedlichen Zuschnitts ein bestimmtes Feld füllt und gliedert. Im gleichen Feld können in Funktion von Zuschnitt, Menge und Anordnung der Körner unterschiedliche Muster entstehen. Das spezifische Körnungsmuster zeigt sich in der Siebkurve oder im Mischverhältnis zum gegebenen Materialgemenge. Im gewählten Feld gibt es zwischen dem Grad der Durchlässigkeit und dem Mischungsverhältnis des gegebenen Materialgemenges einen direkten, aber rechnerisch schwer fassbaren Zusammenhang. Dieser Zusammenhang kann jedoch in Grafiken hinreichend genau dargestellt werden, sodass sie als Vergleichsinstrumente anstelle von Berechnungen verwendet werden können. Dabei gilt die folgende Hypothese:

Je höher Raumfüllungsgrad und Mischverhältnis sind, desto geringer ist die Durchlässigkeit und umgekehrt."

(Oswald & Baccini, 2003b, p. 140)

"The objective of the granulation index is of a shaping nature [auth.n: related to the design process]. The point is to find the appropriate degree of permeability for the selected field in its territorial context. Permeability refers to movements of persons and non-human living beings, light (solar energy), air and sound. It is a variable that is largely culturally predetermined and is marked by habits, different conceptions of the private sphere, security, and comfort, as well as by standards to bring such movements under control. Permeability contributes unmistakably to quality of life and to the memory value of a place.

Granulation is an anthropogenic or geogenic feature that fills and classifies a certain field in terms of the countable number of fragments of material, or grains, of different shape and size. In the same field, different patterns may emerge in the function of the shape and size, number, and arrangement of grains.

The specific granulation pattern is apparent in the grain-size distribution curve or in the mixing ratio of the given aggregation of material.

27 The formulae for granulation and for its derived indicators are given in Oswald & Baccini (2003b, p. 148f).

In the selected field, there is a direct relationship between the degree of permeability and the mixing ratio of the given aggregation of material, but this relationship is difficult to formulate mathematically. However, it can be portrayed graphically with sufficient accuracy to use it as a comparative tool in the place of calculations. Here, the following hypothesis holds:

– The higher the degree of occupied space and the mixing ratio, the lower the permeability and vice versa."

(Oswald & Baccini, 2003a, p. 140)

Accessibility

The fourth and final morphological indicator is accessibility:[28]

"The objective of the accessibility index is the appropriate degree of accessibility of places. Accessibility is differentiated into access to and access from. The interfaces used to determine the degree of accessibility in the network are those capable of linking the selected places across all scales. This linking is a characteristic that gives the selected place a relative advantage of location, makes it accessible for diverse modalities of mobility, and, if desired, creates the prerequisites for differentiating between paths to and paths from. Connections that are mere intersections without constituting interfaces across all scales are simply transit lines."

(Oswald & Baccini, 2003a, p. 142)

„Das Ziel des Erschließungsindex ist der angemessene Grad der Zugänglichkeit von Orten. Zugänglichkeit wird in Hin- und Rückweg differenziert. Im Netz dienen diejenigen Schnittstellen zu Ermittlung des Zugänglichkeitsgrades, welche in der Lage sind, die gewählten Orte Skalen übergreifend zu verknüpfen. Diese Verknüpfung ist eine Eigenschaft, die dem gewählten Ort eine relative Standortgunst gibt, ihn für diverse Modalitäten der Mobilität zugänglich macht und die Voraussetzung dazu schafft, dass Hin- und Rückwege, falls erwünscht, differenziert werden können. Verbindungen, die keine Skalen übergreifende Schnittstellen, aber Kreuzungen bilden, sind einfach nur Transitlinien."

(Oswald & Baccini, 2003b, p. 142)

28 The formulae for accessibility and for its derived indicators are given in Oswald & Baccini (2003b, p. 150f).

This definition is again followed by an example:

"The local density of connections is less significant for the accessibility of a place than the performance of linking interfaces. The accessibility index describes distribution systems and interfaces between different scales. Thus, a mailbox is an interface for postal distribution from the highest scale to the lowest, and vice versa. The accessibility index refers to the points of linkage that make up a distribution system for people, goods, and information. The degree of accessibility of a selected place is primarily determined by the opportunities for making contact across scales, from the place or to the place, quickly or slowly. Thus, it is relatively high when the selected place is on the path of different scales, but links them across scales and can be reached, back and forth, at varying rates of speed. This means that the number and temporally measured distance between the interfaces across the scales determine the degree of accessibility."

(Oswald & Baccini, 2003a, p. 142)

„Maßgebend für die Zugänglichkeit eines Ortes ist die Leistung verknüpfender Schnittstellen, weniger die örtliche Dichte von Verbindungen. Der Erschließungsindex beschreibt Verteilungssysteme und Schnittstellen unterschiedlicher Skalen. So ist ein Briefkasten eine Schnittstelle für die Postverteilung von hohen bis zu niedrigen Skalen und umgekehrt. Der Erschließungsindex bezieht sich auf die verknüpften Punkte, die ein Verteilungssystem für Personen, Güter und Informationen ausmachen. Der Grad der Zugänglichkeit eines gewählten Ortes wird maßgebend durch die Kontaktmöglichkeiten bestimmt, die von ihm aus oder zu ihm hin Skalen übergreifend, rasch oder langsam hergestellt werden können. Er ist also relativ hoch, wenn der gewählte Ort auf dem Weg unterschiedlichen Skalen, aber übergreifend verknüpft und in unterschiedlich raschen Geschwindigkeiten erreicht werden kann. Das bedeutet, dass Anzahl und zeitlich gemessene Entfernung der Skalen übergreifenden Schnittstellen den Grad der Zugänglichkeit bestimmen."

(Oswald & Baccini, 2003b, p. 142)

By way of a conclusion:

„Zusammenfassend lässt sich festhalten, dass der Grad der Zugänglichkeit eines gewählten Ortes durch die Anzahl der Skalen übergreifend verknüpften Schnittstellen, die Skalenzuordnung und die zeitlich gemessene Entfernung ermittelt werden kann. Auf der Basis von vereinbarten Grenzwerten können über-, unter- oder angemessen erschlossene Gebiete ermittelt werden. Die statistische Auswertung ist dabei aufwendig und rechnerisch problematisch. Bei der Einordnung des Zugänglichkeitsgrades kann die folgende Hypothese helfen:

Je höher und vielfältiger das Angebot an Skalen übergreifenden Verknüpfungen für Hin- und Rückkontakte zum gewählten Ort ist, desto höher ist sein Grad der Zugänglichkeit und umgekehrt."

(Oswald & Baccini, 2003b, p. 142)

"In summary, it can be established [auth.n.: we assume] that the degree of accessibility of a selected place can be determined by the number of linked interfaces across scales, the assignment of scales and the distance measured in time. On the basis of [auth.n.: Based on] agreed threshold values, it is possible to determine areas that are accessible to an excessive, insufficient or appropriate degree. The statistical assessment of these values is complicated and mathematically problematic. In assigning the degree of accessibility, the following hypothesis may be helpful:

The higher and more varied the supply of links across scales for contacts to and from the selected place, the higher its degree of accessibility, and vice versa."

(Oswald & Baccini, 2003a, p. 142)

Physiological indicators

In addition to the four morphological indicators, the Netzstadt Method also uses a set of six physiological indicators: density of inhabitants[29], density of workplaces[30], density of services provided to the population [31], density of institutions[32], workforce (flows)[33] and student (flows)[34]. In principle, this set could be completed by two additional indicators, which are, however, difficult to establish: shopper flows[35] and information flows[36].

29 *Einwohnerdichte.*
30 *Arbeitsplatzdichte.*
31 *Dienstleistungsdichte.*
32 *Institutionendichte.*
33 *Arbeitende (Flüsse).*
34 *Studierende (Flüsse).*
35 *Käufer (Flüsse).*
36 *Informationen (Flüsse in Bits und Bytes).*

Density of inhabitants

This is the ratio between the number of inhabitants and the surface, normally measured in square kilometres:

"Urban nodes show a greatly increased density of inhabitants compared to total area. High densities of buildings, which serve only as containers for workers or robots, do not constitute an urban node."

(Oswald & Baccini, 2003a, p. 173)

„Urbane Knoten zeigen eine gegenüber der Gesamtfläche stark erhöhte Einwohnerdichte. Hohe Dichten von Gebäuden, welche nur als Hülle von Arbeitende oder Roboter dienen, rechtfertigen noch keinen urbanen Knoten."

(Oswald & Baccini, 2003b, p. 173)

Density of workplaces

In turn, the specific density of workplaces:

"gives the ratio of workplaces to the number of inhabitants in the node who are in the workforce.

A node gains importance within an urban network when its specific density of workplaces is greater than that of the adjacent node. If the density is equal to 1, the net flow of workforce is equal to zero. However, this density says nothing about the actual flows of people [...]. In theory it is possible that all inhabitants in the workforce work outside their node and all workplaces in their node are occupied by people who live elsewhere. The specific density of workplaces of a node thus weights only its economic potential (limited to the number of workplaces, not to the economic net product of these workplaces), measured in terms of its population in the workforce."

(Oswald & Baccini, 2003a, p. 176)

„[Die spezifische] Arbeitsplatzdichte gibt das Verhältnis der Arbeitsplätze im Vergleich zur Anzahl erwerbstätiger Einwohner im Knoten wieder.

Ein Knoten gewinnt innerhalb eines urbanen Netzes an Gewicht, wenn seine spezifische Arbeitsplatzdichte grösser ist als jene der benachbarten Knoten. Ist die Dichte gleich eins, so ist der Nettofluss der Arbeitenden gleich null. Diese Dichte sagt aber nichts über die tatsächlichen Personenflüsse aus [...]. Theoretisch ist es möglich, dass sämtliche erwerbstätigen Einwohner außerhalb ihres Knotens arbeiten und sämtliche Arbeitsplätze in ihrem Knoten durch Auswärtige belegt werden. Die spezifische Arbeitsplatzdichte eines Knotens gewichtet also nur ein wirtschaftliches Potenzial (begrenzt auf die Arbeitsplatzzahl, nicht auf die ökonomische Wertschöpfung), gemessen an seiner erwerbstätigen Bevölkerung."

(Oswald & Baccini, 2003b, p. 176)

Density of services offered to the population

It designates:

"the ratio of people working in the tertiary 'service' sector of the economy to the total number of people working in the node.

A node is also distinguished in the urban network by the fact that it furnishes a higher degree of services than its neighbours. [...] Economic experience shows that the average net product in service companies is higher than in the primary and secondary sectors. In this respect, this indicator also shows the economic potential of the node."

(Oswald & Baccini, 2003a, p. 176)

„[Die Dienstleistungsdichte] bezeichnet das Verhältnis von Erwerbstätigen im tertiären Wirtschaftssektor „Dienstleistungen"[,] im Vergleich zu dem im Knoten insgesamt Erwerbstätigen.

Ein Knoten zeichnet sich im urbanen Netz auch dadurch aus, dass er gegenüber seinen Nachbarn einen höheren Grad an Dienstleistungen erbringt. [...] Die volkswirtschaftliche Erfahrung zeigt, dass die Wertschöpfung in Dienstleistungsunternehmen durchschnittlich höher liegt als in den primären und sekundären Sektoren. Insofern ist dieser Indikator auch ein Gradmesser für das wirtschaftliche Potenzial des Knotens."

(Oswald & Baccini, 2003b, p. 176)

Density of institutions

When discussing density of institutions:

"An urban node is also distinguished by the number of institutions (public and private) that facilitate the exchange of goods (including services of all kinds). The number of these institutions is observed in relation to the number of inhabitants in the node. This ratio is designated as 'density of institutions'. Institutions are or can be:

- markets
- cinemas, museums, theatres
- schools
- hospitals
- sports clubs
- transport systems."

(Oswald & Baccini, 2003a, p. 177)

„Ein urbaner Knoten zeichnet sich durch die Anzahl von Institutionen aus (öffentliche und private), die den Güteraustausch (inkl. Dienstleistungen aller Art) ermöglichen. Die Zahl dieser Institutionen wird im Verhältnis zur Einwohnerzahl im Knoten betrachtet. Dieses Verhältnis wird als „Institutionendichte" bezeichnet. Institutionen sind oder können sein:

- Märkte
- Kino, Museen, Theater
- Schulen
- Spitäler
- Sportvereine
- Verkehrsbetriebe."

(Oswald & Baccini, 2003b, p. 177)

Workforce flows

Workforce flows[37] are part of commuter flows. Thus:

"The ratio of incoming commuters in the workforce to outgoing commuters in the workforce is calculated."

(Oswald & Baccini, 2003a, p. 177)

„Die arbeitenden Einpendler werden in Relation zu arbeitenden Auspendlern gesetzt."

(Oswald & Baccini, 2003b, p. 177)

Student flows

In their turn, student flows are also part of the broader commuting phenomenon:

"The ratio of incoming commuters 'in training' to outgoing commuters 'in training' is calculated.

The daily dynamics of the flows of people to and from a node are demonstrated by movements to the places of work and learning, as well as to the places that supply private households. The weight of a node in the urban network is given by the ratio of incoming to outgoing commuters. The greater this ratio, the more important the node."

(Oswald & Baccini, 2003a, p. 177)

„Die „auszubildenden" Einpendler werden in Relation zu „auszubildenden" Auspendlern gesetzt.

Die tägliche Dynamik der Personenflüsse zu und weg von einem Knoten zeigt sich aus den Bewegungen zu den Arbeits- und Ausbildungsplätzen, sowie zu den Orten für die Versorgung der Privathaushalte. Das Gewicht eines Knotens im urbanen Netz ergibt sich aus dem Verhältnis zwischen Ein- und Auspendlern. Je grösser dieses ist, desto gewichtiger ist der Knoten."

(Oswald & Baccini, 2003b, p. 177)

37 The (civilian) workforce "includes all persons who are regularly involved in an income-generating economic or public-interest activity, in any of the sectors of the national economy, based on a work contract or independently (as freelancers), to obtain income in the form of salaries, barter, etc.
The categories included are:
_Employees who work in one of the sectors of the national economy in the public sector (for wholly state-owned and public-interest entities) and for mixed, private, cooperative entities and non-governmental organisations;
_Owners (directors of private companies) who employ salaried staff to conduct their business;
_Freelancers;
_Unpaid family caregivers.
The employed civilian population does not include military staff and the people affiliated to them (Ministry of National Defence, Ministry of Internal Affairs, Romanian Intelligence Service staff and military recruits), detainees, and staff of the political and public-interest organisations." For additional information, see: https://bit.ly/3lNewfE.

The method in detail

We have seen that the Netzstadt Method follows five steps:

1. Understanding the observation perimeter and the project perimeter.

2. Identifying the network that crosses the project perimeter.

3. Conducting a preliminary assessment of the urban qualities that describe the project perimeter.

4. Formulating the vision and goals of the project, in other words, setting the objectives and formulating the implementation strategy.

5. Proposing the actual urban projects and assigning responsibilities and deadlines for each one.

It is worth remembering here that the method only serves for the analysis and, implicitly, for the substantiation of urban projects, thereby having nothing to say about urban design as such.

The first step: understanding the observation perimeter and the project perimeter

Coming back to the first step, The Netzstadt Method differentiates between the project and its context or, in other words, between the project perimeter and the observation perimeter, by relying almost exclusively on the examination and careful interpretation of a given territory. Thus, work teams select a relevant area of the regional or, less frequently, of the national network of municipalities, to understand the essential traits of the selected area and to describe the interactions of the project perimeter with the observation perimeter (Oswald & Baccini, 2003b, p. 66).

Pragmatically, the first step is prompted by a series of research questions, explicitly formulated in the design brief (Oswald & Baccini, 2003b, p. 193). For example:

> _Which of the five urban qualities[38] of the project perimeter must be improved?
>
> _Which of the strategies dedicated to urban development can lead to visible improvements in the identified urban qualities over the following two generations?
>
> _What do the urban projects aimed at implementing the strategy look like?

In other words:

> _What is the identity, diversity, flexibility, degree of self-sufficiency or resource efficiency that the project perimeter may possess or attain over two generations from now, when considering present conditions and their development possibilities?

38 I.e. identity, diversity, flexibility, degree of self-sufficiency and resource efficiency.

Once formulated, this research question applies to the observation perimeter, as well as to the project perimeter. In other words, the exercise in argumentation begins here. Investigations focus gradually, starting from the regional scale and concluding at the local scale. Thus, analyses performed at the initial stage still have a general character. In brief, the work teams must follow the steps outlined below (Oswald & Baccini, 2003b, p. 199):

1. Identifying the nodes of both the observation perimeter and the project perimeter morphologically, by starting from the mapping of the settlements and infrastructures.[39]

2. Performing a preliminary physiological analysis of both the observation perimeter and the project perimeter.

3. Classifying and providing a synthetic description of the territories that make up the observation and the project perimeters, from a topographical, statistical, and topological perspective.

4. Illustrating the historical evolution of the identified nodes or, in other words, performing a diachronic analysis of the evolution of the urban system under study.

Using the definitions from the previous section, nodes are places with a (comparatively) high density of people, goods, and information. Thus, nodes represent (relative) concentrations of the built environment.[40] As a matter of fact, nodes result from the superposition of two types of territory: settlements and infrastructures. Hence, the first two analytical principles are:

> **(PO1) Nodes are areas where increased densities of the built environment appear. They result from the superposition of two types of territory: settlements and infrastructures.**
>
> **(PO2) Nodes are first identified on the regional scale and subsequently detailed at the local scale.[41]**

Pragmatically, the identification of nodes starts with mapping transport infrastructures and energy infrastructure, where appropriate. Transport infrastructures are divided into road and rail transport. Once divided, they are classified according to their importance. Thus, rail transport is divided into high-speed, regional and, where applicable, local (metropolitan) rail. Similarly, roads are divided into motorways, expressways, national, county, and local roads as well as into different street categories.[42]

---

39 Since this is only a preliminary identification of nodes, the mapping of all six types of territories is not necessary at this stage.

40 Obviously, only if the increased density of buildings and developed land normally indicates higher concentrations of people, goods, and information. Although there are exceptions to this rule, it is sufficiently valid for studio work.

41 The second principle results from the efficiency of the exercise: once identified on the regional scale, the nodes only need to be detailed at the local scale.

42 In Romania, the classification of roads is given in Government Order 43/1997 on the legal regime of roads.

Following the classification of communication channels, the regional nodes must be identified. We will thus trace the large concentrations across the built environment, as they appear on satellite or aerial images. The contours of the nodes are drawn on distinctive elements within the landscape, on administrative boundaries or property boundaries, when these are known. They can already be used in identifying conflicting areas between higher-level communication channels and the local urban fabric, which we will call "conflicts of scale". Conflicts of scale usually provide opportunities for urban project proposals.

Once the regional nodes are sufficiently well-defined, we can pass on to the classification of territories within nodes and their vicinity, by using the six previously mentioned categories: the built environment, the technical and public infrastructure, agricultural fields, forests[43], bodies of water and fallow land[44].

Once they have been identified, the contours of the regional nodes are transposed to the scale of the municipality, for detailing and possible corrections. After fixing these contours, local nodes must be identified and inscribed within the contour of the regional nodes. They likewise result from superposing the high-density built environment onto the different street categories. In contrast to regional node contours, those of local nodes are predominantly traced on the boundary lines of properties and thus require an up-to-date cadastral plan.

The identification and classification of nodes is followed by a series of morphological and, subsequently, physiological analyses of the observation and project perimeters. The morphological analysis uses the following set of indicators, defined in the "Morphological indicators" section: density of buildings and developed land, fragmentation, granulation and accessibility. Keep in mind, however, that all morphological indicators can be graphically represented but their measurement is not always simple. Thus, density of buildings and fragmentation can be measured directly, while granulation and accessibility can only be calculated indirectly (Oswald & Baccini, 2003b, p. 132).

In turn, the physiological analysis of the observation and project perimeters uses the following set of indicators, defined in the "Physiological indicators" section: density of inhabitants, density of workplaces, density of services offered to the population, density of institutions, workforce flows and student flows. Unlike morphological indicators, physiological indicators work with thresholds, which must be defined for the entire observation perimeter.

After completing both the morphological and the physiological study, the teams map the territory types that make up each node of the project perimeter. This generates the territorial typology of the project perimeter.

43 Including free-access green areas.

44 Obviously, an increased focus requires greater accuracy, both in drawing nodes and in classifying territories. Thus, the settlements are now converted into "built environment".

It is worth noting that we can identify and classify nodes and construct a territorial typology from a historical perspective as well if sufficient information is available. This is then called “diachronic analysis”.

The effort invested in performing a diachronic analysis is fully justified, since it clearly shows the evolution of the different types of territory and the dynamics of nodes over time. Hence, we arrive at our third principle:

> **(P03) A diachronic (historical) analysis shows the evolution of nodes over time and the changes in land use determined by the change in the four activity types (eating and recreation; cleaning; living and working; transport and communication).**

A well-conducted historical analysis clearly shows the use of land for the four activity types. We can now see, for example, decreases in the proportion of agricultural fields or forests, to the benefit of communication channels or of the built environment.

Fig. 3 shows that the exercise we have performed so far can be transposed on any territorial scale, without losing any relevance.

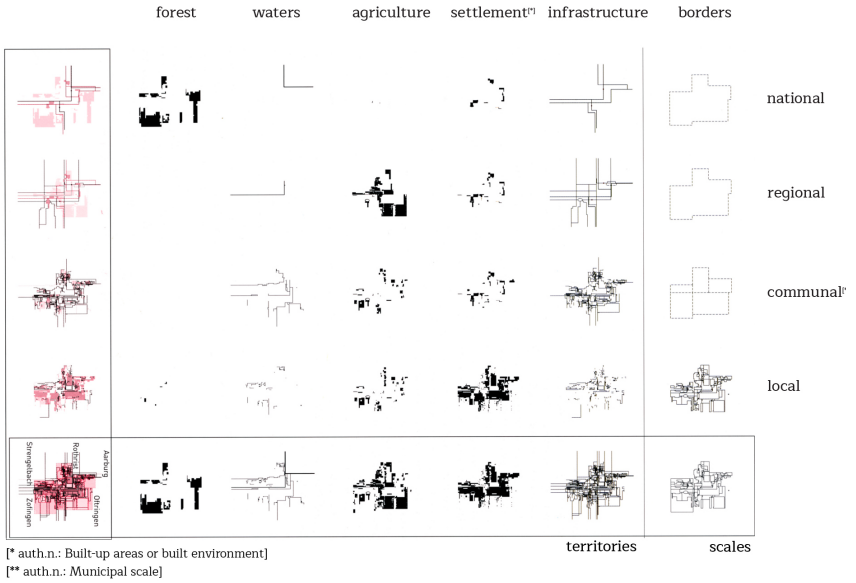


Fig. 3. Territorial typology at different scales Source: adapted from Oswald & Baccini (2003a, p. 129).

The second step: characterising the network within the project perimeter

The second step is an examination of the network. In other words, teams must identify the nodes of the network, connections between them and the territorial scales at which they manifest themselves. More specifically, the urban system includes:

> _Nodes, connections, limits, and different territorial scales, which must be classified and systematised.

_Four types of activity: eating and recreation; cleaning; living and working; transport and communication.

_Four key resources: water, food, building materials and energy. The resources sustain the four activity types named above.

_Six types of territory: settlements, infrastructures, agricultural land, forests, water, and fallow land.

The urban system is subsequently assessed based on the five urban qualities:[45] identity, diversity, flexibility, degree of self-sufficiency and resource efficiency. Evaluating these qualities is very important, since urban projects are explicitly dedicated to their improvement.

Taken together, all the above points constitute the components of the Netzstadt *M*odel, as they appear in Fig. 4.

Essentially, the second step starts from three research questions (Oswald & Baccini, 2003b, p. 208):

1. What do the nodes, connections and territorial scales in the project perimeter look like?

2. Which morphological features are typical of the network?

3. Which physiological features does the network reveal?

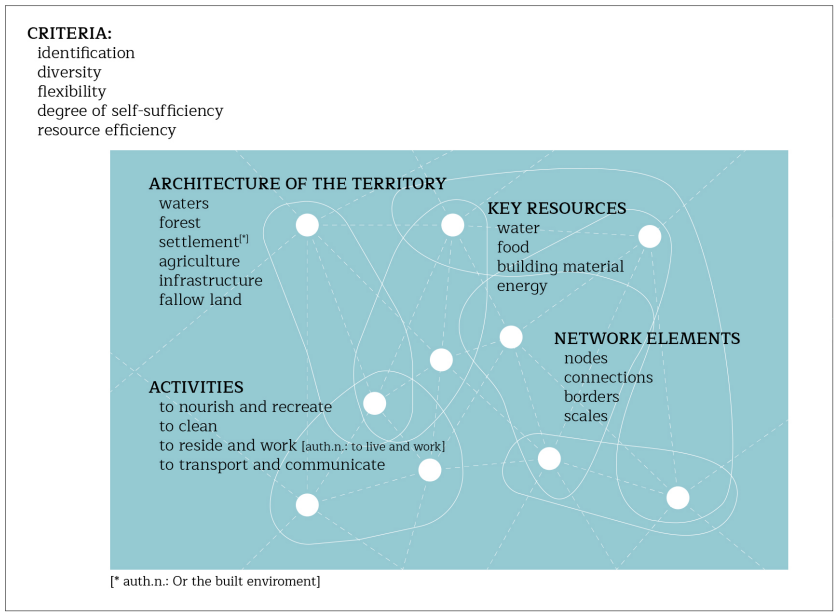


Fig. 4. The elements making up the Netzstadt *M*odel. Source: adapted from Oswald & Baccini (2003a, p. 188).

45 Or a selection of these.

In addition, it has two main aims: firstly, to associate the relevant territorial scales to the network within the project perimeter and, secondly, to describe its morphological and physiological features from the perspective of the five urban qualities, i.e., identity, diversity, flexibility, degree of self-sufficiency and resource efficiency.[46]

In other words:

"On the basis of [auth.n.: Based on] the results obtained in step 1, the network elements (nodes, connections, scales) are initially examined morphologically. The node figures delineated in step 1 are drawn on the topographically larger scale of the project perimeter, and the diagrams are prepared for an investigation based on morphological and physiological indicators [...].

On the basis of [auth.n.: Based on] these results, we now zoom in on the project perimeter, examining it in more depth. The examination of the physiological indicators and the interplay of different scales enables the researcher to generate a classification of the network elements that does justice to each scale. In order to comprehend this interplay, there must be a methodological alternation between the three scale levels. Here, the second or middle scale level forms the focus of the investigation, since it is composed of lower scale levels, just as it is a component of higher ones. Thus, the communal scale constitutes a subset of the regional scale, and the local scales are subsets of the communal scale.

At the beginning of step 2, the researchers must decide which of the five urban characteristics they will give top priority when describing the identified network of the project perimeter. This decision is based on the findings of the examination of the starting position."

(Oswald & Baccini, 2003a, p. 208)

„Die Netzelemente (Knoten, Verbindungen, Skalen) werden auf der Grundlage der Ergebnisse aus Schritt 1 wiederum zuerst morphologisch angesprochen. Die im Schritt 1 gewonnenen Knotenfiguren werden im topographisch größeren Maßstab des Projektperimeters gezeichnet, die Grafiken für die Untersuchung mit morphologischen und physiologischen Indikatoren bereitgestellt [...].

Ausgehend von diesen Ergebnissen, wird jetzt der Projektperimeter herangezoomt und vertieft untersucht.

Aus der Betrachtung der physiologischen Indikatoren und des Zusammenspiels unterschiedlicher Skalen ergibt sich die skalengerechte Zuordnung der Netzelemente. Um dieses Zusammenspiel zu erfassen, wird methodisch zwischen der Skalenstufen hin- und hergewechselt. Dabei steht die zweite, die mittlere Skalenstufe[,] im Brennpunkt der Untersuchung, weil sie aus niedrigeren Skalenstufen zusammengesetzt und zugleich Bestandteil von höheren ist. So ist die kommunale Skala Teilmenge der regionalen, und lokale Skalen sind Teilmengen kommunaler Skalen.

Welche der fünf urbanen Qualitäten vorrangig am identifizierten Netz des Projektperimeters beschrieben wird, ist am Anfang von Schritt 2 zu entscheiden. Diese Entscheidung stützt sich auf den Befund, wie er in der Ausgangslage festgehalten ist."

(Oswald & Baccini, 2003b, p. 208)

46 The urban qualities that are used appear in the design brief. In university projects, the design brief deals with a more limited selection of qualities.

Hence, returning to the nodes delineated in the first step, teams elaborate on them and embed them within the project perimeter, aiming to study each node more carefully with the help of the morphological and physiological indicators. In a nutshell, the major difference between the first and the second step consists in the accuracy with which the work is carried out.

Operationally, the first exercise consists of mapping the four activity types in the project perimeter: eating and recreation; cleaning; living and working; transport and communication. At the end of the exercise, we will obtain four drawings: the distribution of residential areas, of workplaces and of areas dedicated to maintaining or improving the health of the population[47], and the transport and energy networks. Taken together, they provide a highly accurate description of the architecture of nodes.

Subsequently, the density of settlements and of developed land, the granulation of the urban texture and its fragmentation, as well as the accessibility of nodes are calculated or approximated.

The second exercise consists of the physiological study of the nodes. Here, the nodes must be associated with the appropriate territorial scale, based on commuting and the density of institutions that operate at the regional level.

The classification of nodes at different territorial scales is derived from these two exercises. In other words, we obtain the number of regional, communal, and local nodes.

During the second step, we work with the following principles:

> **(P04) The morphological and physiological study of the nodes in the project perimeter must be sufficiently accurate to enable the classification of nodes in the project perimeter into regional, communal, and local ones.**
>
> **(P05) Where no precise data for the calculation of morphological and physiological indicators is available, they must be approximated through observation or surveys.**

The third step: the first assessment of urban qualities

Results obtained in the second step lay the foundation for the assessment of the five qualities expressed by the urban system: identity, diversity, flexibility, degree of self-sufficiency and the efficiency with which it uses the available resources. In brief, we work with four guiding questions (Oswald & Baccini, 2003b, p. 218ff):

1. Which network traits are strong points of the project perimeter?

2. Which strong points are best suited for development?

3. Which network features are weak points of the project perimeter?

47 This includes both the wastewater treatment plants and the areas destined for the selective collection of waste, its sorting and subsequent recycling.

4. What are the weak points that prevent a future development of the project perimeter?

The four questions above lead to a minimum of three anticipated results:

1. The assessment of urban qualities must be transparent, so that they form a verifiable starting point for the future conversion of the project perimeter.

2. The future conversion of the project perimeter[48] must be accompanied by a minimal set of indicators, aimed at measuring the performance and the effects, or impact, of the proposed urban projects, to the extent that this is indeed possible.

3. The vision for the project perimeter must be translated into a minimal set of clear and, preferably, measurable objectives, aimed at producing an operational goal.

We thus have four guiding questions and a minimum of three anticipated results with which to classify the characteristics of the network studied in the second step by using the five urban qualities. In other words:

"The classification is divided into sub-steps. The basis is constituted by [auth.n.: It is based on] lists and diagrams of the network features identified and key variables for the actual condition in the project perimeter. Network features and key variables are divided into strengths and weaknesses with reference to the five quality criteria, classified according to these criteria and represented in a matrix. [auth.n.: Network features and their key measurements are classified into strengths and weaknesses, according to the five urban quality criteria. Then they are represented in a matrix, aimed at providing a clear overview of the network and its features]. The knowledge, subjective experience and the understanding of the problems gained in the previous design steps can be used here to help with the process of classification.

In discussions between the transdisciplinary work groups, the initial subjective judgments are examined

„Die Einstufung gliedert sich in Teilschritte. Die Basis bilden Listen und Diagramme der festgestellten Netzeigenschaften und Schlüsselgrößen für den Ist-Zustand im Projektperimeter. Netzeigenschaften und Schlüsselgrößen werden in Bezug auf die fünf urbanen Qualitätskriterien in Stärken und Schwächen aufgeteilt, ihnen zugeordnet und dementsprechend in einer Matrix dargestellt. Als Hilfsmittel zur Einstufung dienen am Anfang die Kenntnisse, das subjektive Erfahrungswissen und das Verständnis der Probleme, wie sie im vorausgegangenen Entwurfsschritten gewonnen werden konnten. In den Auseinandersetzungen transdisziplinärer Arbeitsgruppen werden die ersten subjektiven Urteile überprüft und gegebenenfalls abgeändert, bis sie als Wertungsergebnis feststehen.

48 Viz., the transformation from the existing to the proposed situation.

Der Prozess der Bewertung kann kontrovers und mit Ungewissheiten und Entscheidungskrisen gespickt sein. Er führt jedoch stets zu einer schärferen, auch vertieften Wahrnehmung von Problemen. Als Folge der vertieften Kenntnisse kann sich die Wiederholung des Bewertungsprozesses aufdrängen.

Die erste Bewertung ist mit der Einstufung der Stärken und Schwächen noch nicht abgeschlossen. Es müssen darüber hinaus Leitideen eingeführt werden, wie mit festgestellten Stärken und Schwächen verfahren werden soll, sonst bleibt die Bewertung abstrakt und unverbindlich."

(Oswald & Baccini, 2003b, p. 219)

and, if necessary, revised until they are established as evaluation results.

The process of evaluation may be controversial and plagued by uncertainties and decision crises. However, it leads to a keener and deeper perception of problems. One consequence of this deeper knowledge may be a perceived need to repeat the evaluation process. The classification of strengths and weaknesses is just one part of the initial evaluation. Key concepts must be introduced that show how to proceed with the identified strengths and weaknesses. Otherwise, the evaluation will remain abstract and noncommittal."

(Oswald & Baccini, 2003a, p. 219)

Unfortunately, we cannot find more precise information on how the assessment of urban qualities is carried out in practice,[49] which means that it must be conceived and adapted for each individual project. Yet we can formulate a series of principles here as well:

(P06) The assessment of urban qualities must be transparent and intuitive. It starts by creating a hierarchy of weak and strong points of the project perimeter, relating to the urban quality in question. Subsequently, the main ideas that structure the approach to the existing situation in the project perimeter receive their first formulation.

(P07) The assessment of urban qualities is generally a cyclical exercise whose degree of accuracy increases gradually, with each repetition.

The fourth step: formulating the objectives of urban development

The fourth step is given the briefest coverage in the description of the method. Essentially, it entails the transformation of both the strong and the weak points uncovered in the previous step into the following guiding questions:

1. Who sets the objectives for the urban conversion that will take place in the project perimeter?[50]

49 A few instructive examples are given in Oswald & Baccini (2003b, p. 219ff.), but they are not explained in detail.

50 In other words, who formulates the objectives for the development within the project perimeter?

2. Who formulates the strategy for the urban development within the project perimeter?

This refers to the selection of the parties involved who in the following step will be given mandates to carry out the urban projects and to implement the proposed strategy. More specifically:

„Hier handelt es sich um Entscheidungen, die den Ist-Zustand in einen Ziel-Zustand zu überführen in der Lage sind. Mit ihnen werden weitere Entscheidungen zur Übernahme praktischer Verantwortung verknüpft.

Vor dem Hintergrund verpflichtender Prinzipien lassen sich diese Leitfragen eindeutig beantworten. Es entscheiden vorrangig diejenigen Gruppierungen von Umbauziele und Strategien, die selbst von den Folgen betroffen sind. In einer offenen Gesellschaft hat kein Individuum und keine Gruppierung ohne demokratische Legitimation das Recht, durch Diktat urbaner Entwicklungsziele und Strategien die Entscheidungsgewalt über andere Menschen auszuüben. Geeignete Beteiligungsverfahren können hingegen helfen, die für den Projektperimeter relevanten Akteure gezielt auf die Aufgaben und Verantwortungen hinzuführen, die sie in der Stadtentwicklung wahrnehmen.“

(Oswald & Baccini, 2003b, p. 221)

“We are concerned here with decisions that help transform the actual [auth.n.: present] condition into a target [auth.n.: future] condition. These decisions are linked to further decisions concerning the assumption of practical responsibility. These key questions can be answered unambiguously on the basis of obligatory [auth. n.: precautionary] principles. Priority in decision-making as regards reconstruction goals and strategies must be given to those groups directly affected by the consequences. In an open society, no individual or group without democratic legitimacy can claim the right to make decisions on urban development goals and strategies that affect other people. Appropriate participatory processes may help to guide relevant actors to the tasks and responsibilities they come to perceive as part of urban development.”

(Oswald & Baccini, 2003a, p. 221)

The fourth step uses a supplementary method, named the Synoikos Method, which is not in fact part of the Netzstadt Method.[51] It is schematically represented in Fig. 5.

51 It is described more extensively in Oswald & Baccini (2003b, pp. 251-289).

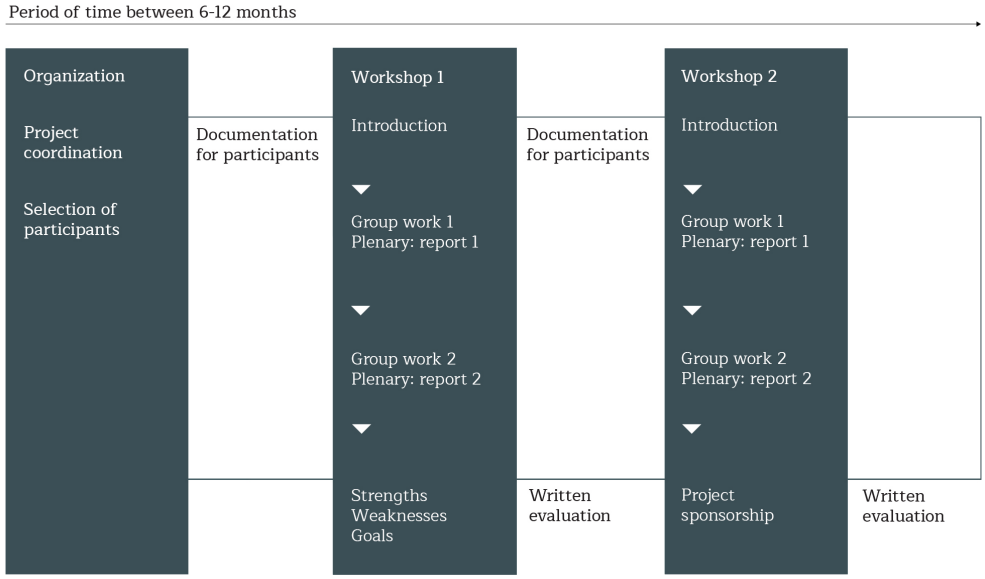


Fig. 5. A brief overview of the Synoikos Method. Source: adapted from Oswald & Baccini (2003a, p. 259).

In sum, the method has four aims (Oswald & Baccini, 2003b, p. 258f):

_Both the weak and strong points of the observation perimeter are highlighted and classified.

_The future urban qualities of the project perimeter are established and explicitly stated.

_Sketches of the urban projects are available, aimed at guiding the urban conversion of the project perimeter.

_Participants to the briefings and consultation process assume tasks and responsibilities for completing the urban projects and implementing the strategy of urban development.

The four aims rely on the following series of prerequisites (Oswald & Baccini, 2003b, p. 258):

_Firstly, a team of strong regional personalities must be formed. This core group must act as a link to the rest of the community in the project perimeter. In principle, the selected personalities should not have any political affiliations.

_Once formed, this core group needs to be completed by as diverse a public as possible, made up of curious, motivated, dedicated, and communicative individuals from the widest possible range of backgrounds: politics, culture, finance, and public administration. They should be able to show a strong track record in their respective fields, to function as a dissemination chain after the end of the collaboration, both in the personal and in the professional sphere.

_Finally, there is a need for preparation, leadership and adequate professional (technical) evaluation of the entire procedure dedicated to this structured collaboration, so that the relatively brief cooperation over the two one-day workshops should make maximum use of the participants' time and abilities. For this reason, moderators, scriptwriters, organisers, and secretaries are required to direct the process.

It is worth noting that the method uses a simple scenario:

"The dramaturgical structure of the process is made up as follows [...]:

– The selected and registered participants receive a document folder ten days before the first workshop. This folder also includes several scenarios for the next fifty years of the region's future.

– The first of the two one-day workshops is dedicated to goals 1 and 2.[52]

– The evaluated results of the first workshop are sent to the participants. Ten days prior to the second workshop, they will again receive preparatory written documents.

– The second workshop takes place several weeks or months after the first and deals with goals 3 and 4.[53]"

(Oswald & Baccini, 2003a, p. 258)

„Der dramaturgische Aufbau des Verfahrens hat folgende Gliederung [...]:

• Die ausgewählten und angemeldeten Teilnehmer erhalten zehn Tage vor dem ersten Workshop schriftliche Unterlagen befinden sich auch einige Szenarien zur Situation ihrer Region in 50 Jahren.

• Der erste der folgenden zwei eintägigen Workshops widmet sich den Zielen 1 und 2.

• Die ausgewerteten Resultate werden den Teilnehmern nachgeschickt. Sie erhalten wiederum zehn Tage vor dem zweiten Workshop schriftliche Unterlagen zur Vorbereitung.

• Der zweite Workshop findet nach einigen Wochen oder Monaten statt und erarbeitet die Ziele 3 und 4."

(Oswald & Baccini, 2003b, p. 258f.).

We can now formulate the next series of principles for the fourth step:

(P08) The communities affected by the development initiative and, implicitly, by the urban projects it encompasses, have priority in formulating the strategy and establishing the objectives it contains.

52 I.e., the systematisation of weak and strong points of the observation perimeter, as well as the choice of future urban qualities for the project perimeter.

53 I.e., the sketching of possible urban projects and the assumption of tasks and responsibilities by the parties involved.

(P09) The selection of parties involved in carrying out the projects and in implementing the strategy for urban development implies that each interested party accepts a series of tasks and responsibilities. The selection of involved parties usually employs a procedure of structured collaboration, wherein informing and consulting the population usually plays an important part.

The fifth step: preparing the proposals of urban projects

The final step of the method transforms the project goal into a series of urban projects, built on the following guiding questions[54]:

1. What do the urban projects, geared towards reaching the objectives of urban development, look like?

2. What are the actions, means and deadlines for implementing the proposed strategies?

3. Who are the parties involved in implementing the strategy and in carrying out the urban projects? What is the mandate for each party?

The three questions above lead to the choice of the appropriate urban programme for each project perimeter. More specifically, work teams use them:

_To designate the beneficiaries of each urban project.

_To choose the functions to be developed in the project perimeter.

_To create a portfolio of possible activities within the project perimeter.

_To attract potential public and private investors.

_To formulate the minimal expected results for each urban project.

Once again, we find only a brief description of the fifth step in the text.

„Im letzten Entwurfsschritt werden urbane Projekte für den Umbauprozess konkretisiert und in den wesentlichen Merkmalen so ausgearbeitet, dass die drei Leitfragen für die verantwortlichen Akteure nachvollziehbar verantwortet beantwortet werden.

Im Stadtumbau sind projektierte Zielzustände für sich allein genommen von geringem, aber im Vergleich zum Ist-Zustand von bedeutendem Interesse, weil die Spanne vom Ist- zum Zielzustand für die Wahl der Strategie zur Stadtentwicklung bestimmend ist.

Die Strategie beschreibt das gesellschaftlich-politische Verhalten, das zu den erwünschten Zielen innerhalb von zwei Generationen führen kann. Sie wird durch verantwortliche Akteure eingeführt und laufend befördert."

(Oswald & Baccini, 2003b, p. 222)

"In the last design step, urban projects were defined in concrete terms for the reconstruction process, and their essential features were elaborated so that the three questions for the responsible actors could be answered in a comprehensible form.

54 The guiding questions must be explicitly mentioned in the design brief.

In urban reconstruction [auth.n.: conversion], the target conditions are themselves of little interest. However, they become significant when compared with the actual condition, because the span between actual and target [auth. n.: present and future] condition is decisive for the choice of the urban development strategy.

The strategy describes the sociopolitical behaviour that can bring about the desired goals within two generations. It is initiated by the responsible actors and promoted continously."

(Oswald & Baccini, 2003a, p. 222)

Furthermore:

"The strategic aspect relates to the long-term target characteristic of sustainability and the practical aspect of shapability [auth.n.: design].

In practice, urban projects allow the realization of the target characteristic of shapability over the short or medium term [auth.n.: In practice, urban projects allow the design realization over the short or medium term]. This makes it possible for all actors to examine the realized project in relation to the strategic goals and thus gain knowledge for the further implementation of the selected strategy of sustainable urban development."

(Oswald & Baccini, 2003a, p. 222)

„Die strategische Ebene bezieht sich auf das langfristig gültige Qualitätsziel Nachhaltigkeit und die praktische auf das Qualitätsziel Gestaltung.

Urbane Projekte erlauben, dass in der Praxis das Qualitätsziel Gestaltung in relativ kurzen oder mittleren Fristen verwirklicht werden kann. Damit ist die Voraussetzung dafür geschaffen, dass alle Akteure das realisierte urbane Projekt an der strategischen Zielsetzung überprüfen und Erkenntnisse für die weitere Umsetzung der gewählten Strategie zur nachhaltigen Stadtentwicklung gewinnen können."

(Oswald şi Baccini, 2003b, p. 222f.)

Thus, the fifth step must also be processed in collaboration with tutors. Nevertheless, we can still formulate a brief set of principles:

(P10) The proposed urban projects must make a visible and measurable contribution to the implementation of the urban development strategy. Hence, each project must have a series of minimal anticipated results.

(P11) Each urban project must have a beneficiary and the parties involved in carrying it out must know and explicitly accept their tasks and obligations. In other words, the mandate of each involved party must be clearly established for every urban project.

Summary

The following passage provides the overall presentation of the steps involved in the Netzstadt Method (Oswald & Baccini, 2003b, p. 66f).

„Die Netzstadtmethode gewährleistet einen stufenweisen Aufbau in der Entwurfsarbeit an urbanen Systemen. Er umfasst fünf Schritte:

1. Der Einstieg erfolgt mit einem Beobachtungsperimeter, in dem das zu gestaltende urbane System als Projektperimeter eingebettet ist. In einem ersten Schritt wird der Projektperimeter als Netz-Teil eines größeren urbanen Systems angesprochen, um das Wesen der Interaktionen nach außen charakterisieren zu können (im Ist-Zustand oder in der geschichtlichen Entwicklung).

2. Die erste Ansprache der Knoten im Beobachtungsperimeter erfolgt nach morphologischen Kriterien [...], gefolgt von den physiologischen Analysen [...]. Ihre Aufgabe ist es, Knoten und Flüsse im Rahmen des Projektperimeters skalengerecht zu erfassen.

"The Netzstadt Method ensures that the work of designing urban systems proceeds in stages. It comprises five steps:

1. Work starts with a perimeter of observation in which the urban system to be designed is embedded as a project perimeter. The first step addresses the project perimeter as a network component in a larger urban system, in order to characterize the nature of the system's interactions with the outside world (in their current condition or over the course of history).

2. The node in the observation perimeter is addressed according to morphological criteria [...], followed by physiological analyses [...], in order to recover the nodes and flows true to scale within the project perimeter.

3. The third step is to perform a first assessment of the urban features in the project perimeter [...]. The objectives of the assessment are:

– to yield a comprehensible point of departure for the work of designing new target conditions.

– to provide a yardstick for the rebuilding process [auth.n.: to provide a benchmark for the conversion process] from the current condition to the target condition, which can be used to measure the effects on the system as a whole [auth.n.: global effects] of individual changes that have been realized already or are planned for the future.

4. In participatory procedures, for instance using the Synoikos Method, development targets are set for the selected project perimeter. These development targets must be translated back into Netzstadt language for the next step.

5. The final step consists of designing the reconstruction process from the current to the target condition."

(Oswald & Baccini, 2003a, p. 66)

3. Im dritten Schritt erfolgt eine erste Bewertung der urbanen Eigenschaften im Projektperimeter auf der Basis von fünf Qualitätskriterien [...]. Diese Bewertung hat folgende Ziele:

• Sie soll eine nachvollziehbare Ausgangslage für die Entwurfsarbeit neuer Zielzustände gewinnen.

• Sie soll dem Umbauprozess vom „Ist-Zustand zum Soll-Zustand" einen „Maßstab" geben, an welchem man realisierte oder geplante einzelne Veränderungen in ihren Wirkungen auf das gesamte System abschätzen kann.

4. In partizipativen Verfahren, zum Beispiel mit der Synoikos-Methode [...] werden für den ausgewählten Projektperimeter Entwicklungsziele gesetzt. Diese Entwicklungsziele müssen für den nächsten Schritt wieder in die Netzstadt-Sprache übersetzt werden.

5. Den Abschluss bilden die Entwürfe für den Umbauprozess von Ist-Zustand zum Soll-Zustand."

(Oswald & Baccini, 2003b, p. 66f.)

Conclusions

The time has come to state the lessons learned.

The first is that the text by Oswald and Baccini is interesting, but rather ambiguous. In other words, the systematisation we have undertaken above has been laborious and we have frankly not always been content with the results. We have kept the descriptions in our summary as rich as possible to preserve the main ideas unchanged, but we have been unable, in most instances, to compensate for the lack of methodological precision. For example, we decided to exclude the formulae for morphological and physiological indicators because some of them are partly wrong, and their derivation is sometimes completely absent, especially for secondary indicators. We intend to verify them one by one, but at present we can only reference the original text and rely exclusively on the readers' due diligence.

Furthermore, even though the Netzstadt Method is correctly divided into the five steps outlined in Fig. 2, important information is missing at almost every turn. The order of analyses is occasionally missing, or the minimal anticipated results are absent in some instances. In addition, the more timid instructors will not find support for decision-taking anywhere in the text. Hence, the method is not well suited to studios that lack a propensity for experimentation.

Nevertheless, it has a few clear advantages: firstly, it encourages research. Thus, the Netzstadt Method can be linked fairly easily to morphological density as well as to network theory.

Density is more intuitive at the moment, largely due to the instruments built by Meta Berghauser Pont and by the research group on territorial morphology,[55] at Chalmers University of Technology (Sweden): *Place Syntax Tool and Spacemate* (Berghauser Pont & Haupt, 2009). We have already tested the *Spacemate* diagram over the last two academic years, both in urban planning disciplines[56] of the second year at the Faculty of Urban Planning within the "Ion Mincu" University of Architecture and Urban Planning and in the Master programme in Smart Territorial Development at the Faculty of Geography within the University of Bucharest. In both cases, the *Spacemate* has been easily assimilated and produced good results. Thus, after slightly more rigorous testing of the Netzstadt Method, we have the possibility of linking it more closely to the morphological analysis of density.

Concerning network theory, the situation is slightly more complicated. Network analysis is not at present part of the tools of urban analysis in undergraduate or Master programmes at the Faculty of Urban Planning. In addition, there are no textbooks to facilitate its introduction and assimilation. It is true that a few, somewhat older, texts are available, like Enache (1977) or Botez and Celac (1980), but they can only be used at present as general introductions to the topic. There is no user-friendly text that also contains tools for detailed analysis (such as, for example, Newman, 2010). In addition, there are no doctoral research projects that could produce this type of publication.

Secondly, the Netzstadt approach is an experimental and open method that fully exploits research questions, which are by far the most valuable components of the book. Studio guidance should therefore be both bold and flexible. In the absence of the minimal results associated to each step of the method, decisions must be taken ex *tempore* and repeatedly verified. Furthermore, since it is an open method, the workshops should be regarded as research projects and not as solving exercises for a given design brief. We thus refer to a different type of workshop, more akin, in principle, to diploma projects at the Faculty of Architecture and to dissertation projects at the Faculty of Urban Planning.

Finally, the Netzstadt Method is interdisciplinary, in the fullest sense of that word. For this reason, it is more suitable for Master programmes, where design teams include different specialties.

Additionally, tutors must be able to bring different professions to the workshops, at least as guest lecturers if not as constant guidance. Given that part of the specialties required by the method are not available, at least for the present, at the "Ion Mincu" University of Architecture and Urban Planning, the workshops constitute an exceptional opportunity for building institutional partnerships with national as well as foreign universities.

55 *Spatial Morphology Group*.

56 UT-49: Urban Design (1) and UT-58: Urban Design (2).

References

Baccini, P. & Oswald, F. (Eds.) (1998), *Netzstadt. Transdisziplinäre Methoden zum Umbau urbaner Systeme. Ergebnisse aus dem ETH-Forschungsprojekt SYNOIKOS — Nachhaltigkeit und urbane Gestaltung im Raum Kreuzung Schweizer Mittelland*. Zürich: vdf Verlag.

Berghauser Pont, M. Y. & Haupt, P. (2009), *Space, Density and Urban Form*. Doctoral thesis: https://bit.ly/2HAjTgx [31.10.2021].

Botez, M. C. & Celac, M. (1980), *Sistemele spațiului amenajat. Modelare – optimizare – previziune*. București: Editura Științifică și Enciclopedică.

Enache, M. (1977), *Modele matematice în sistematizare*. București: Editura Tehnică.

Newman, M. E. J. (2010), *Networks. An Introduction*. New York (NY): Oxford University Press.

Oswald, F. & Baccini, P. (2003a) *Netzstadt: Designing the Urban.* Basel: Birkhäuser.

Oswald, F. & Baccini, P. (2003b) *Netzstadt. Einführung in das Stadtentwerfen*. Basel: Birkhäuser.

trends and technologies

_research

_conception process

_influences

In contemporary architectural practice, the architect's role is in the process of renegotiation, in the sense of their direct and active involvement in computational design and digital fabrication. The use of digital tools enables designers to apply their knowledge and to re-establish their interdisciplinary credentials. Architects have started to actively develop their own design culture by customising working technology as part of their professional practice.

https://doi.org/10.54508/9786066382465.07

Digital tools

Univ. Assist. Ana-Daniela ANTON PhD Arch.
Assoc. Prof. Ionuț ANTON PhD Arch.

Interoperability and BIM design

Contemporary architectural practice explores the potential of digital technologies from the concept stage to materialisation, thus creating the need for communication between digital tools with different applications. The computational environment provides the opportunity of integrating design, analysis, representation, fabrication and assembly as parts of the same collaborative process. The aim of bringing information to the fore is to create a digital continuum (Kolarevic, 2005), a direct connection between the project and the built object. By establishing a common data flow, information can be extracted, exchanged, and thus used with greater ease and speed.

Digital tools, mathematics and coding

Regrettably, the architectural approach to technology, perhaps inherited from the modern period, has until recently focused on what it does (Heidegger, 1995), not on what it might do. Thus, architects have focused on what can be done within the limits of currently available technologies; constrained by the use of the existing standard technologies, they have attempted to master the capabilities of the tools employed and they have designed specifically for these. As a result of this process, the possibilities and advantages provided by a standard tool eventually became mere convenience through repeated usage while architects lost the control and freedom they formerly possessed.

Today's digital environment provides architects with more than a drawing tool, albeit a very advanced drawing tool. The computer can at present be regarded as an extension of the mind or as an advanced tool of logical exploration.

Prompted by the need to survive or by the thirst for knowledge, human beings have always attempted to build augmentations that would intensify physical strength, increase sensory capacity or amplify cognitive functions: memory, judgement, information processing, communicative competence (Marcus, 2011).

The computer is a means of combining the architect's experience and intuition with logical reasoning, skill with rationality. As a tool, it enables us attain a process that is richer in meanings by helping us give shape to our ideas. Concepts materialise; they are not yet tangible, but we can see, analyse and modify them, but with other tools, different from the manual ones. The role of the visual has increased due to the development of computer science, which has expanded the possibilities of approximating the invisible by means of the visible (Marcus, 2011), thus leading to the definition of matter through the abstract, through code.

In the field of contemporary architecture, mathematics and coding give the architect control over the way in which the building will be constructed yet they are also a means to invent. All digital technologies are based on numerical control, yet so are the standardised means of production. While numbers were initially used to control and to enforce standards, at present the qualities of the computational environment are being explored and they can generate diversity and creativity.

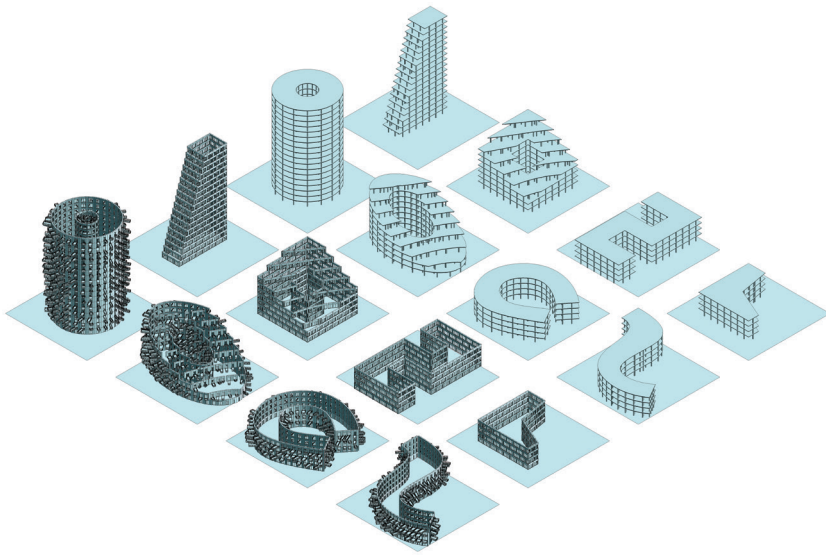


Fig. 1. Study for the workshop: Interoperability Rhino-Grasshopper-Revit – 2021

BIM

Building Information Modelling (BIM) is a digital model of the design intent which, in addition to a three-dimensional geometric description of the constructive elements, also has associated physical and functional characteristics of these elements. BIM is more than a simple tridimensional model that can be used for visualisation since it integrates elements from the different actors involved in the project and thus diminishes ambiguity, reduces errors, increases the architect's degree of control and, not least, lowers the financial cost of the investment (Pittman, 2005).

With the complete pre-realisation of the building in virtual space and the use of a common language where everything is tested and integrated, architecture may be said to have reached full allographic status. Yet with the use of BIM, the process is also autographic through the testing of possibilities, the emphasis on materialisation, which constitutes a return to craft (Picon, 2010). Thus we witness a transition from the representational model of the building, indebted to the allographic tradition of architecture, to a model that comes close to a simulation of the building process (Carpo, 2011). By means of BIM, materialisation becomes part of the design process, which means that the creation process is no longer linear but cyclic, with feedback loops. At present, fabricators can be involved in design and designers can be involved in fabrication (Kieran & Timberlake, 2003). The traditional hierarchical process of design and construction has become a field of interdependent relationships with the aid of computation.

Using this integrative principle enables the architect to become more involved in the materialisation of the project.

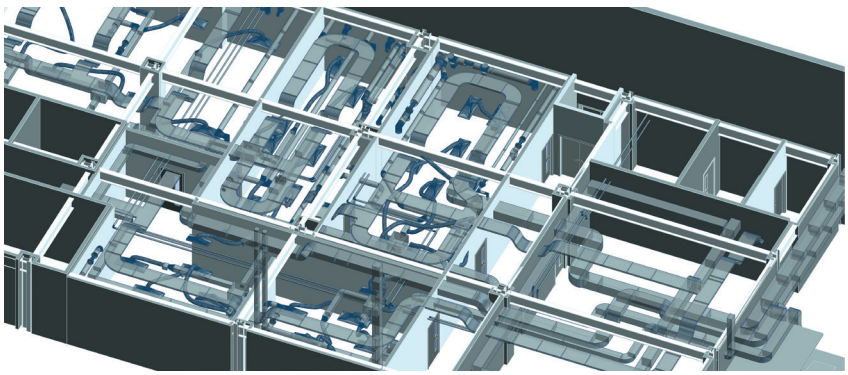


Fig. 2. BIM model, idz arhitectură, 2011

Although BIM seems to be a product of the virtual environment, it obviously contributes significantly to the materialisation of the project due to its anticipatory capacity. The designer has the opportunity of trans-

forming the concept and of integrating data linked to materials and fabrication into the design, thereby generating an architectural object which is based on a much larger amount of information.

BIM is becoming an international standard, adopted by several countries and by an increasing number of architects. Its global spread is only a matter of time. Emphasis should not be placed, however, on its use for management and control and for standardising design but on the connection between the virtual and the real that BIM provides.

So to avoid its being turned into an automated design process which contributes to the multiplication of standard solutions that simply fulfil quantitative criteria of efficiency, there is a need for transformation into a more flexible process that allows for the development of customised solutions. Thus, BIM technology has already started to aim towards communication with other software – towards interoperability. It has also started to exploit the possibility of building customised components to replace the libraries of standard components.

Computational design

The current tools of computational design bring more abstract building components, a system that can be modified and adapted so as to allow the designer to build components specific to each situation. We are no longer interested in the local economy, imposed by restrictive systems; the designer now has the opportunity to define their own vocabulary, but only after understanding the abstract, algorithmic and geometric part (Aish, 2011).

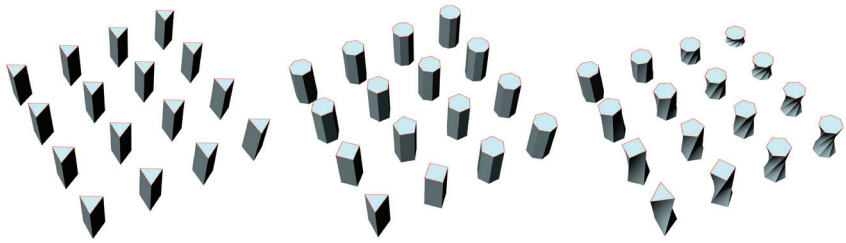


Fig. 3. (a) series of identical elements (b) series with a single variable (c) series with three variables. Parametric variation – 2014

Design is thus approached in more abstract terms, as relationships that interconnect principles of design. Programming can be a tool of the mind; it is not a purely technical act since its application to architecture can be a method for the symbolic communication of intentions (Reas & McWilliams, 2010). The digital model thus becomes an abstraction through the translation of intentions, by transposing them into algorithms.

This abstraction through code and algorithm has been deemed responsible for the exclusion of intuitive experience from design. This may be due to the fact that scripting has not been part of architectural design until recently. Most frequently, scripting has intervened in this field through the involvement of a programmer. Yet on the one hand, the architect must have some knowledge of coding in order to communicate while on the other, the code must be influenced by aspects that are specific to architectural practice (Burry, 2011). Thus, if they are used by the one who creates, by the architect, the tools normally deemed rigid are charged with attributes specific to design and they can become creative. The modification of architectural practice through the introduction of programming in modelling software offers a customised working process, providing both an environment for creative exploration and a productive and efficient method.

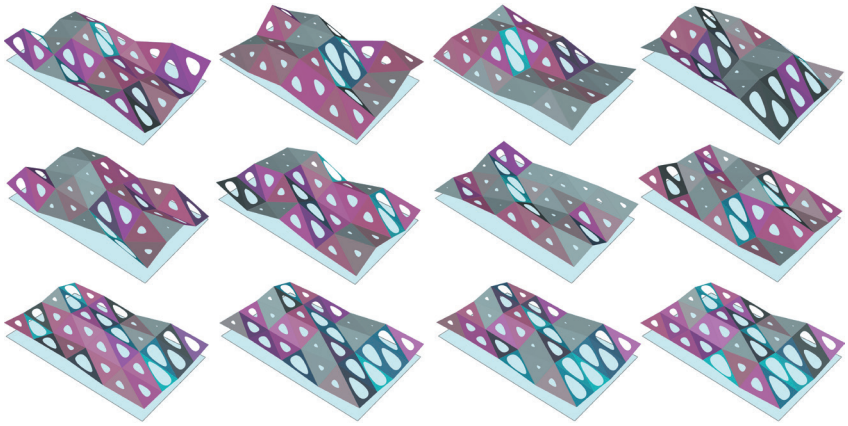


Fig. 4. Genetic algorithm – 2013

It is no longer the form to be produced that is designed but the production process itself. The project incorporates the idea and the method of fabrication from the moment of its conception. Thus, construction is understood as a process that is integrated into design, as it was during the era of craft production. Essentially, by integrating programming into architectural practice, digital tools are designed in their turn and the entire process is reoriented towards the materialisation of the project.

3D printing, robots and digital craft

Currently, digital tools, both design and fabrication, are increasingly explored in architectural research but also in practice, and they generate the connection of the creative process with the materialisation process.

Digital fabrication is now part of the design process and it encompasses conceptual aspects as well as aspects connected to the materialisation of the project.

The primary tools with applications in digital fabrication are archaic and essentially similar to those used by craftspeople in traditional production. These have been refined over time and changes have been made to the way in which they are set in motion and to control methods.

What is new in digital fabrication is that the tool is no longer variably controlled by a human being or repeatedly and precisely by a mechanised system but variably and precisely by digital means. The movement of the digitally controlled tool is defined by precisely set spatial coordinates, via logical sequences.

3D printing

The potential of 3D printing for the production of goods has been compared to the impact of the development of the internet. The spread of 3D printing is seen as another revolution in the area of goods manufacturing. The centralised form of production characteristic of the manufacturing environment is replaced by a decentralised one. The small number of giant corporations can be replaced, through the spread of 3D printing, by countless fab-labs. The large producerś' control over resources can be replaced by the ingenious use of local, accessible and cheap materials. When the technology becomes widespread, the complex system of goods distribution will no longer be justified since the raw material will be accessible and the object will be manufactured close to the buyer. The only thing that will continue to circulate is information, the 3D model which transforms into an object.

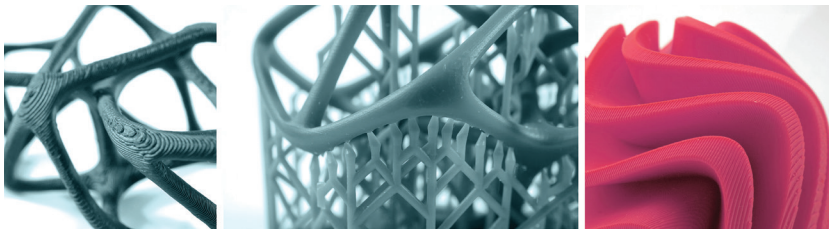


Fig. 5. 3D printed objects that use several technologies and materials – 2018

Industrial robots

Industrial robots have become of interest to the creative field due to their multifunctional character as well as to the low cost of developing different applications. A single robot equipped with a great variety of tools, of end effectors, can be used instead of several specialised machines. Thus, in using the same machine but with different tools, we come closer to the traditional manufacturing process in which the craftsperson's hand switched tools, depending on what was required (Brell-Cokcan & Braumann, 2012).

Robotic fabrication combines generic equipment with a personalised process, thus turning the robots into an open source fabrication tool. It is therefore the creation of interfaces accessible to users from the creative fields rather than the improvement of the robots' performance that has been acknowledged as the area of future development in the field of robotic fabrication.

What is significant is not the value of these machines or fabrication methods but the distancing from the determinist or neutral attitude towards materialisation. Moving towards an integrative model wherein materialisation, i.e. the way in which a project presents itself and occupies reality, becomes an internal component of the design process (FABLAB, Taubman College of Architecture, 2011).

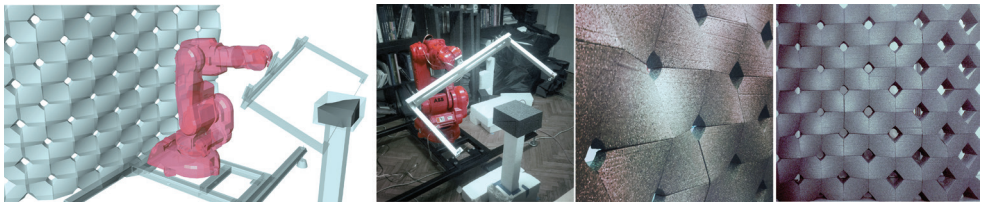


Fig. 6. ROBO_CRAFT WALL, robotic fabrication system – 2013

Digital craft

From the perspective of designers, technology has been perceived as inflexible, forcing them to work with the available. Until recently, architects merely waited for other disciplines to develop tools and to choose from a catalogue of possibilities. This manner of acting could lead to the loss of architectural culture and of its characteristics, which stem from individual experience and professional knowledge (Kohler & Kara, 2011).

This has caused the architect to lose the connection to the production process and to assume a more abstract status. Digital technology gives architects the opportunity to design and adapt highly customisable tools, which can be used in design and in digital fabrication.

The architect's role is in the process of being renegotiated, in the sense of direct and active involvement in computational design and digital fabrication as opposed to passively waiting for technology to emerge around them. By using the attributes of the digital environment, designers can apply their knowledge and re-establish their interdisciplinary credentials. Architects need to actively develop their own design culture by building their own working tools as part of their professional practice.

Facilitating the architect's nearness to materialisation represents a return to craft and recalls the status of master builder that the architect used to possess both as a designer and as a construction expert.

This should not be understood as a demand for total control over all design and construction processes. On the contrary, it is an invitation to explore the collaborative aspect of construction processes, thereby integrating conceptual design tools, digital design and fabrication tools.

Digital technology enables architects to become more involved in project materialisation. They can design and adapt highly flexible tools for architectural practice. The digital environment provides a common ground where creativity is connected to digital conceptual and fabrication tools.

References

Aish, R. (2011). Foreword. In R. Glynn & B. Sheil (Eds.), *Fabricate: Making Digital Architecture*. Riverside Architectural Press.

Brell-Cokcan, S. & J. Braumann. (2012). Introduction. In S. Brell-Cokcan & J. Braumann (Eds.), Rob|Arch 2012: *Robotic Fabrication in Architecture, Art and Design*. (pp. 8-11). Springer.

Burry, M. (2011). *Scripting Cultures: Architectural Design and Programming*. Wiley.

Carpo, M. (2011). *The Alphabet and the Algorithm*. Cambridge The MIT Press.

FABLAB, Taubman College of Architecture (2011). Matter & Making. In R. Glynn & B. Sheil (Eds.), *Fabricate: Making Digital Architecture*. (pp.74-85). Riverside Architectural Press.

Heidegger, M. (1995). *Originea operei de artă*. Transl. Gabriel Liiceanu & Thomas Kleininger. First edition 1935. Humanitas.

Kieran, S. & J. Timberlake (2003). *Refabricating Architecture: How Manufacturing Methodologies are Poised to Transform Building Construction.* McGraw-Hill Professional.

Kohler, M. & H. Kara (2011). Q&A Matthias Kohler - Hanif Kara. In R. Glynn & B. Sheil (Eds.), *Fabricate: Making Digital Architecture*. (pp. 116-123). Riverside Architectural Press.

Kolarevic, B. (2005). Digital Morphogenesis. In B. Kolarevic (Ed.), *Architecture in the Digital Age: Design and Manufacturing*. (pp. 11-28). Taylor & Francis.

Marcus, S. (2011). Calculatorul. In *Paradigme Universale*. (pp.108-113). Paralela 45.

Picon, A. (2010). *Digital Culture in Architecture: An Introduction for the Design Professions.* Birkhäuser.

Pittman, J. (2005). Bulding Information Modeling: Current Challenges and Future Directions. In B. Kolarevic (Ed.), *Architecture in the Digital Age: Design and Manufacturing*. (pp.253-258). Taylor & Francis.

Reas, C. & C. McWilliams (2010). *Form+Code in Design, Art, and Architecture.* Princeton Architectural Press.

This mini-guide attempts to present in an objective manner different personal projects and initiatives dedicated to digitised heritage and to the digital reconstructions of architectural heritage while also showing the potential and the (current) limitations of these instruments of research and exploration. Developing a working method is essential in retaining a degree of value and authenticity for the recorded or reconstructed object or ensemble. Responsibility and the fundamental principles of working with architectural heritage are also valid in digital environments.

https://doi.org/10.54508/9786066382465.08

Digitised and born-digital heritage

Univ. Assist. Ioana Elena ZACHARIAS VULTUR PhD Arch.

Introduction

The original version of this chapter was aimed at the students of the "Ion Mincu" University of Architecture and Urban Planning and of all the Romanian universities with this profile, from all years of study (I-VI), at doctoral students, trainee architects and young professionals in architecture and related fields who deal with design, specialisation or research themes that concern heritage. The language has thus been simplified for greater clarity and accessibility.

This paper is a continuation of the short exploration, intended as a guide to "**The Historical approach**", which was published in "**Research methods and techniques specific to architecture**" within the framework of the *Scholar Architect* 2020 project. It presents possible versions of the **relationship between heritage and contemporary design in the context of the technological (r)evolution**. More precisely, we will refer to the **manner in which the latest digital technologies can be used for the benefit of architectural heritage**, both in the sphere of teaching and research and of actual interventions (restoration, conservation and design).

To complement the theoretical part, we will demonstrate how we explored **the relationship between architectural heritage and its digital or digitised versions (virtual reconstructions)** by organising and coordinating two activities within the framework of the project ***Scholar Architect 2021*** – *Improving the quality of research and teaching in architectural education* project – CNFIS-FDI-2021-0069. This refers to the **Digital Heritage_webinar** (online seminar) and the **Digital Heritage_lab** (workshop), which took place in September 2021 and which will be described in detail in the subsequent sections.

The **keywords** of this mini-guide are:

digital heritage, digitised heritage

virtual anastylosis

VR and AR immersive experiences

open access to cultural heritage content

Why do we talk about digitised and digital heritage in our national architectural education and professional practice?

Although UNESCO defined **digital heritage** already in 2003 in the **Charter on the Preservation of Digital Heritage**, the rapid evolution of technologies and the transient pandemic context have increased reliance on the latest technologies and the need to research, to disseminate information, to explore and to intervene with their help. Digital technologies have enabled the following: the development of digitised databases, digital archives, specialised photogrammetry collections, 3D scanning of monuments as a precision instrument in interventions on architectural objects, the development of collaborative (international) platforms for distance work, museums and heritage sites made accessible through VR and AR, the capacity to diagnose and to establish the pathology of a monument or to uncover in a non-invasive way elements of the interior structure that cannot be observed otherwise.

The **interventions on monuments** as well as **context-related architectural design** can benefit from the use of these instruments.

We will briefly explore the forms of technology that can **serve heritage** by increasing data accuracy, and that can improve the quality of analysis and intervention as well as disseminate the value of heritage both to a specialist and a broad audience.

While t**he history of the architectural profession and the evolution of architecture** in Romania are marked by moments of synchronisation and desynchronisation (Zahariade, Brătuleanu, 2008) with Western Europe, interrupted by various influences or characterised by introversion and isolation (1947-1989) or by prolonged transition, at present we are increasingly well-connected to the international landscape. With regard to architectural education on the topic of **heritage** – covering legislation, discourse, specialists and even good practice examples for restoration and conservation – we approach an increasingly high level, but we only have a limited number of good practice models in this area.

We can synchronise with the contemporary practices that have already attained a level of maturity in the international academic and professional environment. The international recognition of the Romanian architect diploma creates an opening and at the same time a need to align ourselves with ever higher standards. Familiarisation with digital

technologies – as a student and as a chartered architect preoccupied by **heritage** – constitutes an advantage on the (international) market of architectural services.

A coherent didactic vision is needed, with methods of work and research shared by the design studio as well as by the specialist (restoration and conservation) studios. The academic and professional level must also be made visible through **models of good practice** in the interventions on the national **architectural heritage** on a large scale: in the urban and rural space. These models need to be promoted; a clear balance must be established between doctrines, restrictions and permissions, with **good communication** and a good rapport with the general public and with the investors and the political sphere. Architecture and especially the architectural heritage of a state represent elements of identity, power and of economic and aesthetic appeal, which must be **valorised and optimally used**[1].

Furthermore, already from the time of our university studies and later as architects we have the task of acting as culture advocates, intellectuals and competent practitioners who cultivate the taste of the general public and who help improve the quality of life. Thus, if we wish to create a national space with **high-quality** interventions on **architectural heritage** (as well as on **urban, archaeological** or **landscape heritage**) we need to **communicate very well**. Architecture itself is a language through which we communicate, as stated in the description of one of the courses I coordinate at UAUIM, namely Architectural Language II: "We understand architecture as a language of signifying forms by means of which human beings remodel the existing and not as a simple act of communication or as a purely aesthetic act" (Criticos, 2021).

So it is about **responsibility**, but also about an intelligent and well-balanced **dialogue** with the past, about **creativity** and even about **innovation**.

The perception of the general public and also within the national group of professionals should be of heritage as an **asset** and not as a **liability**, as I argued in a lecture and article presented in New York in 2018 (Zacharias Vultur, 2018, p. 18). Towns, villages and landscapes grow organically through intermingling with various forms of **built heritage**, which in the long term encourages creativity and innovation, both artistic and scientific (technical).

From time immemorial, **architecture** has been influenced more strongly or discreetly by technical and technological (r)evolutions, sometimes starting from the imaginary level, pictured in anticipation literature

1 Lecture on "valorised" and "optimally used" heritage by the members of the ARCHE team, presented within the framework of the "Schönberg Live Studio 2021" Summer School that took place in Dealu Frumos, the county of Sibiu, between 16 and 29 August 2021 at Casa Verde and at the Center for Vernacular Architecture Studies. Arranged by Ioana Zacharias Vultur, PhD, Scientific coordinator, together with the organising team. Project sponsored by the Architectural Stamp Duty, the Sibiu-Vâlcea branch of OAR (The Romanian Order of Architects).

and in the visual arts and subsequently transposed into specialised vocabulary and construction. I explored this theme in my doctoral thesis "The metaphor of the machine in modern architectural discourse. Le Corbusier and Norman Bel Geddes" (2012). With regard to **architectural heritage**, already from the Enlightenment, the great "Age of Reason" of the XVIIth and XVIIIth centuries:

"Modern interests in heritage and its conservation have always been closely connected with sciences and a scientific approach. [...] sciences should be used as a 'tool' according to the requirements of the different tasks coming up in conservation. [...] The role of science is to assist in analysing the genuine, historical material of such work" (Jokilehto, 2018, pp. 291-292).

The American philosopher Thomas Kuhn[2] discusses the position of **science** in relation to **history** in his book *Structure of Scientific Revolutions*, first published in 1962. The author notes a non-linear pattern in the rejection of science by communities whenever it made significant advances because it "introduced a radically new way of looking at nature and the behaviour of materials" (Jokilehto, 2018, p. 292). In addition, Kuhn defines the "scientific revolution" in **research** as a moment when science enters a crisis caused by methods that no longer provide satisfactory answers to newly emerged phenomena. Thus, the scientific revolution is the replacement of an old paradigm by a new one, with **new research methods and a new set of rules**. Of course, Kuhn mainly refers to research in physics or chemistry, but these revolutions and discoveries also influence architecture and the conservation and restoration techniques of the modern era.

By analogy, the development of the science of digital technologies gradually affects all forms of working with cultural heritage and it even generates a new category: **digital heritage**. As in the case of any new human creation with its accompanying "power", it is essential that we only exploit its advantages and eliminate all the potentially negative aspects. This is why specialists take a responsible approach in defining research methods, the set of rules and principles and also the values on the basis of which the new digital technologies are to be used in working with **heritage.**

Definitions

It is essential to start from the definition of the term **digital heritage** and its composition as it appears in the vision of UNESCO.

According to the **Charter on the Preservation of the Digital Heritage** of 17 October 2003, republished in a 2009 UNESCO document:

2 Thomas Kuhn (1922-1996) is one of the most influential philosophers of science of the XXth century and his book, *The Structure of Scientific Revolutions* (1962), is one of the most frequently cited of all times. Apart from his doctrines, Kuhn is credited with having inaugurated a new style in the philosophy of science.

"THE DIGITAL HERITAGE AS A COMMON HERITAGE

Article 1

Scope

The digital heritage consists of unique resources of human knowledge and expression. It embraces cultural, educational, scientific and administrative resources, as well as technical, legal, medical and other kinds of information created digitally, or *converted into digital form from existing analogue resources*. Where resources are "born digital", there is no other format but the digital object. Digital materials include texts, databases, still and moving images, audio, graphics, software and web pages, among a wide and growing range of formats. They are frequently ephemeral, and require purposeful production, maintenance and management to be retained. Many of these resources have lasting value and significance, and therefore constitute a heritage that should be protected and preserved for current and future generations. This ever-growing heritage may exist in any language, in any part of the world, and in any area of human knowledge or expression."

(Charter on the Preservation of the Digital Heritage, 2009, p. 2)

So this is about **"born-digital"** resources as well as those **"converted from existing analogue resources"**. There are forms of **digital heritage** originating from **digitised heritage** such as **digital reconstructions** from the level of artefacts up to the level of archaeological, architectural and urban ensembles, on the basis of analogue documents: drawings, plans, maps, printed texts, works of art, various documents from traditional archives etc.

According to the above-quoted UNESCO definition, the forms of **digital heritage** encompass both **"born-digital"** resources as well as those **"converted from existing analogue resources"**. **In this mini-guide** we will refer to the **digital heritage created by virtual architectural reconstruction of monuments.**

Digital heritage is "made up of computer-based **materials of enduring value** that should be kept for future generations. Digital heritage emanates from different communities, industries, sectors and regions. **Not all digital materials are of enduring value** ...", as stated in the "Concept of Digital Heritage" article on the UNESCO website: https://en.unesco.org/themes/information-preservation/digital-heritage/concept-digital-heritage.

To sum up, it is about two types of relationship between heritage and the latest digital technologies, each of which can provide support for its preservation (archiving, scanning, recording and digital measurement etc.) and conservation for future generations (through investigative technologies but also through transmission in digitised form, including via reconstructions etc.). These have been discussed in my lecture titled **"VR in the service of Architectural Heritage"**, at the Tech4Culture conference at the French Institute in Bucharest on 3 March 2020.

The connection to the teaching objectives of UAUIM

The increasing preoccupation with **architectural heritage** reflected already in the first-year curriculum of the design studio activities of the "Ion Mincu" University of Architecture and Urban Planning facilitates knowledge transfer from the Department of History & Theory of Architecture and Heritage Conservation.

Continuous learning on the issue of **heritage**, with a gradual increase in understanding and critical thinking, can be achieved with the help of seminars, lectures and specialised subjects.

The themes of the restoration and conservation studio and the design, diploma project and doctoral research themes which make an intervention on a monument or additions to protected sites are already structured into work stages, based on **digitised** documents (scans of surveys, urban plans, drawings, old photographs, archival documents – texts, maps, etc.); thus, they use a few standard design programmes for vectorisation, for the marking of the pathology of the degradations, their values and degrees, and for the intervention proposal covering architecture, structure, restoration and conservation. So these are rather representations of data obtained from analogue sources and the value of the drawn pieces is illustrative rather than scientific.

Nevertheless, a few techniques and technologies are available to increase data accuracy and the quality of details by introducing scientific data and, frequently, details that would remain hidden with non-invasive methods: 3D photogrammetry, 3D scanning, LiDAR (which has revolutionised archaeological research), GIS technologies for data collection and mapping, instruments that measure the humidity or temperature of buildings and works of art (e.g. frescoes), etc.

How can the latest technologies support contemporary architectural education and practice?

They can function as an additional resource alongside the standard computer programs already used in architectural education, in restoration and conservation studios as well as in specialised practice since we can already describe these technologies as having attained "maturity" in the work with material heritage in all its forms, from the artefact scale to large urban ensembles and archaeological sites. They must of course be used **responsibly**, with a constant emphasis on the criteria of heritage **value** and **authenticity** at every stage of the analysis and, where appropriate, of the digital reconstruction.

It is about adding precision but also, frequently, adding new details, to the understanding of a monument, as shown by the following examples. These instruments do not replace on-site knowledge of the situation or the principles of restoration and conservation charters; they are not absolute truths, but only a technically more advanced stage.

Essential criteria and working methods for digitised and digital heritage **(virtual reconstructions of architectural monuments)**

Authenticity

It is worth recalling two principles of restoration that refer to the authenticity criterion, which I previously introduced in **"Research methods and techniques specific to architecture"**, in the chapter on **"The Historical approach"**:

"Restoration, Art. 9. The process of restoration is a highly specialised operation. Its aim is to preserve and reveal the aesthetic and historic value of the monument and is based on respect for original material and authentic documents."

(The Venice Charter, 1964)

With regard to **digitised heritage**, this **principle of authenticity** is by and large or even fully observed since the digitisation process does not (intentionally) distort information and if there are discrepancies, these derive from the primary sources themselves. An example of discrepancies would be those between the initial project of an architectural monument (for planning permission), the classical survey based on standard measurement methods and its 3D scan. These can arise from modifications of the built monument versus the drawn project (for various reasons – economic, technical problems discovered during the construction process, compromises on style or construction materials, etc.) or from errors of the classical survey versus 3D or 4D scanning. These pieces are thus authentic and each of them can be seen as a "verification" of the architecture and of the state of a monument from several perspectives, even including the textual descriptions, the photographs or the artworks that describe it. The final project of restoration, conservation and intervention on an architectural object that is carried out on the basis of these pieces must thus constitute sophisticated research on all these layers of information in order to achieve the greatest possible precision and level of authenticity and thus preserve the value of the monument.

"Restoration should aim to re-establish the potential oneness of the work of art, as long as this is possible without committing artistic or historical forgery, and without erasing every trace of the passage through time of the work of art."

(Brandi, 2005, p. 50)

This brief quotation from Cesare Brandi's famous *Theory of Restoration* raises three issues on the **digital heritage** resulting from the combination of **the digitised** with **"born-digital"** components, namely the concept of **"virtual anastylosis"**, the potential **interpretative limitations**

and the necessity of defining a working method. These aspects were discussed in a very recent article published by researchers from two internationally recognised institutions – The Institute for Technologies Applied to Cultural Heritage, CNR, Rome, Italy and the Department of Archaeology and Ancient History & the Humanities Lab of Lund University, Sweden. Titled "Reconstructing the original splendour of the House of Caecilius Iucundus. A complete methodology for virtual archaeology aimed at digital exhibition" and thus referring to an ancient and well-known site of Pompeii, the article "starts with a discussion on the philological correctness of a reconstruction based on different kinds of sources, such as paintings, drawings, technical and literary texts, comparisons etc., and proceeds to explore the use of integrated 3D models (both reality-based and source-based)" (Demetrescu et al., 2016, p. 51).

The first project goal was "to survey, record and analyse an entire Pompeian city block, Insula VI" and the second was "to investigate how the use of such documentation may influence the archaeological effort to define the original appearance of the buildings that composed the insula" (Demetrescu et al., 2016, p. 52). If "anastylosis" stands for the reconstruction of a partially destroyed object through the greatest possible use of the original architectural elements (technique also employed in the restoration of ceramics or other small objects), **"virtual anastylosis"** is the reconstruction partly based on **in situ** elements and measurements and partly based on **non-in situ** elements such as watercolour representations of the ensemble, the interpretation of old photographs, plaster models, XIXth century technical drawings, etc. To come up with a working method, the project authors use a table that attempts to summarise the types of sources consulted for the virtual reconstruction of the Pompeian ensemble: objective sources (**in situ** ruins, the 3D model scanned with the TOF laser scanner, frescoes and abstracted architectural elements whose original position is known as well as photogrammetric images and interpreted sources (scientific studies such as archaeology databases, published books, etc., or material evidence – old photographs of vanished frescoes showing their state of conservation during the first half of the XXth century, XIXth century watercolour paintings, technical drawings of the XIXth and of the XXth century and theoretical analogies and parallels to the in situ paintings, with decorative schemes specific to Pompeii, etc.). Thus, the topic of **authenticity** is viewed here from the perspective of potential **interpretative limitations** determined by two types of sources – **in situ** and **non-in situ** ones –, i.e. by the correct correlation of their positions in space (more precise or relative, depending on the source), the possible distortions or artistic representation of sources (photography, watercolour), but also by the accuracy of the textual descriptions.

This is why the authors of the research project and of the article have developed a **working method**, a workflow, to explain the exact steps to be followed, the modalities for verification and the ways in which the **virtual reconstruction** of this World Heritage archaeological site can become as free of imprecisions as possible, bringing a great deal of information and even indicating new elements, inaccessible with classical

instruments of measurement. The article provides a wealth of examples and explains the work process from a realistic perspective by indicating the various high-performing technologies that have been employed, the possible relationship between analogue, digitised and born-digital sources and the (current) limitations and benefits.

The use of equipment and of types of investigations using the latest software – 4D scanning, software such as Blender, Cloudcompare or Meshlab for the visualisation of morphology or Metashape for photogrammetry, 3DHOP as an online platform for work and dissemination – has enabled the discovery of internal details from the different phases of evolution that are otherwise hidden from sight and impossible to observe with non-invasive methods.

To conclude, an example such as this gives an **up-to-date** picture of the **state of knowledge** and of the possibilities of combining conventional methods with **digitised and born-digital heritage** sources to address **the criterion of authenticity in the virtual reconstruction of a historical monument**, in this case one belonging to **archaeological heritage.**

Value

While this criterion and its observation in the interventions on heritage sites and on historical monuments has been briefly discussed in the chapter on "The Historical approach" of the SCHOLAR ARCHITECT 2020 project, it will now be placed in relation to the forms of **digitised and digital heritage**, i.e. those **converted from analogue sources** and the **born-digital** ones.

As apparent from the above-quoted definitions in the Charter on the Preservation of Digital Heritage, **"Many of these resources have lasting value and significance**, and therefore constitute a heritage that should be protected and preserved for current and future generations." (The Charter on the Preservation of Digital Heritage, 2009, p. 2). This means that not all resources have lasting value and significance. So what is digitally created **for the purpose of heritage preservation** and its transmission over time should not damage the **value** or image of the monument and should constitute a type of **valuable resource by itself**, through the quality of the final product, through the **added value** it brings in relation to knowledge and even to image (possibly unknown before, for example in the case of a reconstructed ensemble), etc.

It is thus important to assume **responsibility** for the use or creation of digital resources where heritage is concerned and not to distort the constructed reality but to be objective and precise.

This is the manner of working through which digital technologies can support heritage, augmenting its memorial, emotional, historical and aesthetic value. In addition, digital technologies can even help **safeguard** a monument or architectural or archaeological ensemble that faces a natural or man-made threat; they should therefore be used in a measured and balanced fashion.

Case study

An example of a study and project that adds **value** while also retaining the **authenticity** of a heritage site is given in the article "World Heritage, vernacular dwellings and digitalisation: the case of the Fortified Churches in Transylvania, Romania", published in the 2020 edition of the UAUIM annual CSAV Journal, which I coordinate. The authors, widely recognised personalities in the protection of **architectural vernacular heritage** and UNESCO experts based at Escola Superior Gallaecia, Portugal and at Universitat Politecnica de Valencia, Spain, introduce the project **3D Past**, which "was designed aiming at enlightening the European vernacular World Heritage" and subsequently developed by the two institutions between 2016 and 2020 in the project "Living and virtual visiting European World Heritage", in the framework of the Creative Europe programme of the European Commission.

The stated aims of this research and reconstruction project were "studying and valuing the Outstanding Universal **Value** of these vernacular settlements", understanding "how their **authenticity** is preserved" and "turning vernacular World Heritage Sites virtually accessible" (Correia et al., 2020, p. 15).

It focused on eight vernacular heritage sites, among which we find "Villages with Fortified Churches in Transylvania, Romania" listed in the fifth position. "The selection [...] is intended so the developed approach could be replicated, in the future, in other sites of Europe, and across the world." (Correia et al., 2020, p. 16).

Given the complexity of the project, we will only focus on a brief review of the types of sources used and on the methods and results, i.e. the data that can illustrate a manner of working with **digitised and digital heritage.**

The method

Following research on the sites, on the elements of vernacular architectural heritage and on the geography of these areas, a digital platform – https://www.esg.pt/3dpast/platform/ – and a virtual reality (VR) and augmented reality application (AR) were created. The case of the Transylvanian Saxon villages is presented on this platform page https://www.esg.pt/3dpast/platform/transylvania.html; it contains 3D models of houses and house ensembles, plans of fortified ensembles, house plans, technical drawings that explain the typical spatial configuration, technical details of the construction joints and of structure as well as photographs from the site and of the research and restoration teams at work and images that capture the local colour and atmosphere (Fig. 1).

The AR and VR elements can be accessed on mobile devices and via online platforms and one of the interactive experiences consists in "the real-time overlap between historical images and real observation [...] allowing the visitor to have a sensorial perception of the site's evolution" (Correia et al., 2020, p. 32).

To conclude, this project, accessible by virtue of its digital character, is a model of implementation, of the combination of **analogue sources** and **born-digital sources**. The aim is to further enhance the global **heritage** sites, making them accessible to a broader public who can perceive them as **collective heritage.**

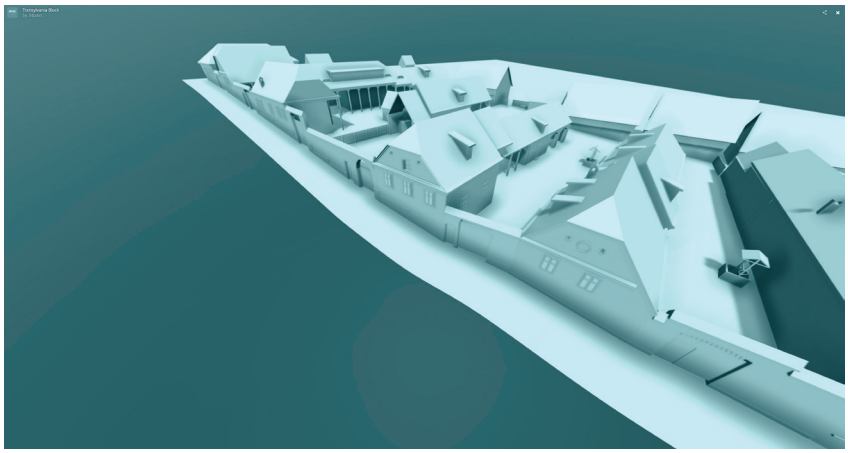


Fig. 1. 2D image of one of the 3D models from the digital platform of the 3D Past project.
The virtual reconstruction represents a special configuration, typical of the Transylvanian Saxon villages, in which the functional organisation and the construction links between houses can also be observed.
Image source: https://www.esg.pt/3dpast/platform/transylvania.html

Digital architectural heritage

Argument

The American professor Edgar Dale proposed in 1946 a model that would become well-known in the history of pedagogical methods – **the Cone of Experience** (or **the Pyramid of Learning**) (Fig. 2). This diagram shows how a student's (or any individual's) understanding and capacity of remembering information **increases** in direct proportion to the practical nature of the activity, the degree of authenticity of the experience and **the number of senses involved**. Transposing this to architectural education, the studio, the internships, the visits, the study trips, the workshops and the summer schools all support precisely this essential direction. They are supplemented by immersive experiences mediated by **VR** and **AR** technologies which allow one, for example, to explore an architectural monument or to learn the history of art and architecture. These virtual environments enable remote visiting as well as the observation of details otherwise inaccessible in the course of the on-site survey of building, such as elements of the painting on a high ceiling, the detail of a fresco, etc.

The most recent VR applications for **heritage architecture** appeal to **kinaesthesia**, the "simulation of real experience" category, and are thus very likely to facilitate the memorisation and understanding of a space, especially an interior one, according to Dale's principle.

Case study

The most relevant example to this effect is the way in which **VR** and **AR** technologies have been used to showcase the Palace of Versailles, an ensemble that has been on the UNESCO list since 1979 and is thus part of **World Heritage**.

In 2019, the Palace of Versailles, in partnership with Google Arts & Culture, launched the **"VersaillesVR: the Palace is Yours"**, a virtual reality application using 3D photogrammetry (thousands of photographs) which enables the free visit of the entire palace and appeals to different senses. It is supported by the commentaries of the scientific team on over 150 works of art and it allows access to otherwise inaccessible places and details.

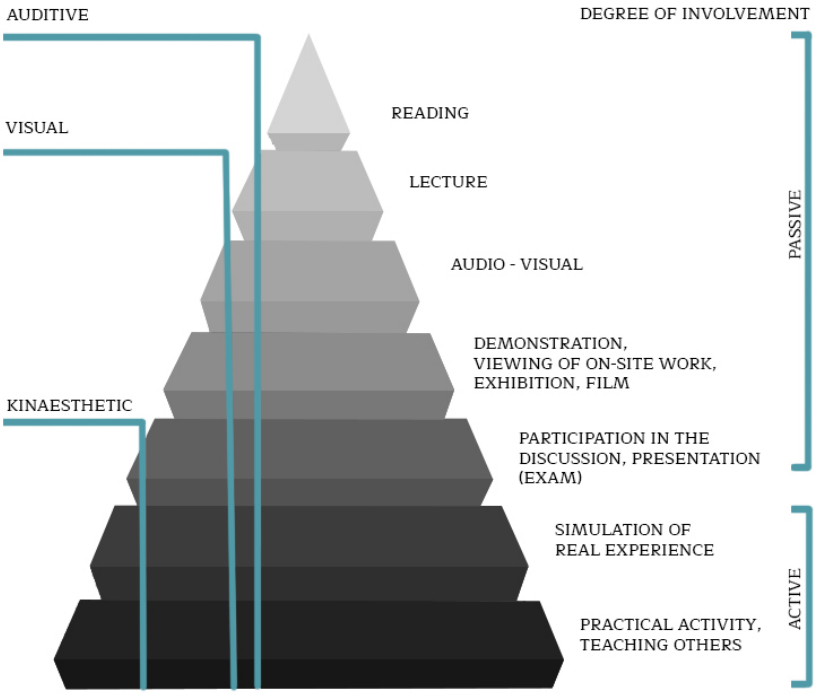


Fig. 2. Diagram based on Edgar Dale's Cone of Experience or Pyramid of Learning, 1946. Image source: personal archive, adapted from Dale (1969).

This is why one of the international speakers invited to the **Digital Heritage_webinar** (15 September 2021) was Paul Chaine, head of the Digital Department of the Palace of Versailles and lecturer at Sciences Po Paris and at the ESCP Business School. His lecture introduced the Palace of Versailles projects that use VR and AR with an educational purpose, for increased accessibility and democratisation of knowledge. Nowadays,

museums must adapt to new phenomena and be accessible in new ways in order to maintain their relevance and appeal to an increasingly diverse public. Yet these re-invention processes require a lot of responsibility and creativity when working with **cultural heritage** content.

Turning to the concrete example of the **"VersaillesVR: the Palace is Yours"** application (Fig. 3), it can be downloaded from the Steam platform and experienced via the VR headsets HTC Vive, Oculus Rift or Valve Index: https://en.chateauversailles.fr/news/life-estate/versaillesvr-palace-yours#a- unique-visit.

In comparing my actual visits to the Palace of Versailles with the VR visit, I can state that the feeling of a real experience is very similar (natural lighting, the sound of footsteps, the realism and the precision of the photogrammetry-based images at the level of colours and textures), but that the virtual experience feels far more intimate (the user is alone in the space of the Palace, there are no other visitors or guides); the information and commentary on the works of art can be very easily accessed; otherwise inaccessible details can be seen in close-up or from different angles, as only a restorer working on a fresco or some other ornament (e.g. on the high ceilings) would be able to observe them.

Put on your headset and be transported to the Hall of Mirrors during the night-time.

Hall of Mirrors in *VersaillesVR: the Palace is Yours.*
© Château de Versailles, 2019.

Fig. 3. Still from the VR tour of the Hall of Mirrors, from the project "VersaillesVR: the Palace is Yours".
Volume and the true-to-life aspect are conveyed by means of 3D photogrammetry technique, supplemented by various elements of interactivity and appeal to the senses: the sound of footsteps, the possibility of touching surfaces, of coming closer, of hearing or reading information, of seeing remarkable details or details not accessible on an actual visit (e.g. the painted ceilings).
Image source: https://en.chateauversailles.fr/news/life-estate/versaillesvr-palace-yours#a-unique-visit (c) Château de Versailles

The Palace of Versailles has been developing over many years learning tools for different levels of education, with special programmes that assist teachers in the preparation of visits and, more recently, on its webpage of Pedagogical resources – http://ressources.chateauversailles.fr/ – with special materials on art history, or with pedagogical, cultural and scientific resources for teachers on the *Edutheque* webpage – https://www.edutheque.fr/utiliser/arts-et-lettres/partenaire/chateau-de-versailles.html.

Such a virtual visit can be an excellent environment for a few art history lessons, for seminars on Rococo architecture and furniture, for a workshop on the complex work of restoration and conservation carried out over the years at the Palace of Versailles following destruction or various events, etc. These are of course the topics of interest that would be compatible with the UAUIM curriculum, but the offer is also relevant to other cultural fields: literature, Baroque music, playwriting and theatre, fashion history, political history, etc.

Activities linked to the SCHOLAR ARCHITECT 2021 project objectives

Within the framework of the **SCHOLAR ARCHITECT 2021 project**, I organised and coordinated two activities that would familiarise the UAUIM academic community with the manner in which traditional education and the latest technologies for the investigation, intervention upon and dissemination of material heritage can be **judiciously combined** for an **addition** of accuracy and technical abilities to the training of a contemporary architect, a synchronisation to the international specialist environment. This is of course about testing the internal academic environment by introducing working methods that have already reached maturity in the international architectural environment.

The Digital Heritage_webinar took place on 15 September 2021 on the Zoom platform (due to the pandemic). The speakers I invited to this English-language event were Nicolo Dell'Unto, Paul Chaine, Andra Bria and Ioana Mischie; each of us prepared a presentation on the theme of **architectural heritage** in relation to its **digitised** and **digital** forms, and thus on the different methods through which it can be investigated and analysed by architects, student architects and restoration professionals and through which it can be disseminated and explored by a more informed or a broader public with the help of virtual reality or augmented reality technologies.

Nicolo Dell'Unto is Associate Professor at the Department of Archaeology and Ancient History of Lund University, Sweden, Director of DARK Lab, the digital archaeology lab of his home institution and Visiting Associate Professor at the Department of Collection Management of Oslo University, Norway. His presentation, titled "Virtual Space and Knowledge Production", explained the methods of digital research and virtual reconstruction of sites pertaining to **world archaeological heritage** – such as Pompeii – or to national heritage – such as the sites

and **artefacts** on the territory of Sweden, which he uses in DARK Lab. In addition to the high-performance equipment for measurements and in situ recordings, the digital instruments for investigation, used for diagnosis and pathology, and the platform for **digital collections of artefacts** – with object cards and detailed information – these resources proved essential during the pandemic, when they were also used as a **teaching environment** for study and examinations. In addition, the use of VR technology in the DARK Lab of Lund University aims to assist students and researchers in exploring reconstructions of heritage architectural ensembles of which only some archaeological traces have survived, for the better understanding of spatiality, of the way of living, of the composing elements or of details such as the way in which natural light penetrated, the positioning of a specific iconography, functional relationships, etc. Starting from the idea of **exemplaria graeca**, which is at the basis of the preoccupation with heritage in antiquity, and thus from the **importance of the model**, the purpose of the in-depth study of these sites, including via the digital environment, is to support knowledge, preservation and use (re-interpretation) of successful models, the understanding of certain spatial typologies adapted to a particular era and context. The images from his presentation have been discussed in the previous section, "Essential criteria and working methods for digitised and digital heritage (virtual reconstructions of architectural monuments). Authenticity".

The digital collections of artefacts introduced by Prof. Dell'Unto are a set of small-sized pieces of archaeological heritage – tools, vessels, weapons, etc. – pertaining to a particular site and organised on specific criteria. They are essentially 3D scans or 3D photogrammetric images of the real objects, which can be studied on the online platform under the form of 3D volumes; each object is accompanied by a card with precise data on measurements, epoch, state, material and numerous other details. The role of these collections is to organise, along the same lines as physical museum collections, a series of pieces originating from the same site or linked by a common scientific criterion in order to also have a digital archive for their preservation (Fig. 4).

Paul Chaine's presentation at the **Digital Heritage_webinar** focused on the way in which the Palace of Versailles, a globally recognised architectural monument, opens up to virtual visitors, to a diversified and broader public with the help of the new digital technologies. It was titled "VR/AR in Versailles, a tool to address all audiences". The virtual reality application developed in 2019 in partnership with Google Arts & Culture named **"VersaillesVR: the Palace is Yours"**, which was presented in the previous section, is a first step towards a broader institutional project, with additional types of digital products that will support exploration and education with the help of VR and AR technologies. These products, partly based on analogue sources converted to digital format and partly based on born-digital sources, have been conceived for the dissemination and democratisation of knowledge, made accessible to a broad public, but also as a teaching tool, relevant from primary to tertiary level of education.

Fig. 4. Image of the Dynamic Collection of artefacts of the DARK Lab of Lund University.
The volumes are obtained through 3D photogrammetry, aggregated by means of software programs and uploaded to this interactive platform, which has even been used for student examinations during the pandemic.
Image source: https://models.darklab.lu.se/dynmcoll/Dynamic_Collections/

I invited these two experts to give presentations on the latest international experiences in the field of **digitised and digital heritage** to the UAUIM community of students, doctoral candidates and teaching staff and to share information on the current state of specific types of cultural and educational initiatives, but also with a view to creating new collaborative opportunities in the future.

To complement the French and Swedish perspectives, the two Romanian guest speakers, Andra Bria, the founder of Craft Product School, and Ioana Mischie contributed with presentations of their experience in using VR for cultural heritage in general, including the project of a digital university in virtual reality: OmniversityVR - https://omniversity.app/. Their experience of international transdisciplinary projects, ranging from cinema to topics in architecture, sociology and politics, provided a fresh perspective and demonstrated how we can adapt to the society of the future.

The webinar aimed to function as an exchange of ideas, a lively debate and as an opportunity to form professional relationships between all the participants, a bridge to future international projects.

Digital Heritage_lab was a hybrid, online and on-site, workshop that complemented the **Digital Heritage_webinar**. The guests were the two webinar speakers Nicolo Dell'Unto and Paul Chaine, together with the widely recognised specialist Prof. Habil. Hanna Derer, PhD., Arch., from the Department of History & Theory of Architecture and Heritage Con-

servation and architect Loredana Stasisin, the creator of Stasisin Services, initiator of the "Houses That Cry" project and at present an active professional in the field of digitised heritage, creator of tours and virtual exhibitions. The workshop participants were students at the Faculty of Architecture, The Faculty of Interior Architecture and The Faculty of Urban Planning as well as doctoral candidates and trainee architects. Prof. Derer raised the issue of **responsibility** in working with the forms of **digitised and digital heritage**. Loredana Stasisin presented her professional experiences in connection to different projects of architectural heritage digitisation and possible directions in the development of museums in the digital era.

The workshop that took place at the **"MAC POPESCU" Experimental Studio (High-Tech Learning Centre)** of UAUIM between 20 and 24 September was the practical application of the elements of theory and methodology introduced in the **Digital Heritage_webinar.**

Theme

The activity proposes the exploration of one of the recording techniques for heritage artefacts, namely photogrammetry, the opportunity of working with the latest software and of launching a small specialised database: a digital collection.

More specifically, the theme is titled **"Collection of historical locks"** and requires each participant to select an individual case study. These are the selection criteria: the lock must pertain to a representative historical style but not necessarily to an architectural monument of Bucharest (or of the locality where the online participant is based); it must be on the outside, i.e. an entrance door, accessible for detailed photographs, and it must represent an "emotional anchor". Why choose such an object as the theme? The idea is to have an object of reasonable size for the duration of the workshop, placed at a suitable height and accessible for photograph-taking from all angles and also an object that is representative of the building to which it belongs. In addition, patina and the detail features of this type of object speak of its history, of symbols and style, of the importance of the building over time and of the way in which it has been used by those who entered it, of the care or neglect with which it has been treated.

Objective

It is essential for students, doctoral candidates and trainee architects to become familiar with and to be taught a method of work and collaboration in which both the autonomy of decisions and cooperation with a team are practised. Theoretical knowledge of architectural history and heritage protection is drawn upon for the reasoned individual selection of the case study and subsequently in the final, contextualised presentation. Technical abilities are demonstrated through participating in the practical instruction and in the demonstrations provided by the technical coordinator, the architect and Associate Professor Andreea Iosif, PhD from the Experimental Studio "MAC POPESCU". The practical component consists of the field trip, the collecting of the required photographs

(200-500 images from all angles), the aggregation of the 3D model and finally the writing of the object card, its insertion in the 3D online collection and the creation of a poster.

The ability of achieving a concrete result at the end of the workshop, on the basis of practical instruction, is complemented by the capacity of understanding and showcasing a heritage artefact, of signalling the case of an endangered monument, of promoting a representative, yet forgotten, building, of bringing new information on a project and of presenting it via the resulting 3D and via an A1 poster. To an architect, both the content component and the component of graphic and aesthetic representation are important – in harmony with the architectural style to which the object belongs and with the purpose of the poster – as is the communication and presentation component.

Coordinators

I provided the technical coordination together with the architect and Associate Professor Andreea Iosif, PhD, who was also the coordinator of the "MAC POPESCU" Experimental Studio, and with Andra Bria and Ioana Mischie.

The jury of the student projects were Andra Bria, Ioana Mischie, Nicolo dell'Unto and Paul Chaine.

Method

The workshop was designed to help students improve their skills of working independently and as a team, in the collaborative preparation of a collection of digital artefacts.

The participants had a well-defined, gradual programme for the five days of the workshop, from the explanation of the theme to individual exploration in the field, technical instruction and constant guidance in the Experimental Studio; they learned the technique of 3D photogrammetry, benefited from demonstrations using software such as RealityCapture and the SketchFab platform and they created together a first digital collection of objects with object cards and finally a poster.

Participation prerequisites were familiarisation with the theme of **digital heritage** through attendance of the **Digital Heritage_webinar**, possession of a smartphone, necessary for collecting hundreds of photographs at the site, and technical abilities in working with new software programs.

The best three projects, all consisting of 3D photogrammetry, the artefact card and the poster, were granted prizes from the bookshop chain Cărturești and all the attendees received participation diplomas, signed by the members of the jury and by the Rector of UAUIM.

The project evaluation criteria for all three components were: technical quality; the ability to contextualise the chosen case, to observe the characteristics of the historical architectural style to which it belongs (specific to Bucharest) – from Classicism to Modernism – and to showcase these heritage objects also at the level of composition, content and aes-

thetics of the poster; lastly, the ability to communicate the observations and results of this small-scale research project in the final presentation (Fig. 5, 6, 7, 8).

The workshop has a dedicated Facebook page https://fb.me/e/16XvI1tX1 while the objects obtained through 3D photogrammetry have been uploaded on the SketchFab platform.

The participants demonstrated technical abilities as well as their knowledge of architectural history in its concrete application in a case study in addition to sensitivity and a sense of mission and responsibility as professionals in the field of architecture or urban planning in relation to interventions on heritage.

Results

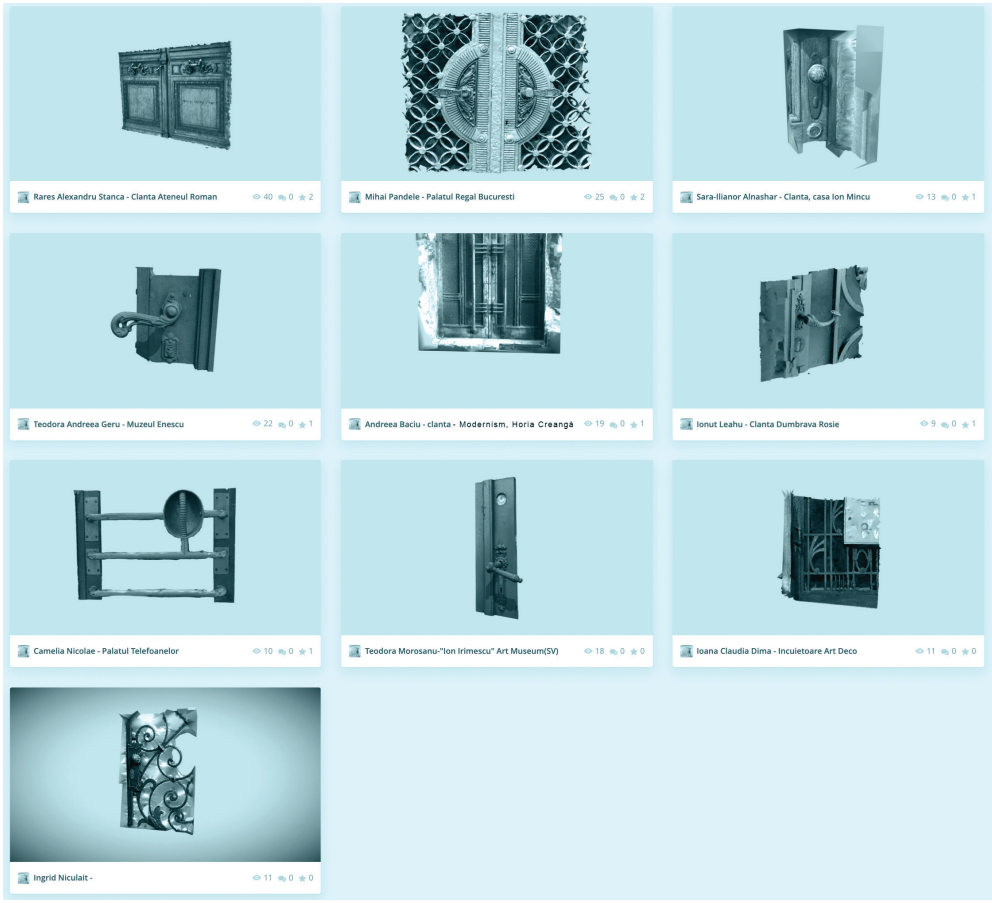


Fig. 5. The "Collection of historical locks" on the digital platform Sketchfab.
Image source: https://sketchfab.com/virtualia.uauim

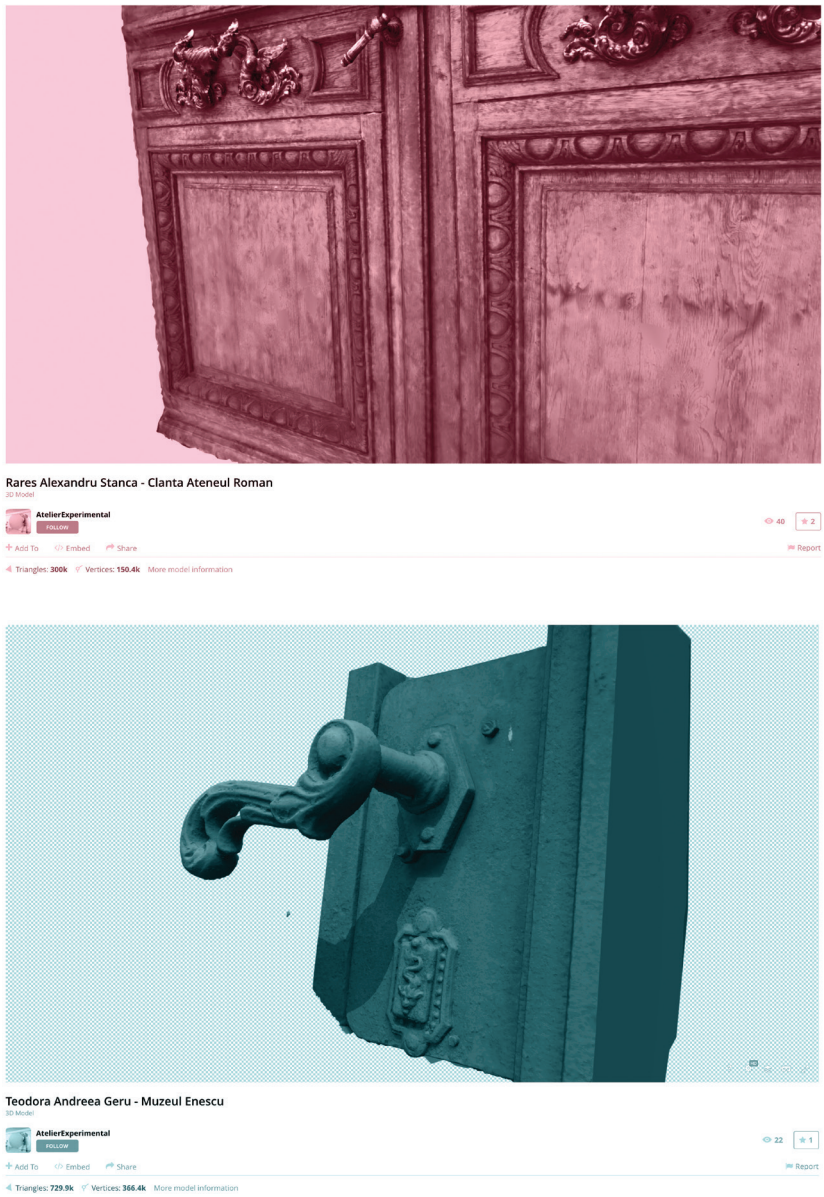


Fig. 6. Details of two case studies: the main entrance of the Romanian Athenaeum and that of the Enescu Museum, Bucharest, Digital Heritage_lab. The high quality of the 3D photogrammetric images, completed over a very short time, is noticeable. Image source: https:// sketchfab.com/virtualia.uauim

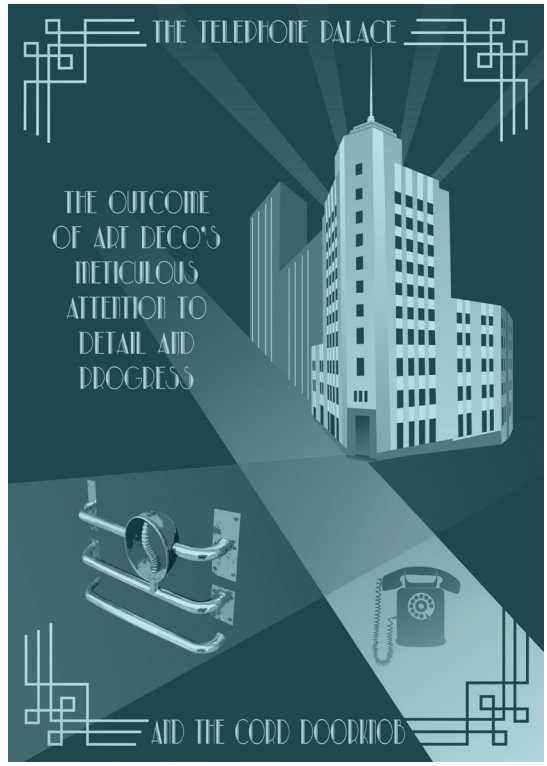


Fig. 7. Poster for the lock of the main gate of the Palace of Telephones, Bucharest, Digital Heritage_lab.
Author: Camelia Nicolae, UAUIM.

Fig. 8. Poster for the lock to the back door of the Ion Mincu House, Bucharest, Digital Heritage_lab.
Author: Sara-Ilianor Alnashar.

Conclusion

The present guide offers both a theoretical exposition and a reflection via concrete creations and practical activities of a few contemporary manifestations of the relationship between architectural heritage and digital technologies, which can be useful in the specialist academic environment and in professional practice.

Digital platforms created for the UAUIM academic community can be useful in doctoral research, for studio restoration projects, for teamwork and for remote international collaboration.

In light of this fact, I initiated in 2017 the CSAV Lab – a lab dedicated to heritage – under the aegis of the Center for Vernacular Architecture Studies which I coordinate, where I organised a training session on GIS software, sponsored by the Environmental Systems Research Institute (ESRI), Romania. The invited instructors trained representatives from each UAUIM department who were given study certificates and personal licences. The objectives were to use this type of software for the mapping of (vernacular) heritage in the national territory, to disseminate this high-potential technology to all departments and to create a digital platform that enables remote collaboration on joint research projects.

This final objective was only accomplished in 2021 when, following the two above-mentioned activities, namely the **Digital Heritage_webinar** and the **Digital Heritage_lab**, I launched the **CSAV Heritage Lab** on the CSAV website; this platform will use the software programs presented in the above-mentioned case studies: www.csav.ro.

This mini-guide attempts an objective presentation of the different projects and initiatives by showing the potential as well as the (current) limitations of these instruments of research and exploration. In addition, the development of a research and work method is important for maintaining an as high as possible degree of **value** and **authenticity** both for digitised objects and for digital reconstructions of objects or ensembles of architectural heritage.

From the perspective of the architect and also from that of the coordinator of restoration and conservation projects, continuous learning and the development of new abilities in working with heritage are essential in order to remain competitive and professionally relevant.

References

Brandi, C. (2005). *Theory of Restoration*, Transl. Rockwell, C., Nardini Editore, Istituto Centrale per il Restauro, Firenze.

Correia, M., Alcindor, M., Carlos, G.D., Rocha e Sousa, S., Mileto, C., Vegas, F., Cristini, V. (2021) World Heritage, vernacular dwellings and digitalisation: The case of the Fortified Churches in Transylvania, Romania / Patrimoniul Mondial, locuințele vernaculare și digitalizarea, *CSAV Journal 2020*, Editura Universitară „Ion Mincu", 2021: https://csav.ro/2020/csav-journal-2020_full-digital-version/, consulted on 15 Oct. 2021.

Criticos, M. (2021). *Limbaj Arhitectural (2)*, curriculum and bibliography, (year II course and seminars, UAUIM), https://www.uauim.ro/facultati/arhitectura/arhitectura/discipline-obligatorii/it-6/, consulted on 5 Oct. 2021.

Dale, Edgar. (1969). *Audio-visual methods in Teaching*. (3rd ed). New York: The Dryden Press, https://openlibrary.org/works/OL1375812W/Audio-visual_methods_in_teaching.

Demetrescu, E., Ferdani, D., Dell'Unto, N., Leander Touati, A.M., Lindgren, St. (2016). Reconstructing the original splendour of the House of Caecilius Iucundus. A complete methodology for virtual archeology aimed at digital exhibition, article in *SciRES*, vol.6, http://www.sciresit.it/article/view/12009/11022, consulted on 1 Sept. 2021.

Jokilehto, J. (2018). *A History of Architectural Conservation*, Second Edition, Routledge, Taylor & Francis Group, New York, S.U.A.

Sfinteș, A., Mitrea, A., Moleavin A., Zacharias Vultur, I. (2020). *Metode și tehnici specifice de cercetare în arhitectură*, https://www.uauim.ro/cercetare/scholarh/Brosura%20digitala%20SCHOLARH.pdf, consulted on 10 July 2021.

Zacharias Vultur, I. (2012). *Metafora mașinii în discursul modern de arhitectură. Norman Bel Geddes și Le Corbusier*, (doctoral thesis), the UAUIM Library.

Zacharias Vultur, I. (2018). Bucharest: Towards a Rethinking of the Urban Heritage, article in *The IAFOR Conference on Heritage & the City - New York 2018, Official Conference Proceedings*, https://papers.iafor.org/wp-content/uploads/papers/hcny2018/HCNY2018_44556.pdf, consulted on 25 Sept. 2021.

Zahariade, A.M., Brătuleanu, A. (2008). *Introducere în arhitectura contemporană*. Lecture notes and bibliographical addenda, (year I, UAUIM), Editura Universitară „Ion Mincu", București

***. (2009). *Charter on the Preservation of the Digital Heritage*, United Nations Educational, Scientific and Cultural Organization, Organisation des Nations Unies pour l'éducation, la science et la culture, unesdoc.unesco.org/in/rest/annotationSVC/DownloadWatermarkedAttachment/attach_import_a73559e3-c94e-4877-8a53-dc43d9dfdf58?_=179529eng.pdf&to=5&from=1, consulted on 1 July 2021.

***. (2021). *Concept of Digital Heritage*, UNESCO website, https://en.unesco.org/themes/information-preservation/digital-heritage/concept-digital-heritage, consulted on 5 Sept. 2021

Applying the concept of sustainability to the field of architecture represents a complex, multidisciplinary process, which has an impact on the qualities of the built environment as well as on mentalities and lifestyles.

https://doi.org/10.54508/9786066382465.09

Sustainable architecture. Stages of design and related concepts

Lect. Adrian MOLEAVIN PhD Arch.

Introduction

Global warming, the degradation of ecosystems, the energy crisis, the resource crisis and excessive pollution are some of the issues that sustainable architecture attempts to find answers to, answers related to human needs and to the continuous development of the built environment. This process has brought a range of problems to the attention of architects, problems whose solutions have substantially modified the general outlook with regard to what architectural creation, in particular high-quality architecture, means.

Ever since the impact of human activities on the natural environment has been understood, architecture has become an active, inherent part of the ongoing transformation process of society. The study of the processes subsumed under the building phenomenon, from the extraction of resources to the recycling of buildings, is the first step towards applying the paradigms of complexity to the field of architecture.

It is imperative to understand and put into practice the fact that sustainable architecture is not merely a technical answer to environmental problems but a transformational process in which technical elements are interwoven with conceptual, eco-systemic, biophilic and other aspects. Sustainable architecture does not mean implementing pre-established technical solutions but, essentially, redefining the relationship between human society and its living environment, a process aimed at the creation of sustainable mentalities and lifestyles.

The following pages provide a brief description of the main stages that must be covered in a design process aiming at the creation of a sustainable built environment (UGREEN, 2021). Additionally, a series of freely interpreted ideas and principles are recorded (Heywood, 2012, 2015), which should be taken into account in the course of completing these stages. The presented information is by no means exhaustive, but it does organise a series of key ideas into a comprehensible, easy-to-apply formula for student use.

General considerations

There is only one planet Earth! Sustainability means designing today while thinking about the future. Sustainable design is a method and not a style. The questions to be asked from the beginning of the design process are the following:

_How will the building perform over time?

_What will be its impact on the environment?

_At the end of its lifecycle, how will the building be recycled?

The pillars of sustainability are: the Environment, the Economy, Society.

Sustainable design has 6 dimensions:

_2D = drawing;

_3D = sustainable design + information;

_4D = planning the building;

_5D = construction and maintenance cost analysis;

_6D = maintenance and management.

The environment designates the totality of the elements of the physical and biological world and the connections between them. There are 4 ecosphere elements on the planet (atmosphere, biosphere, hydrosphere and geosphere) that are inherently interconnected, with any influence exerted on any of them affecting all others.

The environment can be analysed at different scales:

_internal (that of the building)

_local (surrounding) – global.

Any local action is subsumed under a global effect (the lighting of a house requires electricity whose production releases CO2 into the atmosphere, thus affecting the local and global quality of the environment). Every building influences the quality of the environment and the global warming process. But, in fact, it is not the buildings that consume energy but their users.

Analysis of the design brief [1]

1.A THE FUNCTION / USE / DEFINING QUALITY OF THE FUTURE BUILDING IS SET

1.B IS THE PROJECT A NEW BUILDING OR AN INTERVENTION ON AN EXISTING BUILDING?

NEW BUILDING? **2.A**

EXISTING CONSTRUCTION? **2.B**

[POTENTIAL SUSTAINABLE QUALITIES THAT HAVE BEEN MISSED]

1A

For biodiversity to prosper, its habitats need to be interconnected; green spaces in the rural and urban environment must make up a continuous green network.

There is a vicious cycle of buildings and towns which must be interrupted:

global warming → climate change → greater necessity for heating or cooling → higher energy consumption → higher emission of GHG (greenhouse gases) → global warming

A balance between density and human needs has to be struck. A higher density of buildings leaves more room for nature.

The green city is a healthier city. Green spaces must be integrated at all scales: urban forests, green corridors, city parks, green islands, urban farms.

2.A

2.B

1

Site analysis [2]

2.A IS THE SITE CHOSEN OR IMPOSED?

• IMPOSED SITE
[POTENTIAL SUSTAINABLE QUALITIES THAT HAVE BEEN MISSED]

• CHOSEN SITE

2.B IS THE SITE URBAN OR RURAL?

• RURAL SITE
[POTENTIAL SUSTAINABLE QUALITIES THAT HAVE BEEN MISSED]

• URBAN SITE
_HIGH DENSITY (preferable)
_SEARCH FOR PRIORITISED SITES (areas that must be developed/areas that must be recovered: e.g. industrial zones, following decontamination / historical areas with character)
_FUNCTIONAL DIVERSITY
_SUSTAINABLE TRANSPORT (proximity to intermodal transport nodes – for all high-traffic transport of goods and people; sustainable means of transport: electric vehicles, bicycles; opportunities for pedestrian transport)
_BALANCE OF THE BUILT – NATURAL (the destruction of natural habitats inside towns is avoided and the creation of new natural habitats is pursued)

2.C ASSESSMENT

POSITIVE RESULT → **3.A**

NEGATIVE RESULT → **1**

2.A

Analyse all options before building:

_to build

_to expand

_to reduce

_to relocate

_to share (co-living)

_to convert

_to reorganise

_to rethink.

Which option has the smallest impact?

The decision to build has repercussions over a long period of time.

3.A

1

Feasibility study [3]

3.A REQUIREMENTS

_DEFINING THE PROGRAMME
_DETERMINING ALL THE INVOLVED / INTERESTED ACTORS (clients, users, investors, public administration, etc.)
_DEFINING SUSTAINABILITY OBJECTIVES (based on the design brief, site, legal requirements)
_CHOOSING CERTIFICATION (the standard that the building will conform to, e.g. LEED, BREEAM, PASSIVE HOUSE, nZEB)

3.B INITIAL SIMULATION

NEGATIVE RESULT

POSITIVE RESULT

3.C DRAFTING OF THE INITIAL PROJECT DOCUMENTS

_LIST OF CLIENT REQUIREMENTS
_CORRELATION OF CLIENT REQUIREMENTS TO SUSTAINABILITY OBJECTIVES
_CREATION OF A BRIEF, DETAILED BY FIELDS OF EXPERTISE
_CREATION OF A PROJECT DEVELOPMENT TIMELINE
_PRELIMINARY COST ANALYSIS

3.D ASSESSMENT

POSITIVE RESULT → **4.A**

NEGATIVE RESULT → **1**

2.A

2.A

Knowing the features of the local landscape, climate and microclimate is crucial to sustainable design. Work with the forces of nature and not against them!

Use examples from nature – biomimetic architecture.

Use examples from the past – bioclimatic architecture.

Each town has its own climatic environment, which must be known and understood and which is called urban air dome.

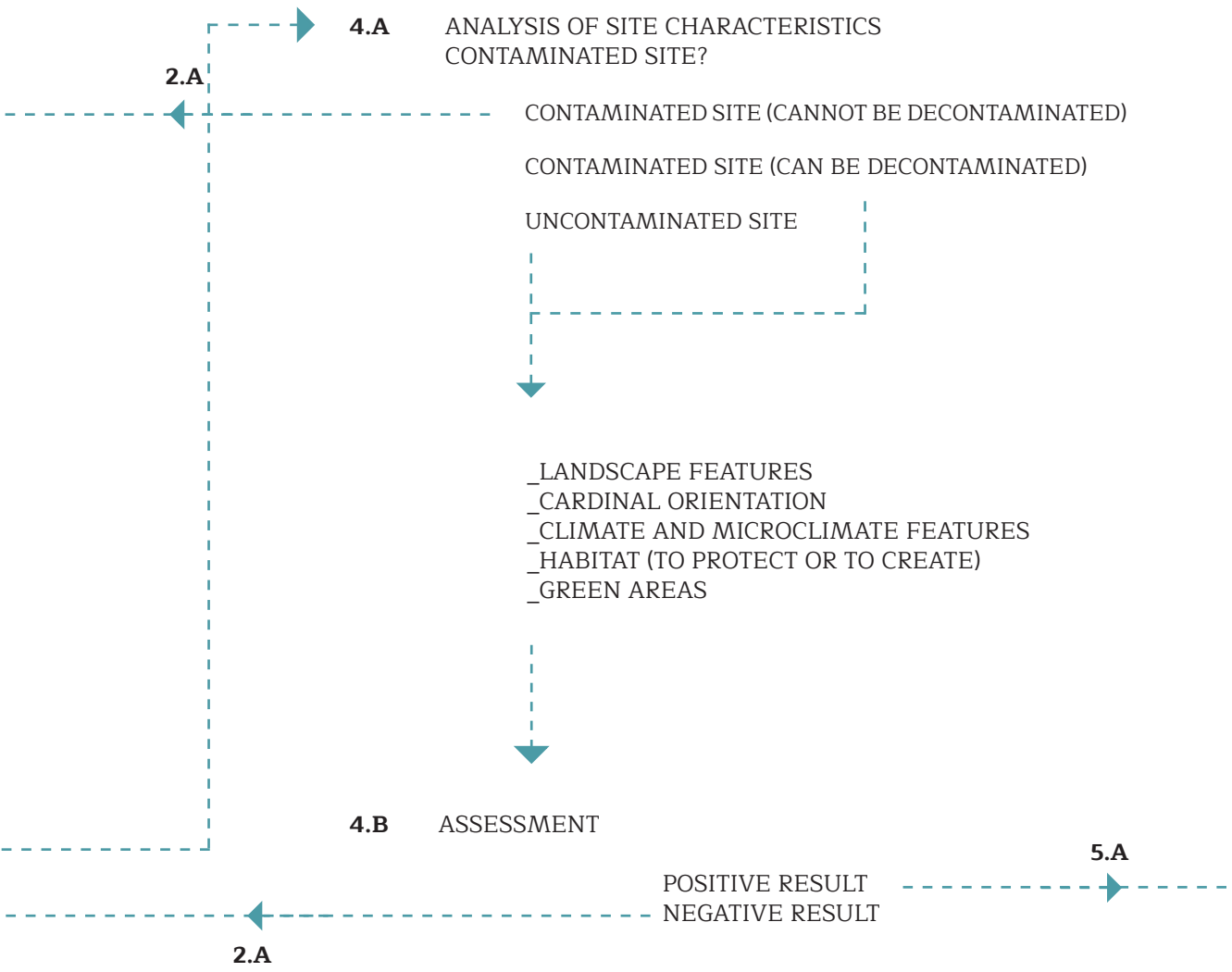
The heat island effect that occurs in cities must be counterbalanced through new buildings.

Reducing fuel consumption means reducing CO2 emissions.

2.A

Sustainable environment requires sustainable transport; transport accounts for 20 to 30% of air pollution (depending on the country).

Site sustainability [4]



Objectives of sustainable design (in general):

_A highly energy-efficient envelope

_Limitation of energy consumption to what the building produces and no emission of carbon dioxide

_Optimised use of resources and of embodied energy

_Minimal use of water and reduction of eliminated waste

_Creation of a healthy, non-polluting environment

_Durability over time and recycling.

Objectives of sustainable design (architecture):

_Durability of the “hard” elements (structure, envelope – materials resistant to UV radiation, careful monitoring of rainwater, a structure resistant to extreme climatic elements – vertical circulations, technical spaces) + “soft”, easily replaced elements (partitions, furniture, equipment).

_Spatial flexibility (possibilities of successive conversions – extension, reduction, repurposing, relocation, adaptation to climate changes) + installations that are easy to access, in multiple versions.

_Durable, energy-efficient and adaptable envelope.

To be climate-neutral, buildings must store as much carbon as possible. This is why buildings made of wood are preferable.

5.A

1

Sustainable design [5]

5.A BUILDING

_DESIGN (aesthetics, cultural elements, local atmosphere)
_BIOPHILIA (incorporating natural elements into the project, the possibility of interacting with nature, landscaping – outdoor vegetation, water, indoor vegetation)
_PROVISION OF SAFETY ELEMENTS
_PROVISION OF PARKING SPACES
_ACCESSIBILITY AND ERGONOMICS

5.B FUNCTION

_THE PUBLIC - PRIVATE RELATIONSHIP
_SPATIAL ADAPTABILITY (multifunctionality)
_PROVISION OF OUTDOOR SPACES FOR REST AND RELAXATION
_OPPORTUNITIES FOR SHARED USE OF CERTAIN FACILITIES (e.g. sports hall, showers and changing rooms, temporary storage)

5.C ENVIRONMENT

_REDUCTION OF THE HEAT ISLAND EFFECT (colours, materials, treatment of surfaces, underground, multistorey car parks or rooftop car parks for the reduction of the built surface)
_REDUCTION OF LIGHT POLLUTION
_REDUCTION OF ENVIRONMENTAL NOISE

5.D TRANSPORT

_REDUCTION IN THE NUMBER OF PARKING SPACES
_PARKING SPACES FOR ALTERNATIVE MEANS OF TRANSPORT
_CHARGING STATIONS FOR ELECTRIC VEHICLES
_PARKING SPACES FOR BICYCLES/ SCOOTERS (in addition to showers and changing rooms)

5.E ASSESSMENT

POSITIVE RESULT → **6.A**
NEGATIVE RESULT → **5.A**

Water is a finite resource! Although 70% of the surface of the Earth is covered by water, 97.5% is salt water and 2.492% is water embedded in the soil (in the form of ice). Only 0.008% of the total is fresh water available for human consumption. In this context, the management of water use in buildings becomes very important.

The first rule is to reduce consumption needs!

Use water of different qualities where it is necessary and possible. For example:

_Use filtered grey water (shower, bath and sink) in lavatories, washing machines and for irrigation.

_Collect and use rainwater.

_Recover the residual heat of water.

Very often, water can become a source of renewable energy (microturbines), especially in the rural environment, waves (where possible).

Water use efficiency [6]

6.A WATER QUALITY MONITORING

(testing the initial conditions and proposing a system that ensures the quality of the used water + its periodical testing)

6.B EFFICIENT MANAGEMENT OF WATER USE

(internal – efficient equipment, water heating + external – collection, filtering and use of rainwater and of grey water)

6.C RAINWATER MANAGEMENT

(knowledge of the annual rainfall levels, management of the site, use of native plants, provision of irrigation, collecting and filtering of rain-water)

6.D REDUCTION OF WATER CONSUMPTION

(private and public bathrooms – lavatory, bathtub, shower, washstand + private and public kitchens – sink, dishwasher, ice machine + washing machine)

6.E COMPLETE OR PARTIAL PURIFICATION OF USED WATER

6.F ASSESSMENT

7.A

POSITIVE RESULT
NEGATIVE RESULT

6.A

1

Buildings (in the course of their construction, use and demolition) consume approximately 50% of the energy produced by the human race.

If possible, buildings should be energetically autonomous (with no use of fossil fuels for electricity or transport) and autonomous in terms of water resources, purification of used water and waste recycling.

First design a passive building and then add active systems!

A sustainable building naturally/passively ensures, throughout the year, environmental conditions that are very close to the ideal level of comfort. This is done by taking into consideration 4 issues:

_site analysis;

_volumetric conformation and cardinal orientation;

_sustainable materials;

_energy performance (passive use of renewable energy sources for heating, cooling and ventilation).

Post-occupancy evaluation (POE) of the building is always required to ensure that the building fulfils all the sustainability requirements that it has been designed to meet.

7.A

Energy efficiency [7]

7.A
ARE CFC USED? (chlorofluorocarbons – compound gases harmful to the ozone layer, e.g. freon, aerosols, refrigerants and solvents)

NO

YES

CAN THEY BE ELIMINATED?

NO

YES

1

7.B
_STUDY OF PRODUCTION - SUPPLY (use of renewable, locally or regionally produced energy preferred)
_RENEWABLE ENERGY (assessing the potential of the site for the collection and use of renewable energy sources in passive or active systems – solar, aeolian, hydro- and geothermal)
_CONSTANT MEASUREMENTS (of production and use of energy, renewable or otherwise, with a view to optimising the entire system)

7.C
_ENERGY PERFORMANCE (STUDY OF CONSUMPTION)
For any building, a complete simulation is carried out, with a view to observing the nZEB standards, different for each country or region (energy-efficient items – lighting, electrical household appliances, high-performing HVAC system; polluting systems and even the mechanical systems of heating and cooling should be avoided, if possible).

7.D
_PASSIVE STRATEGIES (bioclimatic design + systems, e.g. phase-change materials, heat exchangers, etc.)
_ACTIVE STRATEGIES (mechanical systems for the collection and use of renewable energy)
_CONSTANT MEASUREMENTS (of the production and use of energy, renewable or otherwise, with a view to optimising the entire system).

7.E ASSESSMENT

8.A

POSITIVE RESULT

NEGATIVE RESULT

7.A

A sustainable philosophy for the minimisation of the impact of the consumption of resources, materials, water and energy in buildings has 4, strictly ordered, steps:

reduction – re-use – recovery – recycling.

There is no waste in nature. The waste that results from human activities must be fully recycled and transformed into resources.

All building materials are of and from the Earth.

Some are renewable and others are not; some are recyclable and others are not.

In choosing building materials, one should apply above all the principle of economising resources and the principle of the use of renewable, recyclable materials that are produced with a low consumption of energy and require the shortest possible transport.

Economising resources means doing more with less. Here are some examples:

_Optimisation of design to reduce the quantity of used material and the losses

_Modular, efficient, prefabricated design

_Multifunctionality of constructive elements (floor = thermal mass, envelope = thermal and acoustic protection, ventilation, aesthetics)

_Preference for lightweight buildings which require reduced foundations and thus have a small footprint on the site.

Sustainable materials [8]

8.A SEARCH FOR SUSTAINABLE MATERIALS
(re-used or recycled materials are preferred; materials extracted or produced as close to the site as possible are preferred; materials with environmental impact certificates for their extraction and production and materials with ecological components are sought; natural or renewable materials such as wood are preferred)

_USE OF EASILY CLEANED MATERIALS (this reduces the use of detergents and other chemical pollutants).
_REDUCED USE OF HARMFUL MATERIALS (which contain compounds detrimental to human health – materials that contain mercury, lead, cadmium, copper, asbestos, volatile additives)
_REDUCED USE OF COMBUSTIBLE MATERIALS

8.B REDUCTION OF THE ENVIRONMENTAL IMPACT OF THE ENTIRE LIFECYCLE OF BUILDINGS (new buildings – a Life Cycle Assessment, LCA, is carried out; old buildings – re-using the existing buildings or at least their materials is preferred)

8.C CREATION OF A MANAGEMENT PLAN FOR RECYCLABLE AND NON-RECYCLABLE WASTE

8.D ASSESSMENT

9.A
POSITIVE RESULT
NEGATIVE RESULT
8.A

Exceptional attention must be paid to the quality of indoor air. The causes of reduced air quality can be:

_inadequate ventilation

_infiltration of pollutants (microorganisms, carbon monoxide)

_VOC emissions (volatile organic compounds – paints, synthetic resins, insulating materials, varnishes, etc).

High temperatures and increased humidity have a negative impact on the quality of indoor air.

Ensure that the control of the parameters of the indoor environment is as individualised as possible.

The building is not sustainable if the low maintenance cost cannot be kept for its entire period of use.

The quantity of energy required for the maintenance of the building (in use) is 10 times higher than that required for its construction.

Indoor environmental quality [9]

9.A LIGHT (daylight and sunlight assessment, local simulations with a view to obtaining as even a distribution of light as possible, avoidance of very bright areas)

9.B LIGHTING (efficient, low-consumption systems, correct positioning, locally adapted intensity with the highest possible CRI – Colouring Rendering Index, ensuring a high degree of localised control, adaptable to multiple uses)

9.C AIR QUALITY (provision of natural, artificial or mixed ventilation systems + monitoring of air quality, purification if required + use of materials with low emissions of harmful substances – paints, synthetic resin, varnish, silicone, composite materials)

9.D THERMAL COMFORT (ensuring thermal comfort according to the standards + provision of a high degree of localised control, adaptable to multiple uses)

9.E ACOUSTIC COMFORT (ensuring environmental noise reduction by complying with the standards on the acoustic properties of the envelope, the floors and the partitions, reducing the reverberation effect, reducing the noise produced by installations – in particular HVAC)

9.F ASSESSMENT

10.A

POSITIVE RESULT
NEGATIVE RESULT

9.A

The waste that results from the building process should be eliminated.

Design and specifications:

_Use standard dimensions to minimise loss of materials (unless they are easy to recycle);

_Employ re-used or recycled materials;

_Design also from the perspective of the recycling of the building.

Fabrication and distribution:

_Modular design and prefabrication;

_Optimised use of resources;

_Volume minimisation in transport.

Construction site:

_Careful manoeuvring of equipment and appropriate storage of materials/sub-assemblies;

_Re-use and recycling of packaging used in transport;

_Re-use and recycling on the construction site where possible.

10.A

10.A CREATING A GUIDE OF THE BUILDING PROCESS

10.B CHOOSING CERTIFIED CONTRACTORS AND SUBCONTRACTORS
_CARRYING OUT PERFORMANCE TESTS (for the envelope, the installation systems, etc).

10.C MONITORING AIR QUALITY ON THE CONSTRUCTION SITE (detecting mould, bacteria or viruses, volatile organic substances (VOC), noise, vibration)
_PREVENTING THE POLLUTION RELATED TO THE BUILDING PROCESS (dust, erosion, sedimentation, site pollution by waste and harmful substances)

_REDUCING CO_2 EMISSIONS (stemming from the use of building equipment)

10.D ASSESSMENT

11.A

POSITIVE RESULT
NEGATIVE RESULT

10.A

The purpose of a building is to satisfy all the requirements and demands of its users (with regard to function, comfort, safety and health).

The total amount of costs resulting from the energy and resource needs and the impact of the building on the environment over the entire period of its use is greater than the costs for its production and building.

The use of a building can be quantified in operational costs.

The estimated (planned) operational costs have an impact on the initial value of the building.

Reducing the operational costs of a building can also be achieved through maximal accumulation of functions per square metre.

Over the period of use, there is a series of successive cycles of use and renovation or conversion.

11.A

Use and maintenance [11]

11.A A CREATION OF A USE AND MAINTENANCE GUIDE (for users)

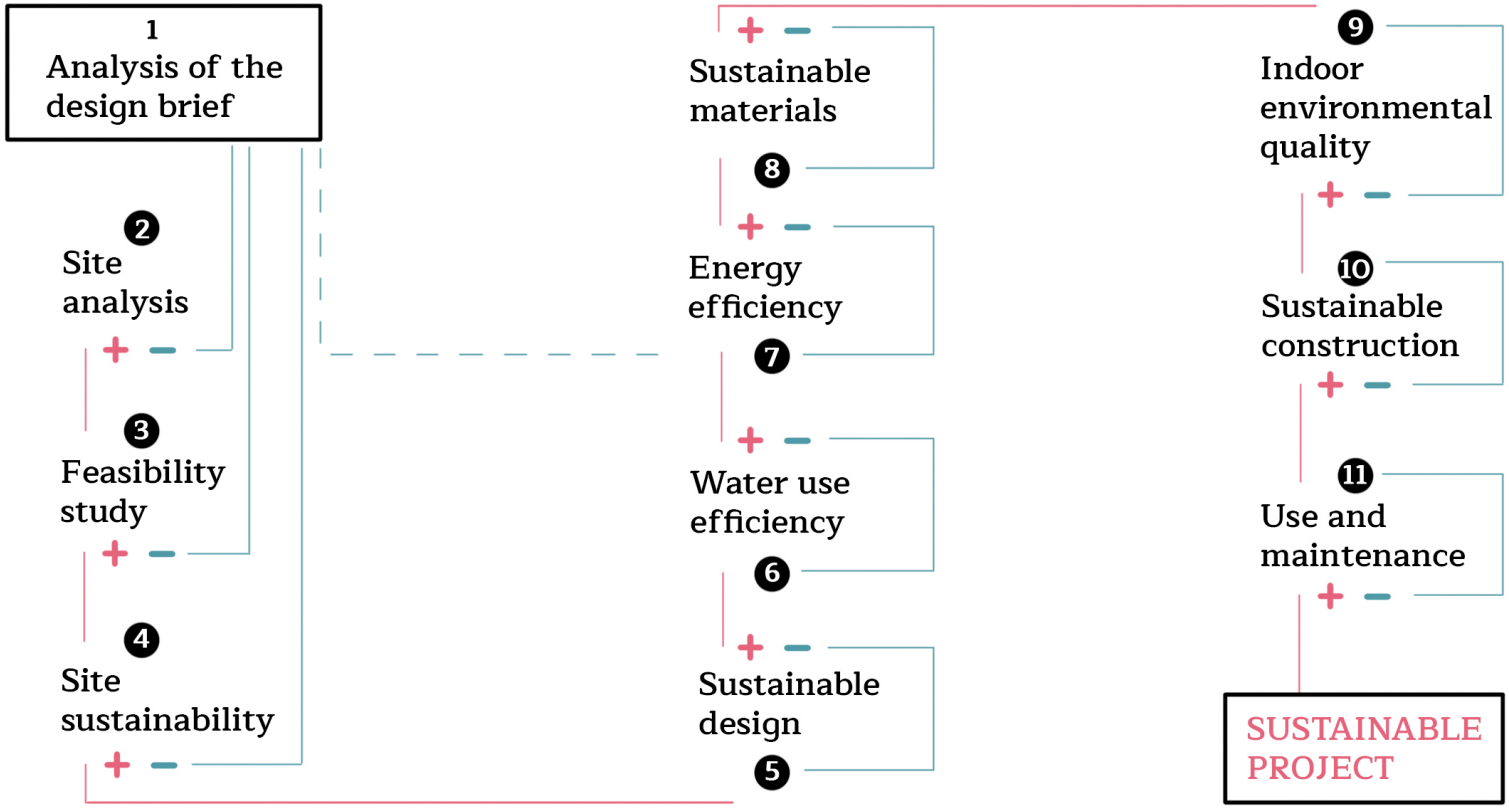
11.B CREATION OF A MONITORING AND MAINTENANCE PLAN (for the investor / administrator)

_MONITORING OF PERFORMANCE PARAMETERS (maintenance of building systems, constant adjustment to new technologies, constant monitoring of user requirements and control of systems to fulfil needs at a minimal operational cost)
_PROVISION OF INDOOR AND OUTDOOR CLEANING (use of sustainable, ecological and biodegradable products, cleaning of installation filters, appropriate storage of chemical products)

11.C CREATION OF A POST-OCCUPANCY MONITORING PLAN (monitoring the parameters of thermal and acoustic comfort, of light and lighting, of space and furniture ergonomics with the aim of improving them or of adapting them for multiple uses)

11.D ASSESSMENT

POSITIVE RESULT → SUSTAINABLE PROJECT
NEGATIVE RESULT → **11.A**


1
Analysis of the design brief
2
Site analysis
3
Feasibility study
4
Site sustainability
5
Sustainable design
6
Water use efficiency
7
Energy efficiency
8
Sustainable materials
9
Indoor environmental quality
10
Sustainable construction
11
Use and maintenance
SUSTAINABLE PROJECT

References

Heywood, H. (2012). *101 Rules of Thumb for Low-Energy Architecture*, RIBA Publishing.

Heywood, H. (2015). *101 Rules of Thumb for Sustainable Buildings and Cities*, RIBA Publishing.

UGREEN - Escola Online de Construções Sutentáveis (2021) The course *Sustainable architecture week* / https://www.ugreen.com.br/sustainable-week/