Research through Design under Systematic Quality Criteria: Methodology and Teaching Research

Sören Schöbel, Julian Schäfer, Georg Hausladen

Editorial Summary: In their contribution, Sören Schöbel, Julian Schäfer and Georg Hausladen ask how architectural design can be used as a method of gaining scientific knowledge. They state that this is only possible if architectural design, which is generally characterized by a specific, creative, subjective and case-by-case process, is embedded into a methodical framework that enables general, i.e. transferable and verifiable knowledge. By stating that qualitative research in the disciplines in which it was developed is essentially based on a creative but nevertheless systematic interpretation of data in search of new, previously unknown structures the authors see a proximity to design in architecture, and therefore suggest transferring the quality criteria of qualitative research to research-based design. They describe three basic principles – regularity, relevance, and universality – and illustrate how research through design can be carried out using these principles with the example of different teaching formats. [Ferdinand Ludwig]

Keywords: Landscape Architecture; Ecology as Technology; Qualitative Research; Abduction; Research Quality Criteria.

Quality Criteria of Research through Design

The most exciting form of research *in* architecture is research *through* architecture – thus through architectural design itself.

A distinction can be made here between research on the spatial model, research through structural realization and research through design – designs that remain only ideas on paper for the time being. For questions where the first two architectural research approaches are not applicable, the remaining possibility is to draw conclusions from the design process itself. This entails using architectural design as a method of gaining scientific knowledge. To do this, we must embed design, which is first and foremost

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a specific, creative, subjective and case-by-case process, into a method that enables general, i.e. transferable and verifiable knowledge.

Research through design, in this sense, is a systematic process in which knowledge is gained from experience – from empirical data. In the sciences, two different methods are known with which insights can be gained from empirical data. These are the quantitative and the qualitative methods. Both are justified if they are used in the right place, that is, for the right question. For example, if we want to know why architects are interested in pursuing a doctorate, we could conduct a survey here using a quantitative method. From literature, we could derive four classical main reasons (deduction): 1. a higher income is expected from a doctorate; 2. their parents have a doctorate; 3. the professor requires it for employment; 4. another reason.

It might be useful for the Faculty of Architecture to find out the percentage of the reasons among the scientific staff to promote doctoral studies particularly effectively.

But if we want to know which deep motives, attitudes and orientations lead to this desire, then we would have to use a qualitative method. Without pre-fabricated categories, we would only let the participants explain what moves them and which values they associate with architectural research. This, too, would provide data, which would not be put into pre-defined boxes, but used rather to search for something new. This discovery of new information through critical and creative interpretation of data is called abduction. In this way, we could describe different types or milieus of doctoral candidates, whose existence we cannot prove nor measure, but whose existence can be described. For the faculty, this may be even more interesting.

To be able to recognize both methods as scientific, there are rules or »quality criteria« for both.

If we now want to define research through architectural design as a systematic process in which knowledge is gained from experience, we must also be able to describe this process and establish rules – quality criteria.

Qualitative research is essentially based on a creative but nevertheless systematic interpretation of data in search of new, previously unknown structures. It therefore has a proximity to research through architectural design. And it is thus beneficial to transfer the quality criteria of qualitative research (cf. Steinke 2000) to our methodology.

We can classify the quality criteria into the six »classic« areas in the philosophy of science (cf. e.g. Steinke 2000). For a method to be considered scientific, it must be systematically structured and follow rules (*regularity*).

The applied method must match the research question, the object (*relevance*). And it must have general validity that extends beyond the individual case or be clearly delimitable to a certain area (*universality*).

These first three criteria are indivisible. We need to take a closer look at the other three, objectivity, validity and reliability, as here differences are already being made between quantitative and qualitative research. Even more so in the case of design research where we must encounter special features.

Objectivity means that the findings are not influenced subjectively, culturally or by the method itself. In qualitative research, this criterion cannot apply because the power of interpretation comes from the personality of the researcher. Therefore, it is important here to disclose this subjective content as comprehensibly as possible.

The next criterion for quality is that research results are valid. The »what« and the »how« of the investigation must fit together, i.e. the method of investigation must correspond to the object of investigation. In quantitative research, this can be proven by statistical tests of representativeness or correlation. In qualitative research, this is more likely to be substantiated by arguments. Does the research result match reality, the real world? In our example: Do doctoral students talk openly and profoundly about their motives when asked about them? Only then does such a survey make sense.

This criterion can also be tested for designs. Can general knowledge resulting from a design solution be translated spatially and into the real world? Is the design authentic in this sense?

The final quality criterion is *reliability*. Can a result of the investigation be repeated? And is the investigation structured in such a way that it can be disproved because the exact process can be traced? Is there certainty that there are no errors? In quantitative research, experimental procedures can be repeated identically. This is not possible in qualitative research; therefore, several methods are juxtaposed here that investigate the same phenomenon in different ways. Returning to our example we could evaluate their private Instagram posts in addition to questioning the doctoral candidates, which would certainly be revealing.

This is even more difficult in *research through design* because creative processes are never exactly the same. However, if not just one, but many designs are included in an architectural competition, collection, or assemblage, they can be compared. Another possibility is to evaluate whether a

design can be thought of as the basic type of a typology, a model, or an architectural convention.

So, there certainly are ways to operate *research through design* not only systematically, but also with regard to general knowledge. The precondition is that researching architects bring as much light as possible into the *black box* of the creative core of their research processes.

Topics of Our Research

When designing landscapes and cities on a regional scale, we address topics that are largely determined by the conditions and constraints of industrial structures and infrastructures. We thereby operate between functional requirements, everyday usage and aesthetic impact. The banalities of modern society are reflected in structures that enter our lives in an equally banal way: energy production and transmission, highways and by-pass roads, commercial and residential areas and, as their compensation, areas for the protection of species, ecosystems, and eventually for »recreation«. For each of these concerns, there exist standard approaches that are safe, can be approved in planning practice, and which one becomes accustomed to in the end. The result is a landscape in which everything works, but no coherent whole is created. In our research, we are looking for new solutions off the beaten track, to think unconventionally, and thus to display possibilities of what new, generalizable solutions can look like.

Teaching Research

In the first seminars since 2008, we investigated how new knowledge is produced in landscape architecture and what methods are suitable for this. We have established a rule-guided procedure that is revised and adapted with each seminar and which meets the quality criteria of qualitative research. A group of students develops specific solutions to a research question by designing short-term proposals. In preparation for this step and to create an »abductive attitude« (cf. Reichertz 2000), the participants are introduced to state of the art and generally accepted good engineering practice of the topic. We then discuss the short-term proposals with the whole group. The focus is always on the basic idea of each group explaining the essential core of their design. These ideas or concepts, represented in both written terms and drawn shapes, constitute the data collection. To scan the data collection

of hidden structures, such as basic types or categories, a cluster analysis is performed. »Cluster analysis or clustering is the task of grouping a set of objects in such a way that objects in the same group (called a cluster) are more similar (in some senses) to each other than to those in other groups (clusters)« (Wikipedia).¹ This process of building clusters is also done in the group, creating a collective understanding. The developed clusters of terms or shapes lead to abductive reasoning, which can be tested in the subsequent designs or textual analyses (reliability).

Research through Design Seminars since 2013

In the next sections, we give an overview of the content and methodology of various topics that have been used to run research seminars in recent years. We would like to briefly describe the relevance, i.e. the extent to which the chosen method produces results that allow new interpretations and explanations for the particular question, and the universality that relates to the research question itself. In the first mentioned seminar, the validity and in a further step the reliability are demonstrated – i.e. whether the results found can be reproduced with another experimental procedure.

Social Flow Generator (2019/20)

Lecturers: Julian Schäfer, Parisa Vaziri

As part of an ongoing research project², we are investigating how renewable energy plants and facilities in the landscape can fulfil a social purpose in addition to their energy aspect. Whether they are accepted by people as social places depends largely on their atmosphere, on the interaction of the constellations of a place with the mood of those who perceive the place. Such local moods cannot be measured, but they can be described, interpreted and designed by visual images.

In the biennial competitions of the Land Art Generator Initiative, such spatial concepts are designed according to the motto »Renewable Energies can be beautiful« as qualities of a place and its perception. Such concepts are part of our cultural reality as spaces of possibility. Research through design is therefore the appropriate method of systematically investigating

1 https://en.wikipedia.org/wiki/Cluster_analysis, accessed July 31, 2020.

2 Parisa Vaziri: »Resilient Trans(action) through Landscape and Urban Design«.

this phenomenon (relevance). Since the question of the social impact and designability of renewable energies arises in practically all contemporary and future landscapes, it also has a general validity (universality). In the seminar, all contributions to the LAGI competition of 2014 (Copenhagen) were evaluated with respect to designed atmospheres and summarized into general types in a two-step cluster analysis.³ The validity was verified by not only describing the atmospheres in the visualizations, but also by examining the competition texts for atmospheric terms as a parallel test. To test the reliability of such energetic-atmospheric concepts, test designs were finally created by the researching students at other locations.

Collage Landscape (2018/19)

Lecturers: Sören Schöbel, Julian Schäfer

In *Collage City*, their groundbreaking 1978 work, Rowe and Koetter called for urban development to reconnect both rational-scientific⁴ and poetic-contextual thinking and planning. Since not only the city, but also the landscape is essentially negotiated by society as an image (universality), the development of ecologically differentiated forms of land use (Schöbel 2017) requires both rational and poetic thinking. Here, too, it is a matter of a spatial synthesis of the functionally separated, for which only methods of research through design can be considered in a systematic way (relevance). In the seminar, the students designed differentiating structures of agriculture in short-term architectural proposals. For each concrete location, they started with a rational-ecological and a poetic-contextual idea and connected them according to other approaches. In this way, 13 teams created a total of 78 impromptu, ecologically differentiated and aesthetically legible agricultural structures for three locations, which were then clustered into types of similar ideas or »attitudes«.⁵

3 The clusters found by one student in our seminar, J. D. P. Murcia, are: Diffuse limits, Ludic interactivity, Marvellous analogies, Entangled particles, Dramatic tragedy, Dizzy attraction, Paranoiac vastness.

4 Rowe and Koetter also use the term »utopian« for this, but in doing so mainly refer to urban tabula rasa planning of modernity.

5 M. Wang, another student, described the attitudes to aggregate, to integrate, to separate, to differentiate.

Production of Urbanity (2017)

Lecturer: Sören Schöbel

The Leonrodplatz in Munich has a high degree of traffic use, but at the same time, too little urban life. The directly adjoining surroundings with the criminal justice center and the »creative quarter« are currently being radically transformed. The square is thus released from its peripheral location and converted into a center. The question arises of how it will not only allow passage as a connecting element, but also promote rest and social encounters (universality). The seminar examined the role of dynamics, primarily traffic, in this process. By designing 40 alternative scenarios, a range of possible reconfigurations of the square were examined in equal measure. The research through design process then described which basic approaches to a stronger interaction of the dynamics on Leonrodplatz could lead to a production of urbanity (relevance).

B15 Neu – A New Federal Highway (2016/17)

Lecturers: Sören Schöbel, Julian Schäfer

Expansion projects on federal roads can result in completely new routes. For the renewal of the B15 between Landshut and Rosenheim, a new line parallel to the old route is chosen, which largely avoids the previously connected villages as a by-pass. Following the established transportation planning paradigm as well as the principle of vehicle dynamics, the space is thus rapidly and safely crossed, but at the same time, the villages are cut off and the landscape is cut through. This is a common consequence of such expansion projects, but also of village by-passes (universality). The National Tourist Routes in Norway show that roads can also be designated as »appropriate« for the landscape. To show the diversity of possible relationships between landscape and road, research through design explores the opportunities offered by highway construction (relevance). The question was tested using a real-life example of a major section of the route. The designs produced by the students were clustered according to their principles, which in return can be applied to comparable cases of highway projects (reliability).⁶

⁶ M. Groos, another student, found the following principles: take the inventory into account, change, entertain the driver, enrich the environment, in contact with elements, efficient and useful, no time pressure, design discreetly.

Overhead Power Lines (2015/16)

Lecturers: Sören Schöbel, Julian Schäfer

The energy transition requires electricity to be transported inland from the large wind farms in the North and Baltic Sea. On one planned route, energy is to be delivered to Landshut via a so-called »high-voltage direct current« transmission line. The seminar focused on the question of how the high-voltage line from there to Munich could be designed more appropriately and, therefore, be more readily accepted by society – conceptualizing real alternatives instead of provoking citizen protests with an inescapable master plan (universality). The openness of this research aim required a designing approach, so the research through design method proved to be useful. The design results could best be explained as a picture, but here too we can also rely on established categories.⁷

Alpine Reservoirs (2014/15)

Lecturers: Sören Schöbel, Michael Schmölz, Andreas René Dittrich

The Alps are currently being discussed as a source and space for the production, but also for the storage of renewable energies. New pumped hydroelectric energy storages could serve as a kind of battery to secure the electricity supply in Europe, used for load balancing. This is opposed by the fear that these storages would disturb sensitive ecosystems on the one hand and local recreation and tourism on the other. So which landscape-related typologies of Alpine reservoirs can be developed that enable new methods of water retention and storage as well as energy production (universality)? In the first step, the ideas for new energy storages are elaborated and their complexity is illustrated in synthetic designs. The clustering of the designs identified the different levels of possible new categories. One group of students, for example, analyzed the »ideals« underlying the designs and differentiated these into objects, complex systems, and moods.⁸

7 For example, the two students L. Schmied and I. Hoffmann describe the approaches exaggerating (übertreibend), tracing (nachzeichnend), inventing (erfindend), guiding (geleitend), emphasizing (betonend) and subdivide them in play (spielen), strengthening (stärken) and ignoring (ignorieren).

8 The students E. Egerter, Q. H. Le and M. Hölzl named alluvial forest (Auwald), cascades (Kaskaden), unspoiled nature – hiding (unberührte Natur – verstecken), natural lakeshore (natürliches Seeufer), swimming pool (Schwimmbecken), path across water (Weg übers

Designing Landscapes by Ecological Systems (2014/15)

Lecturers: Georg Hausladen, Sabine Kern

Landscapes are always also ecological systems, understood as systems of interacting populations and species. The ecological system, however, is only one dimension of the landscape, which has manifold relationships with other dimensions, e.g. social or economic. Therefore, addressing the ecological dimension of the landscape cannot be reduced to questions of nature conservation and environmental protection. Although these fields represent key socio-political tasks, the concrete implementation of the associated objectives (e.g. the protection of a species) always also has effects on various social, economic and, not by the least, further ecological systems in the landscape (other species, agricultural or forestry systems, energy and material flows). The design of landscapes by ecological systems should take this into account. Based on an ecological object, e.g. a certain species, an interaction system or a material resource (water, air, soil), we ask for possibilities that arise from concrete realizations in relation to the other dimensions of landscape. The methodical starting point here is the fact that functionally equivalent systems (e.g. certain habitats) can be realized through different spatial designs that vary in social and economic terms. The aim is to break through conventional and dogmatic ideas of nature conservation through the use of a design approach.

Ecology as Technology (2013/14)

Lecturers: Daniel Czechowski, Georg Hausladen

Ecology is generally understood as a biological natural science, which is »applied« above all in certain socio-political fields of problems, nature conservation and environmental protection. However, a reduction of

Wasser), industry (Industrie), skywalk (Skywalk), lid (Deckel), adventure playground (Abenteuerspielfeld), aquarium (Aquarium), botanical garden (Botanischer Garten), island (Insel), water terraces (Wasserterrassen), walk in fog (Nebelwanderung), Alpenglow (Alpenglüh), skater bowl (Skater Bowl), Atlantis (Atlantis), boat trip (Bootsfahrt), reed landscape (Schilflandschaft), lake district (Seenplatte), waterfall (Wasserfall), amphitheater (Amphitheater), cage (Käfig). On the other hand, another group, F. Gutmann and T. Mezger, named the possible connection more broadly as emancipation, integration, composition, dominance, camouflage and harmony (Emanzipation, Integration, Komposition, Dominanz, Verschleierung, Harmonie).

ecology to the academic-scientific field and the few classical »application areas« obscures the understanding of its overall potential as a technology. As a natural science, it has a technological potential which by no means only serves the above-mentioned problem areas, but can be activated for the design of urban and landscape spaces. The aim of the seminar is to establish an understanding of ecology as a possible technological basis for design. Based on freely chosen examples, the students elaborate spatially varying solutions (designs), i.e. solutions that function technically in relation to the chosen task, but have different aesthetic and, ultimately, multifunctional landscape and urban impacts. Again, the methodical approach is derived from the aesthetic divergence of functionally equivalent solutions. Ecology as a technology is thus to be freed from the constraints of nature conservation and environmental protection and to be considered as a possible field for general spatial design.

Knowledge Produced through Architectural Design

Research as the »production« of new knowledge needs both creativity and system. Architectural design as a form of research entails extensive singular solutions to general assumptions. A systematic approach of dealing with creative conclusions has been called »abduction« in the philosophy of sciences and has been acknowledged in many social disciplines (among others). Abduction is the base of all kinds of »qualitative research«, representing systematic and transparent approaches to overcome preconception and creating new clusters of coherences of phenomena. Research through design in architecture as a germane method can benefit from the generally accepted quality criteria of qualitative approaches. Research comprises »creative and systematic work undertaken to increase the stock of knowledge, including knowledge of humans, culture and society, and the use of this stock of knowledge to devise new applications« (Organisation for Economic Co-operation and Development 2015). Architects produce knowledge in unique built forms. To turn specific solutions into general conclusions, a systematic and replicable methodical procedure is required. Thus, to discover or condense general knowledge from unique phenomena, social and many other sciences (maths, economics etc.) use the potentials of abductive reasoning and apply a systematic approach called qualitative research. Qualitative abductive reasoning is a systematic collection and interpretation of phenomena (e.g. design solutions or built

forms) as data, that intellectually interprets and critically scrutinizes their proper meaning and combines – clusters – unique with related phenomena into categories. Such categories or clusters are quite close to what architects call typologies – interpreted relations between phenomena.

For these qualitative approaches, quality criteria, following fundamental postulations of philosophy of science and theory of cognition, have been developed in the mentioned sciences. We claim that the similarity between qualitative research and architectural typologization can be used in the design-specific approaches if we do the same – accept, adopt, and adjust quality criteria of systematic research in what we call »Research through Design«.

The authors as head, research fellow and lecturer at the professorship of Landscape Architecture and Regional Open Space (LAREG) at the Technical University of Munich (TUM) have been teaching and conducting research in landscape architecture together for many years at the TUM.

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