

# Alignment Work and Epistemic Cultures

Corinna Kruse

*Department of Thematic Studies – Technology and Social Change, Linköping University, Sweden/  
Corinna.Kruse@liu.se*

Antti Silvast

*School of Engineering Sciences – Social Sciences, LUT University, Finland*

## Abstract

This article closes the special issue *Alignment Work for the Movement of Knowledge*. It argues that the concept of alignment work, through making it possible to think about collaborations of different epistemic cultures, provides a useful addition to Knorr Cetina's (1999) concept, keeping it relevant for current concerns in Science and Technology Studies (STS). The article discusses central issues in STS, namely how different academic and professional cultures exchange knowledge, including trading zones, boundary objects, and aspects of Actor-Network Theory, alongside an interest in epistemic cultures and knowledge production. We argue that and demonstrate how knowledge exchange can be understood through epistemic differences and their persistence in collaborative work.

**Keywords:** Epistemic Cultures, Alignment Work, Movement of Knowledge

With this paper, we close the special issue on alignment work for the movement of knowledge<sup>1</sup> and set the research papers into relation with a larger STS discussion. In particular, we want to discuss how the concept of alignment work at the core of this special issue constructively contributes to central issues in STS concerning how different academic and professional cultures exchange knowledge, including theoretical tools like the trading zone (Galison, 1997), boundary objects (Star and Griesemer, 1989), and some aspects of Actor-Network Theory (e.g., Callon, 1984; Latour, 1990). In doing so, we are particularly interested in how the concepts of and research on alignment work keeps Karin Knorr Cetina's (1999) notion of epistemic cultures relevant and useful even two and

a half decades after its introduction. This closing paper accomplishes these tasks by commenting on the concept of epistemic cultures and its contributions to collaborative work, before summarizing the contributions of the issue from this vantage point.

## Epistemic cultures

The notion of alignment work is explicitly intertwined with that of epistemic cultures and their differences (Kruse, 2021), and attention to different epistemic cultures exchanging or moving knowledge is present to a varying degree in the contributions to this special issue. But even if not all of the contributions explicitly refer to epistemic cultures, they do illustrate how the notion of align-



ment work can constructively contribute to keeping *Epistemic Cultures*<sup>2</sup> relevant and useful to STS.

Based on ethnographic fieldwork in two different laboratories, one in molecular biology and the other in high energy physics, Knorr Cetina first introduced the notion in a journal article (Knorr Cetina, 1991), but the 1999 book *Epistemic Cultures* fleshes out and elaborates the concept into what it is known as today. There, she defines epistemic cultures as “cultures that create and warrant knowledge” (Knorr Cetina, 1999: 1), conceptualizing empirical scientific approaches, instruments, and whole methodologies as machineries of knowledge production. Knorr Cetina’s focus on machineries is highly central, since it distinguishes her entire approach: “I am interested not in the construction of knowledge but in the construction of the machineries of knowledge construction” (Knorr Cetina, 1999: 3). In the same vein, she has later (Knorr Cetina and Reichmann, 2015a, 2015b; Knorr Cetina, 2007) called epistemic cultures “cultures of knowledge settings” (Knorr Cetina, 2007: 362). In other words, her point is not simply that scientific knowledge is socially and culturally constructed, but to call for more thorough attention to this knowledge construction via its specific ‘machineries’ and particularly the construction of these machineries.

These different machineries, then, do not only produce knowledge differently but also different knowledge; the latter not only in the sense of producing knowledge about different phenomena but also in the sense of producing knowledge that is contingent on the machineries of its construction. A different machinery would have constructed different knowledge.

This aspect of the concept has, for example, been widely used in STS to pay attention to the difficulties caused by differences between epistemic cultures in large collaborations, especially collaborations that rely on sharing data or knowledge (Merz, 2002, 2006; Cole, 2013; Brosnan, 2016; Kruse, 2016; Heidler, 2017; Hackett et al., 2017; Cointe et al., 2019; Silvast and Foulds, 2022). For instance, Kruse (2016) uses it to trace the movement of forensic evidence in the making through the criminal justice system. Meanwhile, Silvast and Foulds (2022) have drawn on Knorr Cetina’s work on epistemic cultures to understand

research practice in interdisciplinary collaborations.

The concept of epistemic cultures has another, less noted aspect. Knorr Cetina explicitly frames the concept as a comment on society in dialogue with Ulrich Beck’s risk society (1992), Daniel Bell’s (1974) post-industrial society, and Anthony Giddens’s (1990) reflexive modernity (Knorr Cetina, 1999: 5f). She seems to aim this comment on society not only at description and analysis, but also at societal transformation, namely at thinking about “whether the idea of a knowledge society would not require the modern organization to become more like a laboratory” (Knorr Cetina, 1999: 242). In other words, *Epistemic Cultures* appears to be conceptualized as a rather far-reaching work, part of the sociological tradition of aiming to not only examine science and technology but situate them as part of new ‘epochs’ in society and associated social changes. This thought remains tied to epistemic cultures also in Knorr Cetina’s later work; there (e.g., Knorr Cetina, 2007; Knorr Cetina and Reichmann, 2015a, 2015b) she emphasizes how knowledge cultures are an integral part of a knowledge society.

This kind of large-scale analysis or “grand diagnosis” has been criticized by others; in fact, it was already discussed shortly after the book’s publication (Latour, 2005). Nor does her concept seem to have been used this way often. When Knorr Cetina and Reichmann (2015a) in a recent revisit of the notion map how it has been used, they discuss studies that investigate more fields and their “epistemic characteristics,” develop the notion itself, or explain “the difficulties of interdisciplinary research” and optimize organizations (Knorr Cetina and Reichmann, 2015a: 876ff). They only explicitly discuss one study (Jasanoff, 2005) that, in characterizing “the knowledge attitudes, institutional arrangements, and knowledge policies of different societies” (Knorr Cetina and Reichmann, 2015a: 878), touches upon knowledge as a part of society – albeit without using or referring to epistemic cultures. But even without its ambitions of large-scale analysis, we argue that *Epistemic Cultures* still has relevance today, even if perhaps in more ways than originally envisioned.

## Alignment work – bringing epistemic cultures into the future

Epistemic cultures are conceptualized as being dynamic, constantly changing internally and in relation to others, not least in connection with an increasing specialization of expertise fueling increasing diversification. Today, “the disunity of the sciences,” as Knorr Cetina (1999: 2) called this diversification,<sup>3</sup> is even more pronounced than in the 1990s. Knorr Cetina and Reichmann have, in their revisit, pointed out that

Science and expertise are obvious candidates for cultural divisions; they are pursued by specialists separated off from other specialists by long training periods, intense divisions of labor, distinctive technological tools, particular financing sources, and the need to come up with results and display them in public through publishing (Knorr Cetina and Reichmann, 2015a: 874).

However, different epistemic cultures might also, conversely, converge (e.g., Kastenhofer, 2007; Knorr Cetina and Reichmann, 2015a), fusing into new ones and perhaps into whole new scientific (inter)disciplines.

Hence, the notion’s relevance for today – especially in connection with the alignment work at the heart of this special issue – can stretch further than to bring into focus differences in producing knowledge and the machineries of that production, developing further the attention to interdisciplinarity and crossing of established knowledge boundaries. Knorr Cetina and Reichmann (2015a, 2015b) point to the difficulty of collaborations across different epistemic cultures. We argue that bringing together this attention to differences between epistemic cultures with the attention to bridging differences that alignment work proposes, makes it possible to think fruitfully about *how* such collaborations can be made to work.

In this issue, the concept of alignment work (Kruse, 2021) builds on Strauss et al.’s (1985: chapter 7; see also Star, 1991: 275) ‘articulation work’ and Vertesi’s work on producing “moments of alignment” (Vertesi 2014: 268) between infrastructures governed by different standards. Strauss et al highlight the often unacknowl-

edged work that supports the work understood as central in a workplace; Vertesi highlights the ‘seams’ (in the sense of gaps) that separate these different infrastructures, for example through different voltages. Similar gaps can separate different epistemic cultures in a collaboration – there, seams are shaped by different understandings of the knowledge to be exchanged. Alignment work, then, is the continuous work that bridges those seams, aligning epistemic cultures – perhaps temporarily – to make a seamless and stable movement of knowledge possible.

Together, the notions of epistemic cultures and alignment work make it possible to draw attention to the ‘seams’ (Vertesi, 2014) between different epistemic cultures, the differences that make up these seams, and the work of enabling the (at least somewhat) seamless movement of knowledge. In other words, the combination makes it possible to think about how, for example, different experts or specialists can collaborate meaningfully while retaining their differences.

As the introduction to this issue discusses, the idea underlying alignment work is not new to STS. Many STS notions associated with the movement of knowledge imply dealing with seams and differences. Peter Galison’s (1997) trading zone, for example, takes inspiration from the trade of commodities between different groups, arguing that the prolonged contact of repeated trade can lead to the development of trade languages that facilitate communication – in other words his metaphor draws attention to establishing ways of communicating across communities (in his example, subdisciplines of physics).

Similarly, the boundary object (Star and Griesemer, 1989) brings together different social worlds and thus makes collaboration – not necessarily with shared goals – possible in spite of differences. Boundary objects are artefacts, concepts, or methods that lie at the interface of different social worlds, such as politics and the economy. One could also think about boundary objects as lying at the interface of different epistemic cultures if one understands them as special kinds of social worlds made coherent by their members working with the same specialised tools and technologies (Clarke and Star, 2007). By virtue of allowing different understandings or interpretations to

co-exist, the boundary object thus facilitates collaboration in the face of epistemic differences. While this makes collaborations of very different groups possible, such a heterogeneity of meanings would not be feasible in all collaborations. For example, the criminal justice system's core concern with legal of meanings across its epistemic cultures (Kruse, 2021).

Neither the boundary object nor the trading zone, however, offer an analytical lens for capturing how knowledge concretely moves from one community into another, much less what happens to it in its new context. The trading zone focuses mainly on the exchange itself, not on what happens to the exchanged "goods" after the moment of exchange, and the boundary object does not move knowledge as much as gather different communities.

Conversely, Actor-Network Theory's (ANT) notion of 'enrollment' (e.g. Callon, 1984) of others into the production of facts or artifacts constitutes, if not a bridging of seams, an effacement of differences. Similarly, the related STS notion of the 'immutable mobile' (Latour, 1990: 26) that focuses on the movement of knowledge does not offer a way of thinking about epistemic differences between the sites the immutable mobile travels to – after all, the immutable mobile's stable movement crucially depends on the eradication of epistemic differences.

In other words, STS's attention to knowledge being constructed as well as context-dependent implies that movement may be difficult, in particular movement during which the knowledge being moved remains stable<sup>4</sup>. The notion of alignment work at the core of this special issue not only acknowledges the possible difficulty of this movement but offers an analytic lens with which to think about the work of moving knowledge despite differences and difficulties. Moreover, it is an analytic lens that recognizes epistemic differences as not only a source of difficulties but also as an asset. After all, dissimilar expertise is often the reason for a collaboration, and such dissimilar expertise comes with different epistemic cultures. In this way, the special issue aims to contribute to and develop a deeply STS concern.

Having a sensitivity and a vocabulary for capturing and understanding epistemic differences, we argue, makes it possible to go beyond the original scope of the notion and think about how epistemic cultures interact and, possibly, collaborate. While Knorr Cetina initially did not discuss interactions between epistemic cultures, others have.<sup>5</sup> Knorr Cetina herself, in the collaboration with Reichmann mentioned above (Knorr Cetina and Reichmann, 2015a: 877f), highlights several studies that focus on a) conflict between epistemic cultures in interdisciplinary collaborations, b) the "convergence" of different epistemic cultures into new ones when epistemic differences are attended to and reconfigured, and c) the strategic use of understanding epistemic differences in organizational research.

As Knorr Cetina and Reichmann (2015a: 877) notice, the notion of epistemic cultures has been used as an explanatory tool in studies about interdisciplinary research. However, research more loosely dealing with epistemic cultures is even more extensive than the studies they highlight. Decades of research in STS and interdisciplinarity studies have examined how established and distinct academic disciplines relate to and interact with each other and how they come to solve problems and address research questions collaboratively. This interest spans from interdisciplinary education and terminologies (Klein, 1990) to sociological studies of experienced collaborations (see review in Silvast and Foulds, 2022). Here, however, our focus diverges from the usual challenges associated with interdisciplinary research and we would like to highlight the key differences. Our concern is not with how to form multidisciplinary teams, produce interdisciplinary knowledge in collaboration, or conduct transdisciplinary research that transgresses disciplinary boundaries entirely, because inter- and transdisciplinarity presuppose some degree of change as a result of the collaboration. In alignment work, there are no epistemic cultures being imported into others and of necessity changing in consequence, there is only knowledge being moved between them. Thus, our interest is closest to the arguably common form of interdisciplinarity, multidisciplinarity, where different disciplines work together but keep their original identities and epistemic

cultures intact. Of course, epistemic cultures, like all cultures, are still subject to continuous change; we do not rule out internal development and change here.

### Revisiting the contributions

Thus, it seems reasonable to assume that attention to different kinds of interactions between epistemic cultures – which are, after all, a consequence of disunity – is meant to be within the scope of the notion. As the contributions to this volume demonstrate, its use can be widened quite fruitfully to address today's questions and concerns of everyday living with collaborations across epistemic cultures.

The contributions to the issue span a breadth of alignment work. Emilie Moberg draws attention to the relation between the human-centered and the non-human-centered; pointing out how the anthropomorphization that educators and writers use to align the human with the non-human both privileges the human-centered understanding of the world and facilitates the empathy that potentially de-centers the human. Jenny Gleisner points to the importance of aligning parents-to-be with the health care system's standardized antenatal care program; the midwives she studied perform alignment work in the form of emotion and will work to prompt pregnant persons and parents-to-be to *want* to receive the knowledge the health care system is offering. Hannah Grankvist's contribution underlines that alignment work requires relation work – and that, conversely, relationships can be shaped by the knowledge that is being moved, for example when occupational health services providers choose which knowledge they offer in order to make sure their customers (continue to) find them useful. Finally, Corinna Kruse's piece shows how alignment work, through being a source of professional pride and identity, can shape relationships within and between professions.

This breadth of alignment work not only illustrates that epistemic differences and the resulting seams can look quite different, it also illustrates that warranting knowledge (Knorr Cetina, 1999: 1) includes specific approaches to the desirability of and trust in knowledge. That is, the alignment work discussed in the contribu-

tions not only addresses different understandings of the seemingly same knowledge, it also addresses how its intended recipients relate emotionally to it – midwives nudge parents-to-be to desire the knowledge they are offered, occupational health services providers strive to be appreciated as useful and knowledgeable, and educators and writers use anthropomorphization to appeal to the empathy that fuels engagement with the epistemically different. In other words, attention to alignment work also brings forward affective dimensions of epistemic cultures – how people relate to knowledge is also shaped by emotions and relationships to others. This elaborates on Knorr Cetina's (2007: 362) assertion that knowledge creation is not merely "a matter of rational, cognitive and technical procedures undertaken by scientists." Knorr Cetina (2007: 364) herself has pointed to the embodiment of knowledge through practices; the contributions to this issue add to that an affective and relational dimension.

In connection to this, the contributions to this issue underline that, in addition to the relationships with objects that Knorr Cetina (e.g., 1999: 27ff; 2007: 365) points out as a central aspect of epistemic cultures (varying between different epistemic cultures), knowledge or at least its movement between communities is also intertwined with and co-constituted by relationships to people and communities. In other words, this special issue suggests that not only is the production of knowledge not merely a "rational, cognitive and technical" (Knorr Cetina, 2007: 362) procedure, but knowledge is, rather, a part of epistemic cultures and thus of the machineries of its own making and movement.

Knorr Cetina's addition of the embodied to the cognitive – rather than the addition of the affective to the rational that permeates the contributions to this issue – may have to do with her work being founded on enterprises that de-emphasize emotions. Emotions are present in her account – there are, for example, mentions of anger or drama, and of both people and machines being treated as social and moral beings – but they are not centered in her analysis of practices. Nor did her interlocutors seem to find them central to the production of knowledge. In the contri-

butions to this special issue, emotions are part of the foreground. This may have to do with the studied epistemic cultures being professional cultures rather than scientific ones - especially in contexts, and especially in contexts involving laypersons emotions and relationships may be given more room than in a laboratory. Thus, the dimensions the contributions add to the notion of epistemic cultures may also have to do with their rather different empirical foundations. Since Knorr Cetina's ambition was to talk about society as a whole with the help of epistemic cultures, these additions then contribute to the widening of the concept that she proposes.

Bringing the notion of alignment work to Knorr Cetina's epistemic cultures thus makes it possible to analyse disparity and collaboration or knowledge exchange in a way that at least in part realizes Knorr Cetina's aspired relevance of the concept of epistemic cultures for society as a whole. Our point of departure is that bridging different epistemic cultures is essential for interdisciplinary collaborations to be able to function: The disunity of the production of knowledge through more and more specialized experts means that this production relies on knowledge (and knowledge-to-be) being moved between different experts. In addition, the resulting knowledge may have to be moved from producers to intended users. In other words, STS requires a toolbox that makes it possible to draw systematic attention to the epistemic differences between collaborators as well as the work of managing and bridging these differences.

However, with increasing diversification as well as increasing collaborations between epistemic cultures where different experts by necessity bring different expertise to the collaboration, analytic tools are needed for the work of bridging epistemic differences and of striving for seamlessness. Even though prolonged collaboration may lead to epistemic cultures converging (e.g., Kastenhofer, 2007), some collaborations or exchanges of knowledge rely on collaborators or exchangers possessing very different qualifications and type of knowledge - as, for example, the crime scene technicians and forensic scientists, or the occupational health care providers and their customers in this issue. In such cases,

the increasing specialization and diversification of professional knowledge (Knorr Cetina and Reichmann, 2015b: 24) is prevented from disjoining the movement of knowledge by continuous alignment work. In other words, alignment work can provide cohesion in a collaboration that is at risk of disruption due to epistemic differences. With its simultaneous sensibility for the triad of difference, movement, and stability as well as its attention to the continuous and perhaps invisible work that maintains the triad, alignment work can be one way of bringing *Epistemic Cultures* into the present and future and underline its continuing relevance for STS.

## Conclusion

What, then, makes *Epistemic Cultures* still so relevant today is its contribution to capturing the evolving and increasing epistemic differences that the diversification of knowledge production entails. This is a development of rather than a departure from her own intentions; to Knorr Cetina, the transformation of society into a knowledge society "implies the growing importance of knowledge-related cultures" (Knorr Cetina, 2007: 373) That is, a society that relies on "[p]rofessional knowledge" (Knorr Cetina and Reichmann, 2015b: 24) also will consist of different professions or epistemic cultures that produce that knowledge. In other words, a knowledge society implies different expert cultures with different and diversified specializations.

When Knorr Cetina points out that "science and knowledge may not be as unitary as has been thought" (Knorr Cetina, 2007: 334) this "diversity" and "fragmentation" (Knorr Cetina, 2007: 334) in knowledge production also implies that the knowledge produced in these diverse and separate(d) sites must be moved to other sites with different epistemic cultures and thus different ways of understanding, assessing, and valuing knowledge. Thus, even though Knorr Cetina's large-scale diagnosis of society may feel a bit outdated today, its ambition of drawing attention to the "machineries of knowledge construction" (Knorr Cetina 1999: 3) is not. Her work makes it possible to draw attention to very contemporary concerns, such as to epistemic differences, as well

as to how knowledge fits also into non-scientific enterprises. The latter encompasses questions like making knowledge a commodity as discussed by Knorr Cetina (2010) herself or making it attractive to students, patients, or customers as discussed in this issue.

However, Knorr Cetina does not discuss *how* the knowledge produced in these potentially very different sites or epistemic cultures can be brought into collaborations between experts or into larger society. There, alignment work provides an analytical lens at the same level of detail as the notion of epistemic cultures itself for capturing the work of aligning different epistemic cultures sufficiently and for long enough to enable the movement of knowledge.

Pairing the notion of epistemic cultures with a way of conceptualizing the movement of knowledge that takes epistemic differences into account – like alignment work does – thus adds to the STS toolbox through providing a way of

analyzing contemporary disunited modes of producing and sharing knowledge.

At least in our work, this combination further benefits from pairing with ethnographic methods, since an understanding of epistemic culture by necessity builds on both fine-grained detail and on practitioners' understandings (famously, Malinowski, 2014 [1922]: 25) – and their own contestations – of their knowledge production. In other words, we argue that Knorr Cetina's notion still has relevance for STS and, in combination with alignment work, can contribute fundamentally to current and central issues of the field, namely that of producing and moving knowledge. In this special issue, the notion of epistemic cultures has offered a way of thinking about the difficulties and frictions that arise when very different groups collaborate or draw on the "same" knowledge in a fruitful and constructive way – we expect the notion to be as fruitful for STS analysis of other contexts where different communities collaborate or convey knowledge.

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## Notes

- 1 *Science and Technology Studies* Vol 36 no 4 (2023).
- 2 We use the capitalized and italicized *Epistemic Cultures* to refer to the book, whereas epistemic cultures refers to the concept.
- 3 The expression sounds like it is in echo of Galison and Stump (1996); however, Knorr Cetina and Reichmann (2015: 875) list other influences.
- 4 What counts as stable may, of course, be a contentious issue.
- 5 Curiously, Knorr Cetina (1982) seems to have developed an interest in this theme many years before *Epistemic Cultures*. In her “transepistemic arenas” – notably scientific laboratories – scientific communities do not work in isolation on technical matters, but inquiries are done by involving scientists and non-scientists, as well as technical and non-technical arguments and concerns. However, while this early work is focused on the crossing of epistemic boundaries, its interest is still tightly set on the built-in qualities in scientific inquiries. In contrast, we argue that alignment work is a broader topic about all boundary-crossing activity without presupposing it has to happen in scientific inquiries. In addition, alignment work explicitly does not aim to erase epistemic boundaries but to enable epistemic cultures to cooperate or collaborate while remaining distinct.