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Attending to how We Think about Technology

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Reflection note

Attending to how We Think about Technology

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When I started at the Department of Informatics as a PhD student with Ole as my supervisor, it was the first time I encountered researchers who studied technology in a use context. My training in engineering had provided me with knowledge of how technologies were constructed and how they worked. Later, my work experience had shown me that also adoption and usage of the technologies were complex and interesting phenomena. I was exhilarated to become part of a research community which worked in a tradition that built back to pioneers in computing like Douglas Engelbart and Hubert Dreyfus and which applied the thoughts of philosophers like Heidegger and Wittgenstein to questions of technology. The research group in Oslo had emerged around Kristen Nygaard's work on direct user participation and action research in the Scandinavian tradition of participatory design. As part of this strong orientation to use and users, the wider research community we were introduced to, comprised people who studied empirically how humans encountered and worked with technologies. For instance, during the first supervision meeting Ole gave me Lucy Suchman's classic book "Plans and situated actions" (Suchman, 1987) to read. Thus, an important basis for the local research community was this rich tradition of ethnographic and ethnomethodological studies of the interplay between people and machines. At the time, this community was not strongly defined by disciplinary or sub-community boundaries. We read across multiple streams and would meet in different events; sometimes in computer-supported collaborative work (CSCW) events, sometimes science and technology studies (STS) events, sometime in other informatics-focused events. Through becoming part of this community, I realized that there exist a language and vocabulary for things I had observed empirically but did not (at the time of observation) have conceptual resources to talk about—technology use by individuals and organized collectives.

As a new PhD student, I also had to create a plan that included courses, and I searched the course catalogue for what seemed relevant to my PhD study. When I told Ole that I had found one course which looked very relevant, which was called "information infrastructures" and dealt with large-scale, inter-organizational infrastructures, he just smiled and said that it was a good choice. He was not the kind of supervisor that imposed his way, although I think that if I hadn't selected the course myself, he would have suggested that I followed it. As a PhD student I experienced a lot of freedom to explore exciting themes and research strands, and Ole's door was always open if we wanted to discuss something. While Ole would tell all PhD students that they ought to read more (and would also lend us his own books), there weren't a strictly defined canon or direction that limited us. On the contrary, often we would read and discuss works from multiple strands and disciplines. I consider myself lucky to have experienced that there was room to follow my intellectual curiosity and not be limited by a strategic discipline-oriented agenda.

Well, I joined the course on information infrastructures, and I was presented with a truly novel perspective on technology. Here wasn't just the same old and tired talk, but something different; a figure-ground reversal that allowed thinking differently. One aspect of this was the attention to that which wasn't often talked about. For instance, Bowker's (1994) notion of *infrastructural inversion* helped shift our attention from the outcomes to the constituents of an infrastructure. Asking what makes an infrastructure work helped to see what is usually hidden, e.g., the role of standards in shaping the world (Star, 1999). Another aspect was the starting point in taking complexity seriously, not trying to eradicate or control it.

One of the pillars underneath the information infrastructure perspective is its ontological foundation in complexity sciences. Perspectives drawing on complexity science had been applied to technology (e.g., Arthur, 1989; David and Bunn, 1988). This ontological basis proved useful to explain the reasons for the experienced complexity of information infrastructures, such as a high number of interacting yet independent agents, interdependencies, and feedback mechanisms. The complexity science pillar also provided resources to formulate alternative management approaches where adaptation and learning-orientation were foregrounded. The other strong pillar was a deep awareness of the practical complexities of sociotechnical interplay, coming from the empirical studies of actual technology implementation and usage. While the complexity science stream may be more theoretically oriented, this reliance on empirical research helped to build on the base of actual, practical experiences. It also provided significant conceptual resources to the information infrastructure perspective, both from historical studies in the Large Technical Systems stream in STS (e.g., Hughes, 1987) and from the stud-

ies of work and organizing using ethnographic methods. These studies had nuanced descriptions of actions, collaboration, tool use, etc. and how these were impacted by infrastructural project that went "beyond a single event or one-site practice" (e.g., Star and Ruhleder, 1996, p.113). The use of actor-network theory supported the application of a complexity-aware empirical attention to details of the technology in use (Monteiro and Hanseth, 1996).

A strong tendency in the early information infrastructure literature was its polemic against the traditional approaches to technology management; approaches that don't take complexity as a premise and starting point, but instead try to eradicate and control it. This is evident in the collection of stories presented in Ciborra (2000), which centers on stories about how the control approach generally would fail organizations that sought to build corporate information infrastructures, while more adaptive and cultivation-oriented managerial styles were more successful. Also, the subsequent case collection (Hanseth and Ciborra, 2007) represents a critique of naïve beliefs in technology as solution (concretely the book addresses the hype around integration and demonstrates that not only does it bring benefits but also increased risks). The emphasis on telling stories instead of developing traditional theoretical models, I think is related to the foundation in complexity science. In complex systems it is futile to try to detect and uncover all relevant causal mechanisms to a degree that allow predictive value. Instead, there is a value in collecting evidence of how the system behaves (i.e., stories) in order to detect patterns in its behaviour and articulate a more heuristic-based knowledge of do's and don'ts, i.e., building an experiential knowledge basis (a parallel form of such experiential knowledge can be to a doctor who, besides her basic training and knowledge base, is able to develop and finetune her intuition through being exposed to thousands of patients over time). The vocabulary (i.e., the conceptual tools) emerging from these early information infrastructure studies could be seen as helpful complements to existing systems development processes: the new concepts could for instance help practitioners detect and offer attention to the installed base, and to recognize the significance of the interdependencies over space and time. At the same time, the II perspective was better aligned with the more radical critique of systems development processes presented by the agile software approach with which it shares several similarities although addressing different audiences.

The larger mainstream IS research community was for a long time not much concerned with the phenomenon of large-scale, inter-organizational infrastructures (Sørensen, 2016). When shared digital infrastructures grew in prominence and importance, this changed, and now the platform and ecosystem level has become a major research theme also in IS. Some of the authors who built on the information infrastruc-

ture perspective, started to use the easier and more empirically oriented notion of *digital infrastructure* (e.g., Tilson et al., 2010). This has perhaps backgrounded the information component which had its roots in the strong early influence from information science, exemplified by the theme of the role of classification systems studied by Bowker and Star (1999).

With the publication of Hanseth and Lyytinen's joint paper (2010), the focus shifted from predominantly descriptive analysis and polemic against traditional approaches, towards providing normative and prescriptive guidance for how to go about establishing information infrastructures. The following years also saw an expansion in topics of the information infrastructure studies, from the initial studies of development and evolution processes, towards studies focusing on architecture and governance approaches. This also provided more alignment and dialogue with managerial concerns and dilemmas (see e.g., Bygstad and Hanseth, 2016). However, Ole also continued more theoretically oriented explorations and brought *assemblage theory* into the IS field (Hanseth and Rodon, 2021). This demonstrates his broad scope of reading and commitment to intellectual exploration.

As such, Ole's choices aligned with the classic role as a scholar. While I do think it is legitimate and worthwhile for researchers to develop solutions to practical problems and contribute to innovations, these things (solving problems and innovating) are also pursued by practitioners and non-academics. The unique role of the academic scholar is to be concerned with how we *think* about phenomena in the world. To question how we think, how we organize our thoughts about the world, and to ask whether the received theories, models and framework as sufficient to understand and deal with new phenomena, are tasks that aren't easily available to practitioners, but is the main purpose of the academic institutions. If we employ Sandberg and Alvesson's (2021) taxonomy of theories, the information infrastructures theory isn't primarily a traditional explanatory theory which offers a basis for predictive and prescriptive knowledge. Rather it resembles both an *ordering theory* (where indeterminate and ambiguous phenomena are given meaningful form through concepts) and a *provoking theory* (that seeks to re-construct and reframe phenomena we think we already know well).

Ole's work, based on a combination of technical insights from his training in informatics, his comprehensive reading, and ability to question and see the significance of concepts has resulted in a lasting and valuable contribution, as we now have a better understanding and comprehension of the complexity associated with the large-scale, deeply embedded infrastructures that are so important in our current world.

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