DEBATE

"Everything is under control" – Reason for comfort or for alarm?

A discussion of "Can 'converging infrastructure' secure jobs in TA institutions? A polemic" by Yannick Julliard

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The notion that scientists are primarily interested in expanding their (research) agenda is a popular prejudice among professional engineers. If we ask why business and engineering strive for advances, such as 'autonomous driving', the answer is: "It's for the greater good." The use of autonomous driving by individuals hardly solves any of the problems we face in society today (especially if we take into account potential rebound effects), but it may help to sell new cars because conventional cars would then appear old-fashioned. Also, from the perspective of an inventor, we presume it is interesting to see if autonomous technology actually works. That is more than enough to go ahead (often supported by enormous public funding). Therefore, the promised polemical nature of the reply proves to be more a tautology: Scientific research has always had something to do with self-interest, i. e., *curiosity*. However, the focus of TA is not on self-reference in this sense, but on societal problems in order to elaborate the knowledge relevant for decision making. The scientific TA community is regularly asked to critically oversee ongoing developments, to provide recommendations for the potential implementation of technology, or to participate in larger interdisciplinary projects. Anyway, we admit that 'converging technologies' (CT) as such are nothing new; on the contrary, in many areas it is business as usual and old trope. Therefore, our concern that we might have reached too far was unfounded. On the flipside, we have learned to be alarmed if business people and engineers claim that everything is under control. TA researchers, especially, are then motivated to take a closer look, particularly if transition processes may lead to completely new and more complicated sociotechnical constellations.

On a more serious note, there seems to be a misunderstanding that we might have created with our academic style of writing related to the term 'problem'. By using the expression 'sociotechnical problems' we do not mean to imply that converging infrastructures represent a problematic development. For some, it seems that CT has assumed there is unstoppable momentum in the evolution of modern, digitized infrastructures, as natural as "gravity" as Julliard has observed. We, in contrast, have tried to lay out an analytical heuristic to better understand the ongoing challenges posed especially by large scale projects like energy transitions and converging infrastructures. Problems posed by control, change, and action concern technical and social aspects; they can never be permanently solved, but must be solved over and over again at different points in time. The author of the reply provides some evidence how this works in practice:

- According to Julliard the *problem of control* refers to the "balance of rights and duties of infrastructure developers and operators." Julliard claims how "benefits and secondary effects, the risk and societal cost have been subject of intensive research, political discussions and regulations." Julliard also reports how "hundreds of different regulation and deregulation models around the world […] [with a focus on] how to deal with monopolization, access for individuals to infrastructure services, rights and duties of operators, cost and profitability, threats to data privacy etc." have been developed. That points to the fact there are different institutional solutions, tested and tried in different circumstances and jurisdictions, that are subject to constant evaluation and adjustment. From our point of view, these descriptions highlight the contingent nature of solutions[1] and also show how the complexity in this field seems to increase constantly. It is not plausible that somebody (a professional person or organization) is capable of processing the multitude of variables and their interrelations in this complex. We could easily point to some infrastructure projects in Germany that have infamously been challenged recently.

https://doi.org/10.14512/tatup.30.1.76

1 In a formal, abstract sense, contingency means a solution for a specific problem is neither impossible nor necessary. In a positive sense: a solution in one situation can also turn out differently in another.

- With the *problem of change* Julliard refers to "understanding transitions of infrastructure systems". For TA it is interesting to investigate the different solutions for fostering change and to understand the dynamics involved. Here, we have to admit, TA can learn a lot from practitioners in the field, who, like the author of the reply, offer experience in "piloting, trialing and implementing intelligent infrastructures from strategy planning to operations […] in ecosystem partnerships where policy makers, research institutions, the public and industry worked together." In this dimension of sociotechnical problems, where technical innovations and institutional settings evolve, TA and affiliated disciplines in many cases offer only broad normative concepts (e. g., sustainability). Our specific interest here is to analyze how needed social change can occur in practice and be fostered despite the need for stable orientation (e. g., norms, rules, and routines).
- The *problem of action* points to a basic need in any social arrangement where all the participants want transparency, clarity, long-term planning security, and so forth. In our limited experience in conversations with practitioners from industry, almost everybody emphasized the opaqueness and the lack of certainty in transitions. Julliard claims that "decision making under uncertainty for long-term developments in large scale projects has been well understood and is not new (I am not saying, it is not complicated and cumbersome). Processes have been put in place that take a broad perspective on TA related questions. […] Clearing processes, environmental assessments, public participation to cite a few, are day-to-day operations in infrastructure projects." If this is the case, why are representatives of the industry demanding that politics has to provide for certainty? And how (from whom and from where) can politics receive its share of absorption of uncertainty (March and Simon 1993, S. 186) in order to make and execute enormously consequential decisions? These are questions that the diverse and interdisciplinary TA community finds interesting and worth investigating, especially in regard to large-scale societal transformation processes.

The diversity and involvement of many disciplines in TA points to the next misunderstanding, as Julliard seems to nurture a rather limited view of TA that is the "reflection on new ethical or philosophical categories". The focus in TA is not only to reflect on normative orientations, but also to evaluate developments with respect to their potential to meet normative goals. TA also aims at analyzing systems or the effectiveness of policy options in changing sociotechnical structures. Thus, TA in this broader sense can only be realized as an interdisciplinary effort among philosophers, sociologists, engineers, economists, psychologists, political scientists, etc. The exciting challenge nowadays is to bring together meaningful perspectives to better understand and to be able to deal with complex phenomena. In this context, the special topic also served the internal function of organizing interdisciplinary work along certain problems arising with ongoing transition processes.[2]

As we attempted to show in the special topic, the reference problems (control, change, action) provide some common ground for integrating interdisciplinary work. By directing researchers' attention towards more abstract, categorial problems, the opportunity arises to

1. find reference according to familiar theories and methods as well as
2. go beyond the limitations of their academic disciplines.

Therefore, the intention underlying the concept of sociotechnical problems is also to offer support for organizing interdisciplinary research. Still, for synergies to emerge when promoting interdisciplinary research, integration and autonomy need to be in balance by maintaining that each relevant discipline is represented with its core concerns and capabilities. The idea of reference problems, such as control, change, or action, is based on this quest to achieve *cognitive* integration of research projects, as opposed to a mere *organizational* integration.

Reference problems (control, change, action) provide some common ground for integrating interdisciplinary work.

Organizational integration relates to a rather loose collection of projects, dominated by autonomous research conducted by individual partners, i. e., a division of labor according to discipline. The collaborating disciplines have a high degree of autonomy, while the cognitive integration with regard to common theories or methods tends to be low. Here, the opportunity to achieve novel insights stemming from interdisciplinary synergies might pass unnoticed. In contrast, a high degree of cognitive integration could mean, in its extreme realization, that only one research paradigm (or theory or method) is used and mandatory for all, typically leading to a high integration with regard to

2 These ideas have been developed in the last years in projects like the Helmholtz Alliance ENERGY-TRANS and the European Union's Horizon 2020 SHAPE-ENERGY in collaboration with Patrick Sumpf and Jens Schippl. See also for reference (Büscher et al. 2018) and (Sumpf and Büscher 2018).

scientific content but a low autonomy of the participants when it comes to unfolding their own concepts and ideas. This may lead to misrepresentation and long processes of reaching consensus on basic terms and definitions. In order to evade the negative outcomes of mere organizational or paradigm-based integration, a viable alternative may consist in exposing *commonly shared reference problems*. Interdisciplinary work is feasible when references to a commonly defined nucleus are established, while participating disciplines may contribute using their own approaches (i. e., theories and methods). In this way, research partners retain their disciplinary autonomy, which is what helps unfold their full potential. The reference problems approach aims to bridge the gap between multi- and interdisciplinary notions by preserving cognitive abilities and disciplinary achievements and yet achieving integration on a research problem level. This approach embodies problem-oriented research more generally, such as technology assessment (Grunwald 2019).

We are constantly working on scientific problems: How can we observe what is happening in the world? What concepts or models do we need to control our observation? In this light, the special topic represents an experiment – hopefully someone gets some inspiration out of this. We certainly do not want to scare practitioners in the field by calling for more scrutiny. Quite the contrary, a constructive discourse with practitioners is highly valued.

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https://doi.org/10.14512/tatup.30.1.74