Generating explanatory hypotheses

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1. Introduction

The shift of design towards acquiring the status of a discipline in its own right must be understood as a result of certain relationships between design and its environment. My following arguments will be based on the notion of 'creativity', and I will present the main structural conditions that derive from this notion. I will show that the identification and articulation of an epistemological object is a necessary result of the continual structural delimitations and specialisations of our discipline. Following on from that point I want to suggest that the 'practice of everyday activities' is both a productive and a natural epistemological object which outlines the contours of a reasoned approach to design research.

Creativity as an evolutionary principle

For millennia philosophy has sought answers to questions such as 'What must I do?', 'What may I hope?', 'What can I know?' or – 'What is it to be human?' In its great diversity philosophy has developed various discursive approaches to the generation of answers. But these statements do not serve as answers in the sense of solutions to a problem. On the contrary, the intention of many philosophical statements is to experience the problem as such. We assume therefore that the questions of philosophy do not exist to seek solutions but that their significance lies in the continual questioning itself. And since we assume therefore that the meaning of philosophy as a 'machine for the production of problems' lies in itself, the attempt to interrogate philosophy about its own meaning represents as unanswerable and circular a question as asking a human being ‚what it is to be human'. Design creates 'things', and for that reason our present observations bear some similarity to the problem of philosophy because we do not wish to assume either that a 'thing' acquires significance only if it functions as an answer in the sense of a solution to a problem. The description of design as a merely utilitarian or even objectivising problem-solving activity is as untenable as it is unprofessional, given our notions of freedom and culture. There is an intimate relationship between our enjoyment of forms and the autonomous significance of formed objects – a relationship that can be of general interest only if the conditions that result from it transcend themselves: in other words, if they become problematic. The interesting question, then, is the question of the principles that drive society and people to create such indescribable diversity within the general scarcity of conditions. In my view, the notion of 'creativity' is an excellent starting point for the question of how we can successfully act with the requisite art and skill under such circumstances. I would therefore first like to explain the principles and the constitutive conditions which this concept and its significance establish for our discipline.

2. The notion of creativity

The notion of creativity has become a topos of social self-description. Societies link their capacity for survival with the capacity and willingness of its members to be 'creative'. Creativity has become part of the calculus of our knowledge societies. It has become a technology and a survival strategy, and thus 'being creative' has become a duty for every one of us. Creativity requires three aspects: Creative people, domains of creativity and an appreciative environment.

Creative people

Designers are creative people who create a world of goods and services in which the cultural knowledge of an era expresses itself. Consumption thus becomes an act of civic responsibility since consumer societies cease to function in the absence of consumers with their permanent readiness for change and renewal. Certainly an interesting point. But what I want to focus our attention on is a

somewhat less polemical insight. Creativity first of all refers to the capacity of living systems to adapt to changing dynamic situations. Evolution in the sense of genetic creativity implies the process of developing certain features, the creation of variance, and their natural selection. Of course there is also the cultural dimension of creativity. According to Fromm (Fromm and Funk 1999) every growth process requires the creative maintenance of life and a continuous process of integration of humans with their natural and cultural environments. 'Creativity' therefore refers to the development of specific features, the creation of variance, and their natural selection. This process should be linked to continual learning effects. People and societies are therefore creative and strive for growth in order to solve two fundamental problems: the survival of the individual and the co-existence of the many. On the basis of these conditions people act with a lot of creativity and imagination but also with destructive attitudes and energies. Within societies certain institutions and formal structures emerge in order to direct, contain, organise, and formalise these powers. In societies that are organised according to the principle of division of labour we find structures that differentiate between creative and non-creative roles, with corresponding role models and task profiles. We find such structures at all levels of society. This unnatural order has now started to shift and is being replaced or complemented by non-formal structures in which 'consumers' liberate themselves to become 'autonomous consumers', and people discover creative liberties in order to realise that they are agents of their own actions and to initiate creative shifts of the boundaries of these normative orders. We shall see that the development of such non-formal structures implies opportunities for creative people and thematic challenges for the so-called domain of creativity.

Domains of creativity

'Domains of creativity' include places where creative people are trained and educated in order to enable them to carry out creative activities. Art schools and universities are such places; they operate according to their own rules and have a particular way of reflecting social conditions by representing, criticising, or even reversing them. These places are formal social institutions. They are the places where normative decisions are made in order to provide answers to the following questions: Who can be regarded as creative? What does it mean to be creative? What are the judgments and norms on which such evaluations are based? Who determines these norms? Historically speaking such 'domains of creativity' have developed into social institutions and centres of power which for the most part work on the rationalisation and standardisation of the arguments that arise in the course of the evaluation of our cultural production. Depending on our particular ideological approach we can regard these as principles of social exclusion, as processes of academic border control, or simply as censorship. What we see here is the fact that a 'domain of creativity' delimits itself. In doing so it draws a dividing line between certain communications and their outside. The problem of circularity describes the self-reinforcing phenomenon that the feedback loop of present behaviour will influence future behaviour. What does this mean for our case?

The material documents of our culture are evidence of the obsessive tendency and capacity of our species to create innovation with cultural means. Systemically speaking we therefore need to ask whether such operations result in genuinely new relations of meaning within the spirit of our definition or whether we are simply dealing with precisely the kind of circular operations just described? Such circular operations are characterised in particular by the fact that they perceive within their environment only those phenomena that fit their topics, or, as Luhmann would say, only what is compatible with the meaning of previous communications (Luhmann, 1987). As creative beings, humans and their cultures are therefore systematically at risk of continuously reproducing themselves through such restrictive, standardised perceptions.

According to the essential meaning of our definition, the 'domain of creativity' would therefore need to consider questions that self-critically target itself so as to open itself to the kind of semiotic relationships which can only be produced through the arguments of outsiders. Indeed, understood in that sense, the critical questioning of self and other would have to be the principal operation within

that domain. The institutionalisation of creativity can cause a deceleration of the very dynamics which are its root cause. But it also stabilises them through positive reinforcement.

The appreciative environment

What are the features that characterise an 'appreciative environment' which has the capacity to withstand such a programme of relentless criticism and re-orientation? I do not see any substantial problems as long as we are careful not to transgress the scope of our operations. But in our attempt to reflect, negate, or even reverse things as they are we must necessarily reach beyond normative boundaries, and that is why creativity in the sense of a social practice of renewal is rife with conflicts, and in extreme cases even results in destabilisation. The example of science demonstrates how 'domains of scientific creativity' deal with the possibility of a thematic 'suicide' and how the forms of their social organisation mitigate the risks that are structurally inherent because of the natural instability of their subject matter. Thomas Kuhn coined the term 'paradigm change' to describe how these internal mechanisms of science operate.

Let me state one point right from the beginning: I understand the institution of science as a whole to be nothing else but an attempt by creative people to create a domain within their own culture which provides them with protection and capital but which also regulates them and evaluates their performance according to various rules.

If that is our understanding of creativity we will recognise that the same creativity that leads to diversity necessarily also leads to selection criteria, judgments, and normative conditions – because as rational creatures we use arguments based on notions such as scarcity, truth, or beauty in order to implement boundaries. If these rules are recognised, their mentality spreads until they become the principles of a whole society, as illustrated in the notion of a knowledge or science society.

The crucial point lies in the fact that the appreciative environment is increasingly concerned with procedures by which the creativity of such domains can be assessed and evaluated. And we can be certain that the environment will change its assessment of scientific creativity to the same extent that it develops its capacity to make relevant statements about the operative mode of productions within such domains of creativity. Science communication has become an important topic because societies wish to develop the capacity to make such judgments in order to secure their own survival. The Swiss National Fond writes in its most recent multi-annual plan:

"The SNF wishes in particular […] to align its science communication with the objective of increasing public awareness and understanding of fundamental research".

Epistemological problems are thus complemented by issues of communication and evaluation. In addition to its essential purpose of epistemological work this 'domain of creativity' now also faces the challenge of developing procedures of negotiation and evaluation and applying them to itself. Since the diversity and quantity of irreducible information in our virtual and in our material culture has acquired a considerable density of meaning, we can safely assume that normative evaluation procedures will also evolve within the sphere of cultural production, i.e. in the field of design. And we can also assume that such assessments will be undertaken according to criteria and aspects which the appreciative environment can evaluate and integrate into its own communications.

I have explained a number of structural conditions that are relevant for us, too, and which place our pure creative powers in a relationship to people, their organisations, and their environments. The key point concerns the insight that we must develop and lay open not only the procedures by which we create diversity but also the criteria that guide the selections and choices we make.

The domains of science provide insight into the specific structural conditions within which the social organisation that is necessary for the required systematic development of the discipline's raison d'etre can be developed in such a way that it will not be misunderstood as either a process of exclusion or as censorship. Such mutual exchange between internal freedoms and external norms is indicative of the fact that the relationship which a discipline must establish towards its conditions is a reflexive one.

3. Design and / or science

In the second part I now wish to explain why the emergence of quasi-scientific structures in the field of design is inevitable if it wants to remain compatible with further communication. I will outline the developments which our discipline has undergone or is undergoing on this journey. Then I will show how the continuing structural closure of our discipline operates and why such closure is necessary in order to maintain its relationship with an appreciative environment. In 1786 Friedrich Schiller wrote to Goethe:

"Man cannot be transformed from a sense creature into a rational being unless he first becomes an aesthetic being" (Schiller and Hamburger, 1995).

No doubt this insight into the necessity of the artistic education of society had no small part to play in the establishment of art and craft schools throughout Europe about one hundred years later. Their history – and thus also: our history – can be understood as a symptom of the bourgeois desire for reform, as an expression of a civilised collective mentality, or, quite pragmatically, as education policy. In any event we recognise in this process not only developmental stages in the field of European collective mentality but also the history of its academic institutionalisation. Such institutionalisation or classification of a field of knowledge as science has often been quite controversial. For example, it was only during the latter half of the 20th century that sociology established itself in universities. The same is true for ethnology, political science, and economics (Rüegg and Briggs, 1993). These facts are particularly interesting when considering that the subject matters around which these disciplines revolve have always been of particular interest to people and that to us today the necessity of their scientific examination seems to be self-evident.
Two dominant lines of development can be identified within the journey towards increasing institutionalisation of our discipline. One traces the emergence of an academic discipline, the other indicates the field of 'art and craft' positions whose protagonists derive particular pleasure from their various attempts at eluding formalisation. The 'battle zone' of our discipline was clearly articulated in an apodictic statement made by Sigfried Gideon, the architectural theorist at ETH Zurich, already in 1926. He wrote on the subject of arts and craft education:

"The type of designer who revels in matters of taste and aesthetics is on the way out; he is replaced by the inventor type who deals in technical design. There is no longer any atmospheric pretence to arbitrary lines. Inventions are hard insights" (Giedion and Huber, 1987).

The Bauhaus school and particularly the Ulm School of Design are further stages within the European discourse. The debate around the question of 'science vs. artistic-design practice' continues to this day. It is manifest, for example, in the disjunctive structure of the discipline and its subject matter – the position of design between a university with degree-awarding powers and a vocational college of further education. To our environment, the distinction between these different learning pathways appears arbitrary: a difference that seems to others to be as irritating as it is illuminating – to students, to employers, to members of the legislative, and to education policy makers: to the entire environment. Even though we can live with this situation, the environment needs arguments in order to be able to recognise the necessity of different models. It would be important to explain the various arguments advanced for the necessity of university education and how it differs from vocational training. The function of each 'domain' must be argued and explained, and so must the services which they provide on behalf of their appreciative environment. The result of such attribution of function would be a productive boundary in the sense of a discipline, a boundary that marks a difference. It does not matter whether the required arguments are axiomatic in nature or whether they result from normative decisions. The point is rather that they must have recursive effect, i.e. the effect that continual delimitation results in the emergence of a discipline, and that the representation of the necessity of a discipline requires delimitations.

Structural delimitation of the discipline

I will now present some of these delimitations and show how a successful formalisation of the discipline can occur in a process of increasing differentiation.
If we understand design to be an investigative practice, then the first important distinction that we must make concerns the notion of the research object, which must be sufficiently different from other objects and which must yield recognised results. Another distinguishing feature consists in the development of theory as an integral part of this epistemological task. The documentation of the history/histories of the discipline, which serves to clarify its specific processes and/or results, would provide another important delimitation. Further delimitations result from the establishment of different learning pathways within the discipline as a consequence of its increasing specialisation. Specialisation is a form of internal differentiation, based on the variation or extension of the topics and materials of the discipline, on changing media, on the process character of its operations, and on political and other social developments. And finally the discipline can achieve closure by allocating sovereign functions. 'Swiss Design', for example, stands as a synonym for certain qualities which can suddenly take on the character of warranties. Such functions can imperceptibly develop into legal relationships. The warranted qualities can become an integral part of the normative legal relationships that emerge between planers, producers, and users. The development of structural boundaries serves the purpose of producing functional compatibility between our discipline and its environments. Each boundary is therefore the result of specific environmental conditions.

Emergence of the discipline as a result of relationships with the environment

The discipline thus emerges through the development of boundaries which establish the discipline as such in terms of both its content and its function. In other words: It is only this delimitation which makes the discipline clearly identifiable for its environment and which provides the criteria for its recognition and acceptance. The process by which our discipline becomes more systematic and formalised is therefore inevitable. This process has a direct functional relationship with other social objectives, articulated in notions such as efficiency, sustainability etc. Our domain is now called upon to provide evidence that we give due consideration to these objectives, to demonstrate the way in which we propose solutions, and to articulate the success criteria by which our work will be measured. Our task can therefore be described as follows:

- Identifying the object of our research
- Developing a systematic research practice
- Engaging in the practice of documentation and publication
- Developing a theory and historiography
- Ensuring dissemination of knowledge and transmission through teaching
- Monitoring and evaluating the approach to research

What emerges here is the clear profile of a discipline that ensures the operation of specific functions vis-à-vis its environment and for which it gains acceptance and recognition in return.

The object of research

International design research has come of age. Since the 1970s scientific journals, conferences, academic committees, and doctoral awards have emerged. A lot has been written about design, design thinking, design values, design qualities or design methodologies. But how do we escape the main predicament, which is the fact that we may very well lack a unifying centre as the focal point for our scientific endeavours as a discipline. The interests of design appear to be so diverse that certain tasks are perhaps better undertaken by the architect while he is already at it, that they should actually be left to craftsmen altogether, or that it is irrelevant whether or not we proceed methodically as long as we achieve the right outcomes. Our discipline struggles with identifying and articulating its specific subject matter. In this context I am making the following assumptions: As an 'Institute for Design

Research' we will engage in a systematic approach to the question of how to articulate the difference to conventional design methodologies and how to put forward arguments about the subject matter of our research. This seems important to me because our environment will not be satisfied if we merely put a label that says 'design research' onto a tin which actually contains design. We need a delimitation in terms of content … a position which we can assume and qualify in which the profile of design research emerges more clearly. Let us find a point of departure.
Instead of remaining within the plurality of things that we have designed and looking out into the world from that vantage point I propose that we define a place from which design takes an analytical look at the plurality of objects, at their emergence, their legitimation, their functional operation, and their conditions. It is from such a place that we observe people and their perceptual processes: their self-experience with the things that we provide for them.
Design operates with stimuli. It liberates a stimulus in the assumption that this stimulus will lead to a response, i.e. that the stimulus encounters an internal model, that it is confirmed there, and that it constructs an experience. The designer understands himself or herself as an integral part of the experiment, transforming the self-experience with the stimulus into a general principle. We can therefore identify the conventional practice of design as a process of extrapolation because we extend assumptions about behaviour beyond the knowable area of our own experience. Cognitive science tells us that human self-experience is not a process in which sensory stimuli are projected onto an internal model of the world. Self-experience takes place only when people actually interact with things. Interaction is the cultural and sensorimotor coordination by which the human perception of reality is constructed. If through design we intend to plan the use of things and the resulting behaviour of people – and I assume that that is what we intend to do – and if we accept the insights produced by perception research, then it becomes clear that the epistemological interest of design can be concerned with the 'thing in itself' only in an instrumental sense. Our actual epistemological interest should revolve around the practices of people, because it is only through them that things acquire their significance. I would therefore suggest the following simple definition: The meaning of a thing is its use in practice. We are now in a position to identify the following research object in the sense of an ethno-methodological design science: Design research designs the use of things on the basis of the assumption that things are only designed in and through their use. The object of design research is therefore connected with the question of how we integrate people into our design practice.

The role of experiments within the field of design research

Design would thus be engaged in a journey from a previous model of a purely descriptive practice towards the status of an experimental-analytical and applied science with causality-based explanations. The object of design would be re-defined as an 'instrument', and the participative experiment of design, which involves its users in the experiment, would become its principal research method. From the perspective of the theory and sociology of science, the scope of research is defined through notions such as 'experiment' and 'hypothesis'. If we transfer our experiments into the everyday lives of people, the scope of our research would not be defined as a specific place. Instead, our experiments are always conducted under real conditions. Model and reality become one and the same!
From the perspective of application the convergent set-up of such experiments is interesting because they abolish the boundaries between model and reality as well as the boundaries between planners, producers, and users. As a result of the transfer of such an experimental culture into the everyday reality of people new concepts emerge with regards to social figurations, design cultures, and role models. Wikipedia, Facebook, Google, and similar examples demonstrate the potential of such real experiments, which evidently emerge through the participation of many. In recent years we have already begun to test such approaches at our Department. Whether it is conducting research into new forms of interaction between banks and their customers, the development of digital repositories, or the use of computer games for the therapy of paraplegics: the point is always to integrate users into open

experimental developments as active participants through the creation of innovative instruments and to derive insights from these experiences, for both designers and users. Thinking of design as an experiment opens up a form of knowledge which is experienced immediately and which is therefore unmediated (Mormann, 2007). With this relation to reality, design as experiment becomes an 'explanatory hypothesis'.

The development of explanatory hypotheses

The instruments designed here and the experimental experiences in dealing with these instruments define the notion of 'explanatory hypotheses', which I used as the title for this lecture and which, according to Peirce, the theory of science describes as abductive research (Peirce, 1931). According to the definition, abduction does not start from a known rule but rather from a surprising experience, something that causes a participant in the experiment to entertain serious doubts about his or her current concepts. In our case the instrument that we have developed is an explanatory hypothesis if the experiment converts a surprising self-experience into a rule. The experiential possibility deposited in this rule interprets each further surprise as an instance of the rule that has been constructed. The element of surprise is thus abolished through a new rule (Peirce, 1931).

Epistemological consequences

But can we describe these rules – let us call them insights – as the knowledge of our discipline? Which forms of knowledge do we recognise in the field of design? What are the epistemological consequences? From the perspective of a history of ideas, design has claimed far less scope for artistic freedom than we might assume. The history of design is the history of a discipline that investigates various restrictions and conditions which impose functional-holistic restrictions onto the almost infinite potential of human creativity and inventiveness. In the sciences, such exploratory processes lead to theories, methods, processes, and techniques and form a more or less systematic body of knowledge. It supports a reasoned and systematic approach, and to a certain extent it makes didactic transmission of design possible. We can then identify declarative knowledge in our instruments. Both the use of instruments such as the computer and the design of instruments can be described as making knowledge abstract and objectifying it. Something that used to be the exclusive domain of a specialist suddenly becomes open to anyone, because the instrument objectifies and of course simplifies the application of specific rules. And finally we can state that the use embedded in the thing embodies the procedural knowledge which we experience through interaction with the instrument. Such knowledge is exclusively created, transmitted, and tested in the experiment, and it lies with the user. Phenomenologically speaking we can thus identify different forms of knowledge. But it is difficult to represent this knowledge in a form that is general and compatible for further communication. This epistemological complication leads to the question of how to communicate our insights. A part of our work will revolve around the question of how to explain our insights. What is certain is that we will not simply continue to exhibit the instruments. Instead we must show not only the instruments but also the ways in which they were subjected to experimental testing and the experiences which they communicate. That is the only way in which the design of experiments can lead to general insights. We are therefore looking for a practice of discourse and documentation which is compatible with further communication and with which we can show how such a form of communal experimentation opens up new potentials for self-perception and self-experience. Such a practice will also serve to explain the reasons and foundations of our designs. To declare such a systematic approach is a programmatic statement.

4. Further prospects

A culture of questions

If we want to be creative within the meaning of the term as defined in the beginning, our thinking must reach beyond what appears as the given structure today. We must expand from our current

position and complement the culture of inspired action with a culture of disciplined observation. We must therefore develop new questions in order to develop a better understanding of our structures and institutional patterns, their constitutive elements and their effective relationships, precisely because they shape our self-perceptions. And it is from such an approach that we automatically arrive at fundamental notions such as autonomy, trust, or certainty. These terms are fundamental because they use the means of language in order to indicate the structural conditions within which people can determine their own development. If we apply these terms, we can create new relationships with reality in our designs, and we can express them with our own resources: not in the sense of narcissistic self-observation but rather with the intention to develop the contours of a responsible and autonomous existence – as human beings and as designers (Arendt, 1958).
What then are our questions?
How can we trust in products or processes which we are unable to fully comprehend but which determine an important aspect of the quality of our lives? What does it mean to trust a language of aesthetics? How do we perceive trustworthy conditions and how do we stage them? What is the correlation between the inevitable perception of unstable conditions and our natural desire for safety? What is complexity? What happens when we simplify, trivialise, or falsify facts by producing a mere illusion of simplicity and transparency? How do we mediate the relationship between autonomy and boundary? Such questions relate to the implicit expectations which people have with regards to their institutions as well as their material and visual environments. It is precisely in this approach to design research as outlined today that I recognise its transdisciplinary mission. Transdisciplinarity refers to the integration of the whole of society into the discourses with which we negotiate our future. Not only the disciplines and not only science as a whole but the totality of social practices is declared to be an open experiment. And if we want to achieve more with this experiment than just manage or entertain people, then we must show ways in which people can experience themselves as initiators of their own actions under such conditions. We must therefore ask different questions in our experiments and test new structural conditions in which the related notions of autonomy, trust, and safety can be realised. The crucial question for design, in my opinion, is the question of how interaction itself can become an aesthetic potential. The new questions begin where the old answers leave us.

Conclusion

In summary we see the contours of a dual challenge. On the one hand we must arrive at a more systematic approach to our discipline and the conditions that shape it. This requires a precise understanding of those conditions in order to be able to exert a meaningful influence. As the emergence of the discipline continues, academic norms and ways of working as well as forms of documentation and approaches to research will emerge. And we will be thinking about the academic mechanisms that decide issues concerning the allocation of reputation or the quality of research. While systematizing the creative disciplines we secretly aim for a more thoughtful creativity, as a critical ressource of the civil society.

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