The experiment as a programme: new schemes in architectural education

Martin Uhrík & Robert Špaček

Slovak University of Technology in Bratislava
Bratislava, Slovakia

ABSTRACT: This article deals with the role of the experiment in architecture and a way to teach experimental architecture. It defines the concept of experimental architecture by dividing it into two parts, and with the experimentation on construction and research dealings with the problems of architecture design. The aim is to deepen the understanding of an experiment during the design phase of architectural research. The approach adopted has been divided into research into new architectural tools for the design, and into the problems of social, environmental, political and economic environments. These two lines of architectural experiment are verified in education in the Master's degree studio. In the article, the authors suggest a shift from classical architectural education towards a more experimental and computer driven study process that reflects the contemporary shift in digitalisation of society. The primary task of new architectural education should be to accentuate the pedagogical tools, which would enable the graduates to realise their potential in a broader area of future creative disciplines.

INTRODUCTION

At present, the crisis in the architectural profession is perceived as deepening. This process does not only concern architecture itself, but there are various externalities manifesting. The system of traditional occupations is being dissolved by digital technologies. For example, a number of major newspapers have stopped employing their own photographers, instead using the photos and videos shot by random participants on their mobile phones. Information is collected for editors by software robots constantly searching social networks. This trend of deploying similar technologies may be seen across all sectors of human activity. Oxford research points out to the fact that in the USA *…as much as 47% of employee positions will be endangered within the next twenty years* [1]. It is the ever growing deployment of digital technologies that is linked to this trend. However, current educational practice is responding to the new trends only to a limited extent.

An architect's education in the first half of the 20th Century was determined by the modernist perception of this task marked by refusing the old and discovering the new. In the words of Le Corbusier:

> *…In architecture the old bases of construction are dead. We shall not rediscover the truths of architecture until new bases have established a logical ground for every architectural manifestation* [2].

An architect was perceived as a humanist with technical education or *vice versa*, as a technically proficient builder with aesthetic education, depending on the source of educational concept. In the first case, the humanistic model was taken from the French Academy and in the second, technical case, the definition of architectural education was offered by Durand. Unlike the academic education based on history and drawing, in Durand's studio the drawing was replaced by descriptive geometry and history focused on exploring the visual elements of architecture [3].

This concept has also formed the background of Slovak architectural education and this type of education prevails with minor adjustments to the present. However, the current status of educational systems displays significant malfunction in the context of digital technologies development and related social changes. It is necessary to reconsider the architect's role in society and identify new branches of knowledge where the architectural mind might be applied.

EXPERIMENT AS A PROGRAMME

The goal should be to adapt education to the current state of technology, focusing on digital technology usage as the principal factor. Conceptualisation and architectural design takes place in close connection to computers. It is not possible to separate this new technology from the creative process. The classic division between the passive tools facilitating the creative process and the architect - artist is gradually ceasing to apply.

The creative potential of the human - computer entity was described by D. Engelbart in his 1962 article, *Augmenting human intellect*: *a conceptual framework*. It was not a coincidence that Engelbart chose the architect's work as an example for his article. It is important to differentiate between the qualities brought to the creative process by both the human and computer. Engelbart defines this relationship as: ...*working relationship between human problem-solver and computer* clerk [4]. The human is the creative part, with the computer being the analytical component taking up the mechanical activities. Therefore, creativity is the moment, which has to be reinforced and extended for the architect's future practice. Presently, the majority of architectural thinking still perceives the concept of architecture as a structural art. The non-technical dimension in architecture started to come significantly to the fore along with the booming criticism of modernism in the second half of the 20th Century.

The utopian projects of Superstudio and Archigram, Japanese Metabolists overlap to other disciplines, e.g. inspiration is semiotics. The iconic work of this period, Park La Villet was designed by B. Tchumi together with the philosopher, J. Derrida. Significant theoretical works of Venturi, *Complexity and Contradiction in Architecture* (1966), or *The Language of Post-Modern Architecture* (1977) by C. Jencks describe the new grounds of architectural practice refusing the modernist approach. In the same period, also the term *experimental architecture* was established. In the late 1960s, P. Cook published his 10 books on architecture. One of them, issued in 1970 is entitled *Experimental Architecture*. The book maps the philosophy of the Archigram Studio. As one of the first appearances of the term, he refers to the architectural research of new opportunities in architecture.

In this period, experimental architecture benefited from the strong theoretical background and the works classifiable as experimental mostly took the form of text illustrated by works. Several P. Eisenman's projects should be mentioned here, which were, however, only explained in the books written by the author about them. This mixture of theory and practice also continue in the works of R. Koolhaas or the UN studio. He also provided such books with new formal expression. His SMLXL, composed in cooperation with designer B. Mau, created a new method of presenting the architectural practice mixing an experiment with a real project in a volume of more than 1,200 pages of research, projects and texts.

The definition of experiment in Cook's architecture is as follows:

> ...*The situation now can be called experimental will be strategic as well as operational; it will involve the design of the process, its economics and its marketing potential as much as the beauty of its detailing* [5].

This quote, points to an extension of the scope of architectural thinking strategies by new disciplines, as well as providing examples of successful experimental architecture from the history. In other words, experimental architecture may include any activities crossing the established borders of conventional architectural design. The idea of pushing the limits is important for the definition of possible experimental approaches.

THE EXPERIMENT

Every exploration usually starts with an unanswered question or issue. If the search for an answer starts to follow a defined thinking process, one may start talking about research. Since the times of ancient Greece, man has been searching for explanations for the phenomena around us. Greek philosophy was based on constructing the thought processes, which would describe existence of the world as closely as possible. Even in relation to this very early period, it is possible to identify two branches of research. One of them dealt with nature and tools and the other one focused on human and society. Aristotle's works are usually classified in five categories. His logic and natural science writings contain topics close to the contemporary exact sciences, whereas the works in metaphysics, politics and aesthetics, as well as works of psychological nature would nowadays be classified as humanities.

The arrival of enlightenment has brought two new research techniques. On the one hand, there is the rationalism of René Descartes with his deductive knowledge of the world through critical thinking. On the other hand, there is the inductive method of British empiricism. According to Francis Bacon, an experiment is the fundamental pillar of knowledge, which needs to be additionally explained by rational knowledge.

The general definition of an experiment, from the Merriam Webster Dictionary, is …*An operation or procedure carried out under controlled conditions in order to discover an unknown effect or law, to test or establish a hypothesis, or to illustrate a known law…*, applies to experiment in both exact and social sciences [6]. The three points always needed are question, determination of the field of research and methodology. An experiment may denote a number of completely different approaches. However, what is common to all of them is the possibility to repeat them to verify the result.

The approach of exact and social sciences differs considerably. In the first case, the proposal for an experiment is characterised by the effort: ...*to isolate* small *systems from the rest of world* [7]. In the second case, such small systems are not able to describe the complexity of issues. And, what spot within this space is taken by architecture? Even the primary division into exact sciences and humanities is problematic.

In terms of architecture, the segment characterised as construction fits into the scientific experiment. The development of new materials, devices or construction systems meets the objective research criteria. These are fields where one can

clearly tell what an experiment is and when it is successful; therefore, it is possible to create a small, strictly limited system. However, one is moving in the area of construction rather than architecture as such. Experimenting in this area, even if fully accepted, is not a subject, which can be fully relied on within the work at an architecture school.

THE BOUNDARIES OF ARCHITECTURAL RESEARCH

A humanities-oriented architectural experiment will be the first boundary to be considered. The same issue had been pointed out in the late 18th Century by the famous architect, É-L. Boullée, in his definition strictly differentiating the aspects of structural design and architectural creativity.

> *What is Architecture? …It is this product of the mind, this process of creation, that constitutes architecture and which can consequently be defined as the art of designing and bringing to perfection any building whatsoever. Thus, the art of construction is merely an auxiliary art which, in our opinion, could appropriately be called the scientific side of architecture* [8].

In this respect, one professes the experiment of social science. After all, it is the relation of form to human being where most of the definitions of architecture overlap; modernism aimed at solving the social issues of humankind. Modernism believed that the society can be changed through new arrangement of cities. In the former socialist countries, this experiment was implemented generously. An example may be found in the construction of housing complexes where various social and income groups were mixed in order to ensure an *egalitarian nature of the social planning* [9]. One of the significant contexts into which architectural research is located is the sociological and psychological nature of architecture. This category also includes environmental research, exploring the relationship of architecture and human in terms of the environment and human impacts thereon. This is where architecture overlaps with ecology.

AN ARTISTIC DISCIPLINE

The artistic nature of the creative process is a significant factor, which makes the discussion of experimental architecture more difficult. Unlike, for example, biology or sociology, architecture as a discipline does not need to examine and describe anything to justify its existence. Architects create objects and a majority of them make do with this approach. When considering architecture as *art*, it is important to talk about the results. In the scientific disciplines, the output is a scientific paper, i.e. a text with enclosed charts, schemes and tables or photographs.

Significant scientific journals have the standards of graphic and formal text design strictly defined. In artistic production, the main result is the individual author's form, which becomes the carrier of content. Several examples have been provided above where the authors combine the architectural design with explanation of philosophy and experiment of thought. Books illustrating the formal and ideological results of the creative process are constantly originating. The work is the result. In art, experiment in the scientific sense is a rare phenomenon. The iconic project, research of the line by painter Paul Klee, containing both drawing and text analysis, is an exception rather than a rule. One has identified two possible levels of architectural research.

The first research area focuses on social and environmental issues. These questions are crucial for architecture as they create the cultural framework between human and the environment he inhabits. In other words, this is the environment in which the architecture is placed and for which it has been created.

The second issue connected with the artistic nature of architecture is the space of architectural tools used for the creative process. As a matter of course, what one means here is not only the set of physical tools, but rather the complex apparatus of thought, composition and ideological processes leading to the architectural design as a sovereign work of art.

In the context of the work itself, these two categories cannot be separated, especially in student work. One always needs at least the basic tools for solving the creative problem, while also having to anchor the problem in a certain way. That means, there is a need for external relations to determine it. (This issue was addressed by the French Poststructuralists, Deleuze. Two grammatical systems of exteriorities and interiorities, which repeatedly enter into mutual interactions).

It is apparent that architecture does not have its own experimental processes clearly formed. Most of the time, it takes over systems from the disciplines it is in close communication with in a particular experiment. These are further developed and adjusted to the architectural way of looking at issues.

THE PHENOMENON OF DIGITAL ARCHITECTURE.

The entry of digital technologies is a new significant factor which influences both of the aforementioned variables in the architectural experiment. Usually, the term *digital architecture* is used for a multitude of strategies and techniques. Digital processes determine the new space, which may become the location of an architectural experiment.

The term itself originated in the 1990s as a direct reaction to the first animation methods in digital architecture. The digital tools used for creating digital effects in movies were attempted to be transferred into the architectural creative

process. However, the deeper our civilisation dives into the era of computing machines, the broader the deployment of new tools and procedures has become. Only the computer, as a tool, remained the link to the original meaning of the term. One of the tasks in an architectural experiment comprises exploration and recording of new terminology, which is a precondition of the *graspability* of any issue. For emerging disciplines, the terminology is particularly important. The issue of theoretical and historical relationships of digital architecture is partially addressed in the book *Digital Architecture* [10]. The theoretical research in this area should be a substantial part of experimenting at universities. The works of digital architecture are no longer an exceptional part of the portfolios of architectural schools. Not long ago, every computer-generated project was considered as experimental, futuristic and breakthrough, however, one is much more critical today. In the words of G. Lynn, gone is the generation of designers whose creation was based on *happy accidents* [11].

To put it differently, something went well (computer-generated), it is visually interesting and, therefore, one will declare it a successful experiment in the field of digital architecture. Such criticism causes a shift of the term of digital architecture from its perception as a direction, stream or style to a less poetic definition as a tool. Of course, it is a tool much more universal and modern than any other creative tools; however, it is no longer the only possible future strategy. Such perception of the term is somewhat liberating, enabling one to move away from the formal, more technical, programming and mathematical issues and return to architectural creation, such as solving the spatial and social relations. On the other hand, the mathematical exactness, which is the core of computing technologies, applies pressure on the architectural experiment to be specified more exactly. Therefore, it is possible to get closer to the procedures of scientific disciplines, which are focused on research as their main scope of activity. A strategy of possible shift in the field of architecture is revealed. However, it will involve less constructing and more experimenting. An architect becomes a scientist and gives up his artistic status.

The most practical way to approach the more specific grasp of an architectural experiment is to verify the procedures in the design process directly. The object of exploration of experimental architecture, whether explored at a theoretical or practical level, occurs in the two aforementioned positions. One of them is the internal position examining the designing tools and procedures.

To illustrate the issue, the example of the diploma thesis assignment, Experiment - University, under the supervision of Špaček and Uhrík is provided. The assignment calls for transferring Slovak University of Technology as a whole from the town centre of Bratislava to a new space, which may be characterised as a green field. This part is a standard task. However, by speaking of transferring the University, one intends to reorganise its structure and programme in order to increase the scientific potential of the school rather than only transferring it in its current form. Thus, the students were confronted with the following question: What is a university? It was necessary to map the basic building blocks and identify structures defining it. At this point, it was crucial to emphasise the character of the assignment, which moves the boundaries of architectural work. The students' task was to compile a set of data and spaces, and interpret them. This task was not bound to the structural form. The chart explaining relationships of pedagogues, fields of study, individual faculties and their space requirements comprised several thousand inputs. From the analytical point of view, it was not possible to evaluate such an immense amount of data manually. Therefore, digital tools were deployed (The tools of digital data analysis are applied here. Datamining and data visualisation).

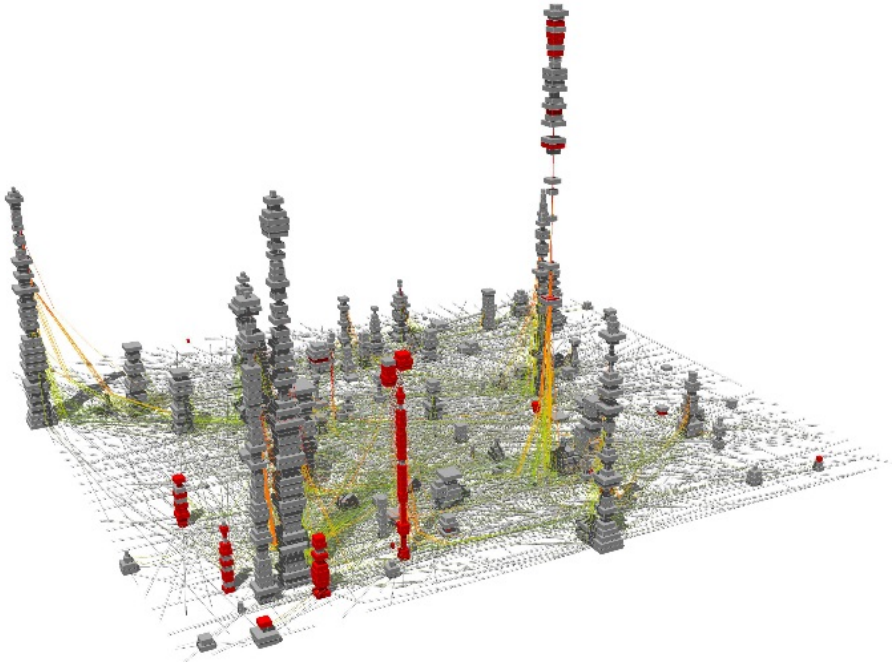

Figure 1. Lukáš Cesnak: Experiment University, spatial visualisation of educators, study subjects and faculties (diploma project).

In order to enable interpretation of the data created, they had to be displayed. At the same time, procedures of the digital world were used, known to experts as data visualisation. This issue was addressed more in an architectural way, with less abstract spatial models originating. These were located in a specific physical environment, which enabled further options to interpret the data in the context of a given locality and operational relations.

The project points to the common experimental approach to the creative process. This is a software interface design, which interprets the relations in the issue addressed and enables to spatially interpret such relations, also referred to as architectural programme, in terms of an architectural diagram. (The term first appeared in the post-structuralist philosophy of Foucault and Deleuz and was further transformed into architectural theory. The recursiveness of actions is the basic fact. In the beginning, there is an abstract diagram which is transformed into a specific diagram, with this relation being repeated several times. The development in time is important. Architectural diagram is a fitting description for creative practice). It is exactly this dimension of creating an abstract structure that is the key signature element of the example provided, visualising a number of data in architectural language.

The diagram is a result of an architectural effort. However, instead of understanding it in the classic meaning, i.e. as a static scheme, one should perceive it rather as a dynamically changing entity capable of generating new arrangement. It should be pointed out that in addition to the data collected and procedures on how handle them, the diagram also contains a spatial component. It is set into a particular environment and the specific arrangements are designed for specific locations. Thanks to this spatial component the diagram may be classified as architectural. The student works hard to find new tools for solving the architectural issue. In this sense, an experiment means identification and verification of procedures. Even if the projects are on the verge of other fields and the statistic view of the data is important, the crucial issue and determination of the experiment is architectural, touching a specific space and its relation to human.

The second position constitutes the exploration of external influences, social, environmental, political, as well as economical, in relation to the contemporary information society.

In other words, this is the question of our environment. It does not matter whether one talks about environmental changes, social and geopolitical changes or virtualisation and digitalisation of the whole living space. One's understanding and perception of the world is significantly modified by these quickly developing processes. Especially, in the context of aforementioned challenges, the role of architecture has to be reconsidered. In this workplace, the research concentrated around the change of environment that takes place in several different lines.

The first one, regularly appearing in the history of architecture, is the research of hypothetical forms of future architecture. The topics may be diverse, with the basic variables being the time-shift against the present, assumption of new, as yet undiscovered technologies, environment where the human activities are set and, finally, the changes in the society's social relationships. The assignment specification has to work with these elements very accurately to ensure reliability.

The Space City Project is an example of a successful shift to the future without getting into the sci-fi zone. The environment characterised mostly by the absence of gravity enforces reconsideration of all architectural paradigms.

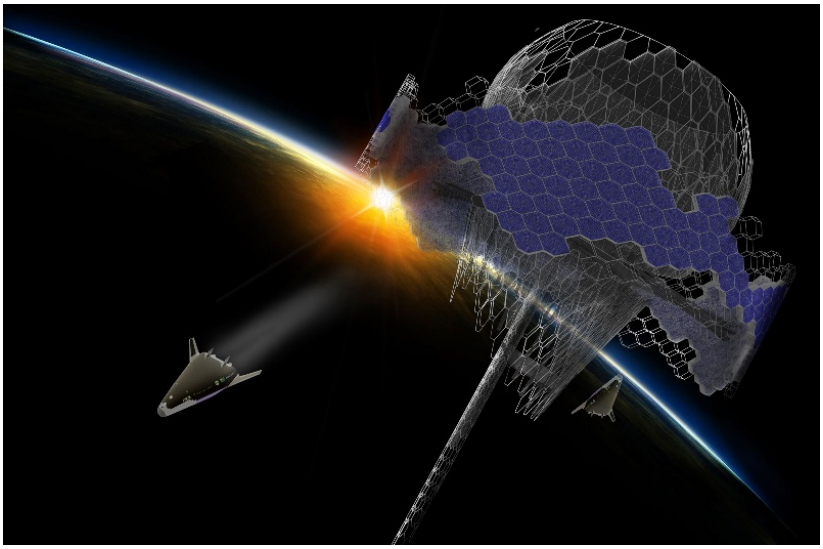

Figure 2: Adrian Babis: Extra Terrestrial Habitation under construction (Master's degree).

In their thoughts, the authors applied a similar approach as the contemporary visionaries of private space research. This is the philosophy of start-ups. Radically new ideas, which become a reality within a very short time thanks to digital technologies and crowdfunding.

In the educational process, such a thought experiment serves for the shaping of new study methods, teaching the students to create new things using a thought experiment.

Another example of work within the architectural environment may be the change of the standard architectural processes and redefinition of common social ties in order to enable new functioning of spatial structures. While the Space City represents designing in an abstract space of the world of ideas, the second line of the projects takes place in a particular space of new social relationships.

The topic comprised the interventions into the historical building of Old Market Hall in Bratislava. Students were required to find the problem and devise an adequate solution. In the words of one of the teachers: *The challenge of this task consists in the necessity of thinking outside the architectural box. A different type of creativity than the one creating forms had to be used* [12]. Students were confronted with the deficiency of classic education, where the relationship of form and function is considered as crucial. What the students needed was to *be able to evaluate the social and cultural aspects of the place and to design an optimal local programme* [12].

Another decisive parameter was the necessity to actually implement the project. Therefore, the students had to work within a realistic budget. Finally, the students were required to communicate with their client, the civic association. The most successful projects were the ones, which were able to set up their programme best. In this case, the architect's role comprised more or less the evaluation of the spatial options, relationships and requirements of various participants and possible technical solutions rather than designing an aesthetically exciting form. The experiment took place within the sphere of communication and social interaction. The architect becomes a mediator and guarantee of success in conversation between the client and space intended for use.

THE ROLE OF ARCHITECTURE IN THE DIGITAL (POST-PHYSICAL) WORLD.

Experiment as a programme tries to offer an alternative to the classic architectural education at the Faculty. The primary task of new architectural education should be to accentuate the pedagogical tools, which would enable the graduates to realise their potential in a broader area of future creative disciplines. The educational methods need to be adjusted in a similar way, focusing mostly on creativity. For future architects, the ability to conceptualise new impulses into a meaningful creative procedure will be a crucial one. Likewise, the term *environment* has to be extended.

The classic understanding of environment for architecture emphasises a physical spot on Earth. However, the present brings a significant expansion of this term. Space, which is one of the basic components of environment, has also changed. Whereas up to now, the term of space in architecture identified the relationships in three dimensions and was perceived as the Euclidean space described within the Cartesian system, the architects have been experimenting with shifting this concept since the early 1980's. The world where the virtual space of the Internet is a part of everyday life moves the perception of environment and space significantly further.

The social dimension of the architect as a thinker contemplating relationships space and people, who was lost in the last decade of immense technological progress has been mentioned. This dimension has the potential to be re-discovered within the prism of new issues of the digital world, which are no longer technological. The space, body and mind will always remain the basis for architecture. However, all of these terms are currently subjects to a substantial transformation. Man has entered the post-physical era. Not that one would lose the physical world as such, but it starts to overlap with the virtual one in such a way that everyone is able to mix their individual reality. The new challenge is how to design and educate within these different, individual, realities. Experiment as an educational programme represents one of the new strategies.

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