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Leydesdorff, L.

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The Communication of Meaning and Knowledge in a Knowledge-Based Economy

By Loet Leydesdorff

The articulation of the idea that human beings not only provide meaning to events, but are able to communicate meaning in addition to and in interaction with the communication of information emerged gradually during the 20th century with the development of sociology as a discipline. According to Weber (e.g., 1904, 1917) values can be considered as the crucial domain of human encounter and social development. As is well-known, Weber advocated adopting ‘value freeness’ as a methodological principle, while paying proper attention to the value-ladenness of the subject matter in the sociological analysis (Watkins, 1952). Values govern, from Weber’s perspective, human history as givens.

Durkheim (1912) noted in this same period that values can also be considered as ‘collective consciousness.’ Parsons (1968) emphasized that this concept of another dynamic at the supra-individual level can with hindsight be considered as constitutive for the new science of sociology. He traced it—that is, the idea that social interaction bestows events with qualitatively different meaning—back to American pragmatism (Mead, 1934), on the one hand, and on the other to Freud’s (1911) and Durkheim’s (1912) independent discoveries of the ‘reality principle’ and ‘collective consciousness,’ respectively.[1]
This new sociological program of research clashed with positivism—which also finds its origins in sociology (e.g., Auguste Comte), in opposition, however, to idealistic philosophies of the 19th century—because the focus was no longer on empirical data, but rather on what the data means, and how the subjects under study can sometimes reach consensus or otherwise dwell in conflicts about such meaning. The ensuing 'Positivismusstreit' in German sociology had its origins in the 1930s, but was exported to the United States by German emigrants in the prewar period (Adorno et al., 1969).

In his 1971-debates with Habermas (who as a neo-marxist sided with the anti-positivists in the 'Positivismusstreit'), Luhmann (1971) proposed that the communication of meaning be considered as the very subject of sociology: coordination among human beings is not brought about by information transfer, but rather by the communication of meaning (Habermas & Luhmann, 1971). Unlike information, meaning cannot be transferred over a cable, but it can be communicated in interactions among reflexive agents. According to Luhmann (1984), sociologists should focus on the dynamics of meaning in communication (e.g., Luhmann, 1988). Habermas (1981, 1987), however, wished to focus on ‘communicative action’ as an attribute of human beings.

In these exchanges, both Habermas and Luhmann made references to Husserl's reflections on 'intersubjectivity' as a common base, but they provided Husserl's philosophy with another interpretation (Husserl, 1929, 1936, 1962; Derrida, 1964). Habermas (1981, at pp. 178f.) followed Schutz (1952, at p. 105) in arguing that Husserl had failed to ground his concept of 'intersubjectivity' in interhuman communication (cf. Luhmann, 1995, at p. 170). This grounding would require the concept of a 'life-world' in which communication is embedded. In my opinion, Luhmann remained closer to Husserl's so-called transcendental phenomenology by considering social relations as instantiations (Giddens, 1979, 1984) which are embedded in 'virtual,' yet structured communication fluxes.

The *locus classicus* for the alleged failure of Husserl is Alfred Schutz's (1952)
study entitled 'Das Problem der transzendentalen Intersubjektivität bei Husserl' ('The problem of intersubjectivity with Husserl'; Schutz, 1975). Schutz formulated in this essay:

All communication, whether by so-called expressive movements, deictic gestures, or the use of visual or acoustic signs, already presupposes an external event in that common surrounding world which, according to Husserl, is not constituted except by communication. (Schutz, 1975, at p. 72).

Schutz, therefore, wished to ground the communication in a common frame of reference. He called this the 'life-world' and criticized Husserl for explaining this ground as a result of and not as a condition for communication. However, Husserl considered the external referent of communication as a 'horizon of meanings.' Husserl's 'intersubjectivity' remained intentional, whereas Schutz argued in favor of an existential grounding of intersubjectivity in a 'we,' for example, when he went on to say: 'As long as man is born from woman, intersubjectivity and the we-relationship will be the foundation for all other categories of human existence.' (ibid., at p. 82).[2]

In other words, despite his admiration for Husserl (e.g., Schutz, 1953), Schutz disagreed with Husserl about the possibility of deriving social relations from communication. Social relations, in Schutz’s opinion, are prior to communications, while Husserl argued that social relations are embedded in communications or—as he put it—‘transcendental intersubjectivity.’ In the Cartesian Mediations of 1929, Husserl followed Descartes by questioning not only what it means to be ‘human,’ but also the referent of human intentionality. For Descartes this cogitatum could be distinguished only negatively from the cogito as that which transcends the contingency of one’s cogito. From this perspective, the other in the act of doubting is defined as God. God transcends the contingency of the cogito, and therefore one can expect this Other to be eternal.

Husserl proposed to consider the cogitatum no longer as a personal God, but
as the intentional substance *among* human beings which provides the *cogito* with an horizon of meanings. We—as *cogitantes*—are uncertain about what things mean, and the communication of this uncertainty generates an intersubjectivity which transcends our individual subjectivities. Although meanings are structured at the supra-individual level, these structures are no longer identified with a personal God. On the contrary, meaning can be constructed, enriched, and reproduced among human beings by using language.

By using language one is able to relate meanings to one another, but within language the world is resurrected as an architecture in which the words can be provided with additional meaning at the supra-individual level. However, this meaning is not provided by the words or their concatenations in sentences or networks of co-occurrences (Leydesdorff, 1997). Language merely organizes the concepts by providing specific meaning to the words at specific moments in time. The instantiations refer to what could have been differently constructed and understood. In other words, the *cogitata* are not specific; they remain uncertain.

Husserl emphasized that this substance of the social system ('intersubjective intentionality') is different from subjective intentionality because one knows it *ex ante* as beyond the domain of the individual. The study of this new domain—Husserl used the Leibniz’s word ‘monade’—might provide us with ‘a concrete ontology and a theory of science’ (*ibid.*, at p. 159). However, Husserl conceded that he had no instruments beyond the transcendental apperception of this domain and therefore he had to refrain from empirical investigations:

We must forgo a more precise investigation of the layer of meaning which provides the human world and culture, as such, with a specific meaning and therewith provides this world with specifically ‘mental’ predicates. (Husserl, 1929, at p. 138; my translation).

Intersubjectivity precedes objectivity in the world (*ibid.*, at p. 160) because
the world is represented within it, for example, by using language. Phenomena remain an instantiation. First, the experience of the phenomenological world may be common sense (for example, using natural languages), but the meanings provided to what is represented can further be codified as in scientific discourse. Thus, the system is grounded in intersubjective knowledge that is generated historically within the system. However, intersubjective knowledge can further be codified into discursive knowledge under specifiable conditions (Cowan & Foray, 1997).

The order of priority itself changes with Husserl’s reflection: the *cogitatum* provides a necessary condition for the *cogito*, although the latter remains a historical condition for the former. Husserl used the word ‘rooting’ for the historical origins, but he emphasized that the intentionality develops in the present. As noted, Husserl was not able to specify the ‘mental’ predicates which he hypothesized other than as an analogy to the categories of philosophical reflection within the *cogito*. I submit that the mathematical theory of communication provides us with these categories, and the theory of anticipatory systems provides us with categories for studying their evolution.

First, Shannon’s (1948) theory of communication can be elaborated for systems which communicate in more than a single dimension at the same time (Theil, 1972; Leydesdorff, 1995; Yeung, 2008). Human language can be considered as the evolutionary step that enables us to communicate both (Shannon-type) information and meaning. (Meaningful information can be distinguished from Shannon-type information as an interaction term between these two layers of processing.) However, meaning is provided from the perspective of hindsight. Thus, the arrow of time is locally inverted (Coveney & Highfield, 1990). This can be modeled using Rosen’s (1985) theory of anticipatory systems. Although Rosen's model was developed within theoretical biology, the model can be made more general by mathematization in terms of incursive routines (Dubois, 1998; 2000). The anticipatory
operation is incursively reconstructing. However, the incursion is recursive: some meanings can be provided with meaning in a scientific discourse and thus be further codified (Leydesdorff, 2008a, 2009; Leydesdorff & Franse, 2008).

Two anticipatory mechanisms at a systems level can co-evolve into a strongly anticipatory (or hyper-incursive) system. The one anticipation is a consequence, for example, of the functional demarcation and asynchronicity of scientific communications from differently coded ones (e.g., on the market), while the other precedes differentiation and is inherent to specifying meaning among human beings using language. Thus, the formal and informal layers of communication are always intertwined. However, they can be distinguished analytically. The analytical dimensions abstract from the observable world. One might say that the models provide us with a ‘genomenology’ in which we are able to specify the ‘genotypes’ as analytically different routines without a one-to-one relation with observable phenomena. The models remain our constructs in language and noesis (Langton, 1989).

The formal perspective of mathematics which abstracts from the contents of respective models enables us to think of inter-subjectivity as an interaction effect grounded in an inter-textuality or even an inter-disciplinarity among perspectives (Leydesdorff, 2008b). Phenomena can be considered as boundary objects that contain interaction terms among the genomena (Star & Griesemer, 1989; Leydesdorff, 2007). The subdynamics of the genomenological organization of the complex system are first abstracted analytically from the substantive categories that have been made available to us in the positive sciences (e.g., as variation) by appreciating these substantive insights as the specifications of subdynamics. The historical phenomena can then be reconstructed as the results of interactions among the reflections. Culture and civilization thus remain constructs that feed back on what is ‘naturally’ or previously given. The feedbacks operate in an anticipatory mode. The sciences are part and parcel of the knowledge bases of
this transformative culture. The external references of the communication can be considered as a reality 'out there,' but these 'realities' have been constructed reflexively and therefore invested with meaning.

In economics, for example, this new meaning provided by the reconstruction can be appreciated as the value of commodities on the market. The values are shaped by market forces (under the conditions of modernity). Thus, in addition to commodities, capital and shares can also be traded. Since Newton the concepts of physics (like centers of gravity and gravitation) have been theoretical constructs that can be provided with an interpretation by the experiment. These concepts have highly codified meanings. Maturana (2000, at p. 169) formulated this as an ‘interobjectivity that we observers in language live as operations in the flow of languaging in which we observers exist.’ Our frame of reference, in my opinion, is not the ‘we’ of the aggregate of living subjects, but the interactive development of this ‘interobjectivity’ as a cogitatum.

The phenomena in this ‘interobjectivity’ can be considered as stabilizations based on quasi-equilibria among the fluxes of communications. The stabilizations occur historically as instantiations among other potentially possible ones. How can the knowledge-based operations which reproduce the phenomena as a knowledge-based system be specified? Let me quote Husserl one more time:

This, the cogitatum as cogitatum can never be imagined as a readily available given; it becomes clear by the specification of the horizon and the continuously regenerated horizons. The specification itself is yet always imperfect, but because of its uncertainty to be considered as a structure of determination. For example, the cube leaves perspectives open on the sides which cannot be seen, and nevertheless as a cube conceptualized [...]. This openness precedes the real specification in more detail. [...] Real observing—unlike abstract clarification in the anticipating imagination—leads to more precise specification and perhaps differentiation, but with new horizons
opening. (ibid., at pp. 47f.; my translation).

Note the emphasis on ‘anticipating imagination.’ The positive sciences (e.g., biology) tend to begin with observations, but in sociology this approach has led to positivism. On the basis of a priori decisions, the stabilization of facts would then be given priority over the meanings of these facts. This generates only one perspective among other possible ones. When this configuration is reflected, observations in the past can be turned into expectations about the future provided that a code in the communication is stabilized for carrying the inference discursively.

Sociological specification is neither able nor allowed to forget that the ‘facts’ contain meanings and thus already imply a perspective. This double perspective is the very subject of methodological reflection in the discipline (Geertz, 1973; Giddens, 1976). Next-order, symbolic, and global horizons can be expected to resonate within hitherto stabilized meanings. Further reflections bring the meanings and the tensions among them to the fore. Meanings can be subjective and/or intersubjective. Intersubjective meanings can further be codified, for example, by using symbolically generalized media of communication (Parsons, 1963a and b; Parsons & Platt, 1973; Luhmann, 1975) in addition to everyday languages. For example, science can be considered in a sociology of science as the specific subsystem of communication in which truth-finding operates as a symbolically generalized medium of communication (Luhmann, 1990; Leydesdorff, 2001).

The meaning of intersubjectivity could be specified by Husserl only from the perspective of the subjective cogito, but nevertheless as a monade that transcends the individual cogito. Other authors, e.g. Levinas (1953, 1963), have argued in favor of the foundation of intersubjectivity in the relation with the other human being (‘Thou’) as a transcendental instance. In sociology, however, the contingent other provides an instance of a double contingency, while the configuration can modulate this relation as a third source of the uncertainty (Strydom, 1999). Three sources of uncertainty can no longer be
envisaged within a single metaphor (Leydesdorff, 2008b). Since the metaphors are then no longer ‘natural,’ the systems under study tend to become visible as knowledge-based constructions that remain under reconstruction.

In summary, the reconstructive, that is, hyper-incursive, routines of a knowledge-based system remain the result of the intentionality of the carriers, but this is not a sufficient condition for the emergence of another (globalizing) order of expectations at the systems level. The groupings and the interactions of weak anticipations in social formations need first to be developed into a differentiated communication structure that contains another asynchronicity and, therefore, potential incursion endogenously. Insofar as this second incursion resonates with our weak anticipations and predictions, the intersubjectivity can become an interobjectivity. This remains always a matter of degree because the strongly anticipatory system co-constructs our future on the basis of organizational formats that are entertained in knowledge-based representations.

Because of the expectation of incompleteness and fragmentation of the codifications in the differentiated system, the reflection cannot guide us as a grandiose meta-theory. However, it is available and needed at the epi-level (that is, around) to increase the clarity of the substantive reflections. Simulations inform expectations in quasi-experiments in measuring the knowledge bases of historically stabilized systems. The models no longer need to be 'history friendly' (Malerba et al., 1999) or grounded in the evolutionary metaphor of survival (Nelson & Winter, 1982; Nelson, 1995). The emerging knowledge base is not a living system, but a social system. A social system is not to be modeled as a (meta-)biological one because it communicates knowledge and meaning (Habermas, 1987; Leydesdorff, 2000). As a hypercycle, the knowledge-based subdynamics transform ‘the ship while a storm is raging on the open sea.’ In the resulting economy this reconstruction is no longer a mission only for the scientists involved (Leydesdorff, 2006b).
The matching of knowledge-based anticipations and innovative reconstruction on this basis has been woven into the complex dynamics of the social system and its economy as one of its coordinating mechanisms.

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**Notes**

[1] According to Parsons’s (1952) reading of Freud, the social environment is internalized at the level of the super-ego.

Husserl acknowledged this function of language in the generation of meaning when he formulated for example: ‘The beginning is the pure and one might say still mute experience which first has to be brought into the articulation of its meaning’ (ibid., p. 40).

Künzler (1987, at p. 331) formulated that ‘between Luhmann’s marginalization of language (cf. Habermas, 1985, at p. 438) and Habermas’s foundation of sociology in the theory of language, one should be able to find the comparatively innocent consideration of meaning as the ratio essendi of language and language as the ratio cognoscendi of meaning’ (my translation). My argument, however, goes beyond this position because I argue that codified knowledge in a functionally differentiated configuration can only be analyzed by invoking codes of communication generalized at a level beyond human language.
How can an economy based on something as volatile as knowledge be sustained? The urgency of improving our understanding of a knowledge-based economy provides the context and necessity of this study. In a previous study entitled *A Sociological Theory of Communications: The Self-Organization of the Knowledge-based Society* (2001), I specified knowledge-based systems from a sociological perspective. In this book, I take this theory one step further and demonstrate how the knowledge base of an economic system can be operationalized, both in terms of measurement and by providing simulation models.

In the first chapters, I make two theoretical steps. First, I submit that the knowledge base of an economy can be considered as an effect of the interactions between three social coordination mechanisms: economic exchange relations, political power...
relations, and the socially organized generation of novelty in scientific discourse. In other words, this generalized Triple Helix model can be used as an *explanans* for the knowledge-based economy as the *explanandum*. Because the three (differently coded) communication systems can also interact, my approach takes elements from Luhmann’s (1984) social systems theory, but also deviates from it. This is extensively explained in Chapter Two, where I specify meaning-processing as an operation on underlying (Shannon-type) information processing.

Meaning is provided from the perspective of hindsight, and thus the time axis is locally inverted. Knowledge can then be considered as a meaning that makes a difference from the perspective of hindsight, and thus discursive knowledge as a social coordination mechanism can be expected to reinforce this inversion of the time axis. These two levels of codifying the events along the time axis from the perspective of hindsight can be modeled using concepts like weakly and strongly anticipatory systems, respectively (Rosen, 1985; Dubois, 1998).

Weakly and strongly anticipatory systems can be operationalized by using incursive and hyper-incursive equations. In the case of hyper-incursivity, the future states of the system are considered as the independent variable. Thus, the system co-constructs its own future. I show in Chapter Four that the
I show in Chapter Four that the incursive and hyper-incursive formulations of the logistic equation enable us to model the knowledge-based economy as a regime which continuously produces sets of differently codified expectations (Leydesdorff & Dubois, 2004). These different sets have to be interfaced by organizing decisions. The decisions are shaped along historical trajectories and can thus become locked-in into suboptima (Arthur, 1994; Luhmann, 2000).

The mutual information in three (or more) dimensions enables us to measure the generation of negative (probabilistic) entropy within a knowledge-based system. The negative value of the probabilistic entropy indicates the inversion of the time axis quantitatively. In the empirical chapters (8, 9, and 10), this is first elaborated from the perspective of the Triple-Helix model, and then applied to the measurement of the knowledge bases in the Dutch and German economies (Leydesdorff, Dolfsma, & Van der Panne, 2006; Leydesdorff & Fritsch, 2006). Among the conclusions: high-tech manufacturing and knowledge-intensive services tend to uncouple the knowledge-based economy from its geographical dimension as a consequence of potential globalization. Regional development efforts should focus on medium-tech manufacturing.

In the final chapter, I turn to the philosophical reflection on how the knowledge base of an economy can
be conceptualized as an order of expectations. Following Luhmann (1995), I use Husserl's (1929) notion of the substantivity of the cogitatum, that is, the subject of uncertainty of Descartes's cogito. In principle, uncertainties can nowadays be measured using information theory (Shannon, 1948; Theil, 1972; Leydesdorff, 1995). Luhmann, following Parsons, added that under the condition of modernity the uncertainty in communication systems is functionally differentiated in terms of the codes of the communication. Hitherto, the Shannon-formulas have only been elaborated with the axis of time. This study adds the non-linear dynamics of meaning-processing against the axis of time, provides the relevant formulas, and shows how one could begin with the operationalization. The focus is on the knowledge-based economy, but the socio-cybernetics can also be applied to other knowledge-based (sub)systems.

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