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Deriving an IS-Theory from an Epistemological Position

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Abstract

Starting with a subjective epistemological position in combination with an objective ontological position we show that language is the limiting factor of scientific communication. Theoretically we draw on Language Critique, a branch of philosophy known as the Erlangen School to analyse communication and mutual understanding based on linguistic signs. We then argue that, if language limits communication in scientific discourse, this is true for any discourses in information systems processes. We propose a formalised theory of information systems anchored at Language Critique and show resulting consequences for research on information systems.

Keywords

Epistemological and ontological position, information systems theory, participative research approaches, Language Critique

Introduction

Research is always based on fundamental philosophical assumptions (Lee 2004; Myers 1997). These assumptions led to dedicated debates concerning competing philosophical paradigms for IS research. The two labels “positivism” (Jenkins 1985) and “interpretivism” (Walsham 1995a) stand for two ostensible contradictory positions on an imaginary continuum. There are other related distinctions which are commonly made. For example, research methods have variously been classified as objective versus subjective (Burrell & Morgan 1979), or as critical versus uncritical (Alvesson & Deetz 2000). Although the differences and boundaries between research positions have ever been a cause for discussion and argument among IS researchers, recent contributions argue for a conciliation and the acceptance of each others principle philosophical arguments as ontological and epistemological paradigms (Weber 2004).

Our scientific position is characterised by two main epistemological assumptions. The first presupposition is the existence of a real world (of whatever kind) that exists independently of cognition, thought and speech processes. That is, our ontological position can be called objectivist or ontological realism. The term ontology denotes the analysis or theory of ‘what is’ and ‘how it is’ (Bunge 1977; von Foerster 1996). The second epistemological assumption is that the relationship of cognition to the object of cognition is clearly determined by the subject. Thus, to our view objective recognition of an existing world is impossible due to limitations of cognition and communication. That is, our epistemological position with respect to the relationship of cognition and the object of cognition can be called subjectivist. Our scientific position is in line with Niehaves (2004) and Ribbert et al. (2004) and the main consequence for our argument in this paper is that scientific insight has communication and cognition as limiting factors (beside others). Therefore we cut back our argument to the function language fulfils in scientific communication.

In the next section we focus on linguistics and Language Critique to better understand what language is and how it works as medium of scientific communication. We then transfer these insights into the domain of information systems (IS) itself and argue that communication in organizations is one central function of IS. Two main operations making an IS are identified and a formal description of IS as language centred systems is presented. Finally, we identify consequences for IS research stemming from our conceptualization.

Language and Communication

Ferdinand de Saussure, one of the early researchers in the field of linguistics, conceptualized a linguistic *sign* as a union of a *concept*, or alternatively the *signified* (*signifié*) and a *sound image*, or alternatively the *signifier* (*signifiant*) (de Saussure 1974, p. 66). The subject matter of linguistics is languages. De Saussure developed two principles characterizing linguistic signs. Firstly, there is the combination of concept and sound image which

is arbitrary and based on human conventions (de Saussure 1974, p. 67). Secondly, auditory signifiers are fugacious and auditory sound images are represented successively or linearly. If written down, the line by which auditory signifiers are to be interpreted substitutes the time dimension of auditory sound signifiers (de Saussure 1974, p. 70). In this case the signifiers are still represented linearly.

Charles Morris, another influential researcher in linguistics and founder of semiotics worked out the interrelation of a set of signs as constituting character of a language (Morris 1971, p. 24). Signs as conceptualized by Morris only address what de Saussure calls the signifier and are thus called symbols. Semiotics comprises three subordinate branches, syntactics, semantics, and pragmatics. Syntactics deals with the relations of symbols to one another (Morris 1971, p. 28). Semantics deals with the relation of symbols to concepts or objects which they may or do denote (Morris 1971, p. 35). Finally, pragmatics deals with the relation of symbols to their interpreters (Morris 1971, p. 43).

These conceptualizations leave important points open concerning the question of how communication works in organizations based on languages (Holten, Dreiling & Becker 2005). De Saussure did not explicitly address the problem as to how the relationship between a signifier and a signified were bound, thus creating a sign. Morris' semantics and syntactics are based on conventions because meaningful communication in a community relies on shared understanding of symbols and their relationships. Pragmatics, however, deals with an individual who understands a symbol, which has a meaning to a group of people, the same way these people understand it. How does this happen? In order to understand how languages as sets of symbols are created and a common understanding of symbols can be established, the work on Language Critique, a branch of constructive philosophy known as the "Erlangen School", of Wilhelm Kamlah & Paul Lorenzen, provides useful insight (Kamlah & Lorenzen 1984; Lorenzen 1987, 2000).

In their writings on Language Critique Kamlah & Lorenzen show that language is used to disclose the world (Kamlah & Lorenzen 1984, p. 33) and is based on two fundamental abstractions from (1) *discourse to language* as a system of signs and (2) the abstraction from *sign to concept* (figure 1). First, *language* and *discourse* are separated leading to *schema* versus *linguistic action*. By this, Kamlah & Lorenzen provide a means of separating signs from their linguistic usage (Kamlah & Lorenzen 1984, pp. 44). The former leads to a so called schema of a language, the latter is called discourse and means the repeatedly actualized usage of signs in changing combination and variation. Thus, discourse is an *actualized* activity, whereas the schema of a language comprises *potential* activities, defined as *activity-schema* (Kamlah & Lorenzen 1984, p. 45).

To separate meaning from sign Language Critique uses a second abstraction. The representation for a given concept is called *sound pattern* by Kamlah & Lorenzen. A concept "is at first no more than a term; however we abstract from the arbitrary sound-pattern of a term when we call it a "concept" " (Kamlah & Lorenzen 1984, p. 72). Given a term, *concept* is the meaning of this term. If statements are made about signs which are invariant with respect to the changing meaning of these signs, these statements deal with the sound-pattern. That is, disregarding the meaning as an abstraction is required to get the sound-pattern of a sign (Kamlah & Lorenzen 1984, p. 73).

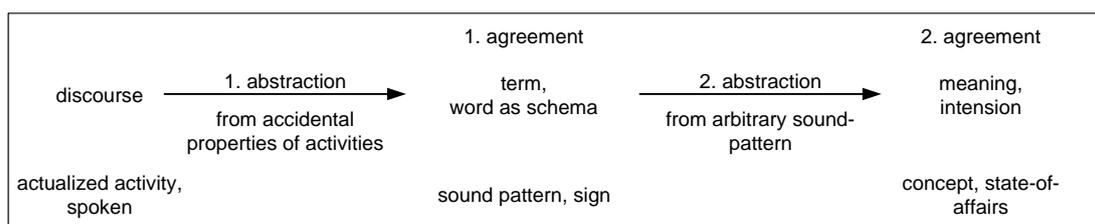


Figure 1: Agreements and Abstractions in the Language Critique Approach (Holten 2003)

To explain where the conventions making syntactics, semantics and pragmatics of symbols in the sense of Morris come from Language Critique offers the construct "language community": A new term is introduced by *explicit agreement* with respect to its usage and meaning (Kamlah & Lorenzen 1984, p. 57). That is, there are no languages without users and the meaning of every language construct for one member is aligned with the other members' understandings in the language community. Morris' pragmatics is thus directly related to the construct language community.

Language communities have to be created by introducing symbols and explaining them. This agreement leads to a relation of concept and term and is shared by a language community as the *knowledge* of using this term (Kamlah & Lorenzen 1984, p. 45). In the words of Kamlah & Lorenzen: "Since discourse as actualized activity pursues the particular end of mutual understanding, we may say of language [...] that as a system of signs it promotes mutual understanding. For this very reason it is, in a unique way, a 'know-how' held in common, the possession of a 'language community'" (Kamlah & Lorenzen 1984, p. 47). Kamlah & Lorenzen state that

aligning the meaning of terms can not be reached by pointing to things only but relies on “the very accomplishment of acting and living together.” (Kamlah & Lorenzen 1984, p. 36). The authors explain: “What “walking” or “eating” is, “sawing” or “plowing” or “roasting,” “controlling oneself,” “agreeing,” “praying,” “loving” and so on: we learn these things linguistically only along with the activities themselves, at the same time.” (Kamlah & Lorenzen 1984, p. 36). This is called “empractical” learning and this word stands for the fact that people have to experience what the meaning of a term in certain situations really is.

Once a language community has been created, the members of this language community share the pragmatic dimension of every symbol of this language. All members have the same concept in mind if they are confronted with a symbol of the language and vice versa. In turn, non-members of the language community do not understand the language symbols or they understand them differently. In order to become a member of a language community, an individual must align his understanding of given language signs with that of the language community. Sharing the same language as common knowledge the members of a language community are able to use terminology, e. g. domain specific languages, in their discourse.

In summary, based on the Language Critique of the so called Erlangen School two main operations characterize the function languages have for communication in organizations. First, to create a language for domain specific communication, language constructs need to be introduced and explained. This leads to a language schema and is called construction. To really align meanings of terms in language communities living and acting together is required. Thus, “empractical” learning is part of this construction process. Second, terminological discourse is possible for members of a language community only. A prerequisite for language critical construction is men’s ability to speech becoming manifest in colloquial and standard languages.

Formalization of IS as Language Communities

Given a long tradition of conceptualizing IS as so called “socio-technical” systems, e. g. (Laudon & Laudon 2005, pp. 17-20), and an even longer tradition of behavioural management research, e. g. (Mintzberg 1971, 1973), we premise that communication is an important factor influencing the quality of a human organization. To justify our presumption, we just refer to (Chopra & Meindl 2007) who state that success of supply chains strongly depends on the coordinated management of product flows, information flows and flows of funds. The authors stress that information “is potentially the biggest driver of performance in the supply chain because it directly affects ... the other drivers.” (Chopra & Meindl 2007, p. 45) We further assume that efficient flows of information require concerted communication between parties involved in the business processes, and we conclude that properly designed communication processes are a crucial component of successful organizations. Consequently, we think that it is reasonable to transfer insights from Language Critique into the IS domain itself to better understand how communication based on language does work. We therefore formalize the two main operations of a language community and then combine these two into one relation characterizing IS as language communities (Holten 2003). Languages as the common knowledge of a language community are called terminologies in the following. We use simple first order logic expressions for our formalization.

We start by introducing few formal conventions: A terminology T is an element of the set of all terminologies Φ , $T \in \Phi$, and stands for the level of activity schemas, i. e. potential activities. To introduce the level of actualized linguistic action, i. e. discourse, the symbol ρ is used as superscript. According to this, the set of terminologies on the discourse level is represented by Φ^ρ . Every $T^\rho \in \Phi^\rho$ thus is a terminology on the level of actualized and concrete linguistic action. Terminological statements are symbolized using the symbol $*$. T^* symbolizes statements on the schema level, $T^{\rho*}$ symbolizes statements on the level of discourse. Using the union of all terminologies the set of all terminological statements on the schema level is defined as $\hat{\Phi} = \bigcup_{T \in \Phi} T^*$. $\hat{\Phi}^\rho$ represents the respective set of statements on the level of discourse.

Terminological statements are symbolized as $w \in T^*$ on the schema level and as $w^\rho \in T^{\rho*}$ on the level of discourse respectively. The start-terminology T_0 is defined as $T_0 = \{v\}$, where v stands for the so called *neutral word*. This construct is required later to explicitly model the decision to do nothing. Note, the *neutral word* is distinct from the empty word ε . Since $T_0 \neq \emptyset$, T_0^* and $T_0^{\rho*}$ represent infinite sets of statements on the schema as well as on the discourse level. In contrast and in accordance with the theory of formal languages for an empty alphabet $\Sigma = \emptyset$ it follows $\Sigma^* = \{\varepsilon\}$ and $\Sigma^{\rho*} = \{\varepsilon^\rho\}$.

To introduce standard as well as colloquial languages the symbol X is used, with X^* and $X^{\rho*}$ representing schema and discourse level statements respectively. These languages are called not- or pre-terminological. They

are the prerequisite for language critical construction and serve as basic infrastructure in our formalism to anchor the creation of language communities in real world settings. The set of all pre-terminological languages is symbolized as Ψ , with $X \in \Psi$. Any terminological or pre-terminological statement on the discourse level can become a perturbation for the language community. These kinds of statements are written as $p^p \in \Pi^{p^*}$, with $\Pi^p \subseteq (T^p \cup X^p)$, $\Pi^p \in \Phi^p \cup \Psi^p$.

Perturbations $p^p \in \Pi^{p^*}$ cause (re)actions of the language community as a system. The system's reactions are formalized as composed relation and symbolized as α . Actions may be composed of language critical reconstructions, i. e. new or modified agreements on the meaning of terms, symbolized as κ , and terminological discourse, symbolizes as φ . An action may comprise a series of terminology modifications on the schema level as well as terminological statements on the discourse level.

We now formalize terminological discourse as first reaction of the language community. Given a perturbation $p^p \in \Pi^{p^*}$ and a terminology $T \in \Phi$, terminological discourse (φ) as a reaction is specified as relation $\varphi \subseteq \Phi \times \Pi^{p^*} \times \hat{\Phi}^p$:

- (1) $(T, p^p, v^p) \in \varphi$, $v^p \in T^{p^*}$, if $\exists w \in T^* : w^p = p^p$ is true,
- (2) $(T, p^p, a^p) \in \varphi$, for any $a^p \in T^{p^*} - \{v^p\}$, if $\exists w \in T^* : w^p = p^p$ is true,
- (3) $(T, p^p, \varepsilon^p) \in \varphi$, $\varepsilon^p \in T^{p^*}$, if $\forall w \in T^* : w^p = p^p$ is false.

The meaning of this reaction is as follows:

- (1) The system decides to react *not at all*, meaning the system does without terminological discourse. This is about the neutral reaction symbolized by the neutral word v^p . Nevertheless, based on the given terminology T a reaction as terminological discourse would be possible, i. e. the perturbation $p^p \in \Pi^{p^*}$ is interpreted correctly, and there are terms within T allowing for a correct terminological statement $w^p \in T^{p^*}$ about situation $p^p \in \Pi^{p^*}$. This is expressed by $\exists w \in T^* : w^p = p^p$ is true. The intention is that the system does really understand what is going on.
- (2) The system decides to react with terminological statement $a^p \in T^{p^*}$, which is not the neutral word v , expressed by $a^p \in T^{p^*} - \{v^p\}$. Additionally, there are terminological statements possible describing perturbation $p^p \in \Pi^{p^*}$ correctly ($\exists w \in T^* : w^p = p^p$ is true). So, the system does understand situation $p^p \in \Pi^{p^*}$ terminologically. Nevertheless, based on the given terminology T , these statements can be different from reaction $a^p \in T^{p^*}$. Therefore two symbols $a^p, w^p \in T^{p^*}$ are used.
- (3) The system is not in a position for a correct terminological statement about situation $p^p \in \Pi^{p^*}$. Based on the given terminology T perturbation $p^p \in \Pi^{p^*}$ is – at least partially – perceived based on standard and colloquial languages only. A suitable terminological discourse about situation $p^p \in \Pi^{p^*}$ is not possible. This means, based on the given terminology T there is no terminological statement possible describing situation $p^p \in \Pi^{p^*}$ correctly, which is expressed by $\forall w \in T^* : w^p = p^p$ is false.

Language critical reconstruction is the language community's second reaction on perturbations $p^p \in \Pi^{p^*}$. This reaction alters the schema of a terminology T . Terms are either modified or new terms are declared. We introduce further formal conventions to clarify this: Given terminology $T \in \Phi$, the set of intended concepts is symbolized as B_T , the set of identifiers (sound-patterns or signs) as I_T . For every term there are a definite concept and an identifier: $\forall t \in T : \exists b \in B_T \wedge id \in I_T$, such that $t=(id, b)$. That is, every term is composed of identifier and concept. Using these conventions, the possible set of state-of-affairs on the schema level for a given Terminology T is represented as B_T^* .

Given terminology T , language critical reconstruction (κ) as reaction is specified as relation $\kappa \subseteq \Phi \times \hat{\Phi}^p \times \Phi$:

- (1) $(T, v^p, T) \in \kappa$, $v^p \in T^{p^*}$,
- (2) $(T, a^p, T') \in \kappa$, for one $a^p \in T^{p^*} - \{v^p\}$ and $B_T^* = B_{T'}^*$,
- (3) $(T, \varepsilon^p, T') \in \kappa$ and $B_T^* \neq B_{T'}^*$.

The meaning of this relation is as follows:

- (1) The system decides to behave neutral that is not to alter the terminology. Again the decision to behave neutral is symbolized by the neutral word v^p on the discourse level. Terminology T remains unchanged.
- (2) The system is in a position and willing to react with terminological discourse, e. g. by terminological statement a^p which is not the neutral word ($a^p \in T^{p^*} - \{v^p\}$). Nevertheless, using the given terminology T, possible terminological statements are felt to be circuitous or not suitable for other reasons. Therefore, another term – not of any interest here – is introduced by explicit agreement concerning its usage and meaning. This leads to terminology T'. However, the potential to discuss state-of-affairs is not modified at all, meaning that the sets of all concepts intended by terminological statements based on terminologies T and T' are the same. This is expressed by $B_T^* = B_{T'}^*$. The term introduced just allows for synonyms with respect to statements possible using the original terminology T.
- (3) The system is not able to react with terminological discourse because at least one term is missing to describe situation $p^p \in \Pi^{p^*}$ correctly on the discourse level (ε^p). A new term – not of any interest here – is introduced by explicit agreement concerning its usage and meaning. The set of state-of-affairs the system can terminologically communicate about is altered or differentiated, expressed by $B_T^* \neq B_{T'}^*$. This reaction is about the system's ability to terminologically adapt to new or formerly unknown situations.

To summarize, terminologies are altered by reaction $\kappa \subseteq \Phi \times \hat{\Phi}^p \times \Phi$ because new terms are required either as synonyms or to allow for terminological descriptions of new situations (cases 2 and 3). This means that for every construction step leading from a terminology T to a terminology T' either a terminological statement $r \in T^* - \{v\}$, for which a synonym is introduced, or the empty word ε , as sign for the inability to terminologically describe a given situation, can be identified. This leads to the concept called *transition of configuration* which is a relation between two terminologies T and T':

Two terminologies $T, T' \in \Phi$ which are in relation $\kappa \subseteq \Phi \times \hat{\Phi}^p \times \Phi$ are said to be in transition of configuration $\square_k \subseteq \Phi \times \Phi$. Given $(T, r^p, T') \in \kappa \subseteq \Phi \times \hat{\Phi}^p \times \Phi$, $\square_k \subseteq \Phi \times \Phi$ is defined as: $\exists r^p \in \hat{\Phi}^p$, with $(T, T') \in \square_k \Leftrightarrow (T, r^p, T') \in \kappa$. An arbitrary sequence of configuration transitions $\square_k^* \subseteq \Phi \times \Phi$ is defined as

$\exists r_1^p, \dots, r_{n-1}^p \in \hat{\Phi}^p$, with $(T^1, T^n) \in \square_k^* \Leftrightarrow (T^1, r_1^p, T^2) \in \kappa, (T^2, r_2^p, T^3) \in \kappa, \dots, (T^{n-1}, r_{n-1}^p, T^n) \in \kappa, n \in \mathbb{N}$.

To explain the system's composed reaction α on perturbation $p^p \in \Pi^{p^*}$ we draw on the transition of configuration. The system's reaction may consist of an arbitrary number of language critical constructions modifying the language schema, as well as an arbitrary number of terminological statements on the discourse level.

We compose the system's complex reaction $\alpha \subseteq \Phi \times \Pi^{p^*} \times \Phi \times \hat{\Phi}^p$ on perturbation $p^p \in \Pi^{p^*}$ using relations $\kappa \subseteq \Phi \times \hat{\Phi}^p \times \Phi$ and $\varphi \subseteq \Phi \times \Pi^{p^*} \times \hat{\Phi}^p$. Given terminology T and perturbation $p^p \in \Pi^{p^*}$, reaction relation $\alpha \subseteq \Phi \times \Pi^{p^*} \times \Phi \times \hat{\Phi}^p$ is characterized as follows:

$\alpha = \{(a, b, c, d) \mid a, c \in \Phi, b \in \Pi^{p^*}, (a, c) \in \square_k^*, d \in \hat{\Phi}^p, (c, b, d) \in \varphi\}$.

This means that terminologies $a, c \in \Phi$ are related by an arbitrary sequence of configuration transitions $((a,c) \in \square_k^* \subseteq \Phi \times \Phi)$ and terminological statement $d \in \hat{\Phi}^p$ on the discourse level is the systems final reaction on perturbation $b \in \Pi^{p^*}$.

Having introduced reaction relation $\alpha \subseteq \Phi \times \Pi^{p^*} \times \Phi \times \hat{\Phi}^p$, we can say that an *IS is a language community*, made up of terminology $T \in \Phi$ on the schema level, the discourse level with terminological speech $\hat{\Phi}^p$, statements comprising standard, colloquial as well as terminological speech Π^{p^*} on the discourse level and is characterized by reaction relation $\alpha \subseteq \Phi \times \Pi^{p^*} \times \Phi \times \hat{\Phi}^p$, reacting on perturbations $p^p \in \Pi^{p^*}$ by terminological discourse or language critical construction concerning its terminology (Holten 2003, p. 65).

This conceptualization of IS as language communities directly leads to at least the following consequences: For every IS

- (1) a terminology should exist, directly related to an identifiable set of people belonging to the language community possessing this terminology,
- (2) terminological discourse should be observable,
- (3) traces of developing or revising terminologies should be identifiable.

The impacts on IS research approaches consistent with the proposed conceptualisation are by far not exiguous. This is due to the fact that analyses of language communities from the outside are strictly impossible. If investigation of a language community intends to understand what is going on, plunging deeply into this language community is imperative. This means, neutral observation is impossible. In the next section we further analyse these limitations of IS research.

Resulting Limitations for IS Research

Following the discussion of language critique and our philosophical assumptions, we argue that the creation of a language community between the researcher and the subjects and the following interpretation of this subjective understanding are the weakest links in the chain of IS research. The creation of a mutual common sense understanding of the research domain essentially creates a boundary for IS research: only by using the detour of forming a language community and creating an interpretive understanding, we are able to investigate the phenomena of socio-technical systems as IS. We believe that a *constructive philosophy* (Lorenzen 1987) which allows to solve conflicts between interpretive and positivist approaches is required to methodologically combine and integrate supposedly adverse positions (Lee 1991). Therefore the research approach proposed by (Rosenkranz & Holten 2007) is characterized by three roles that researchers adopt during investigation (figure 2). In accordance with a framework for the development of scientific theories as proposed by Lee (1991; 2004), this three-role-approach allows to relate interpretive and positivist positions in the following way: After having created a subjective understanding of everyday meanings and common sense within the observed organization, which provides the basis for the interpretive understanding, the researcher creates a positivist understanding in order to explain the empirical reality – the explanation being a scientific theory which can be tested against the subjective meaning as recorded in the interpretive understanding (Lee 1991, pp. 351-4).

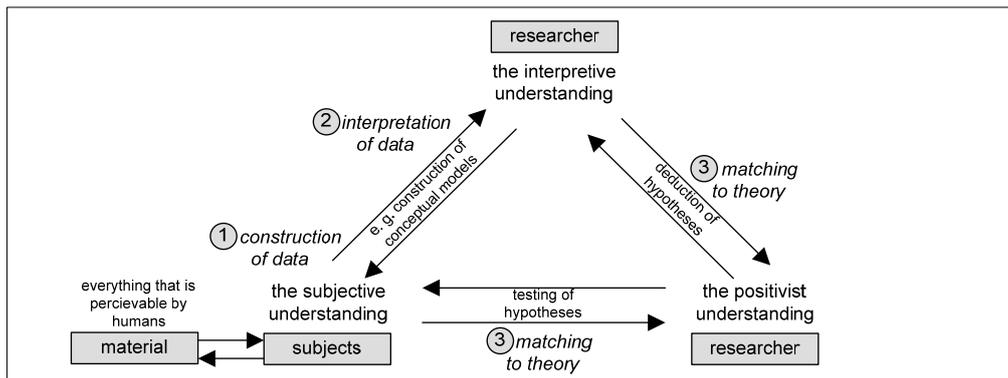


Figure 2: Framework for IS research (Rosenkranz & Holten 2007), adopted from (Lee 1991)

The three roles can be applied and embodied during known research methods, e. g. action research (Baskerville & Myers 2004; Baskerville & Wood-Harper 1996), field or case study research (Barrett & Walsham 1999; Walsham 1995b; Yin 2003) or action case studies (Hughes & Wood-Harper 1999).

First Role: Construction of Data

Kamlah & Lorenzen (1984, p. 5) state that we exist “all along” within a subjective understanding of the world which is linguistically articulated. Therefore, the first role refers to the *construction of data*. Akin to Langley, researchers should plunge deeply into the operational processes themselves, collecting fine grained qualitative material and attempting to extract theory from the ground up (Langley 1999, p. 691). The task is to secure empirical material for the construction and interpretation of data. This means that data are intermediate products in the research process.

Starting at the point where the researcher is not an expert in the domain in focus, material is perceived based on standard or colloquial language. In any case pre-terminological language – $X \in \Psi$ referring to our formalization – is used to describe observations. In order to generate a mutual common sense understanding, researchers and other participants have to actively create a language community, e. g. they have to converse while working together in a project. Referring to language critique they align their language constructs in the specialised language or terminology of the domain in focus. Referring to the formalization of IS as language communities

this alignment of language constructs is an instantiation of construction reaction $\kappa \subseteq \Phi \times \hat{\Phi}^p \times \Phi$. This means the researcher enters the practitioner’s language community by learning his terminology. Figure 3 shows that entering a language community depends on language critical construction. Given the researcher already is an expert in the situation in focus he already belongs to the language community sharing the terminology.

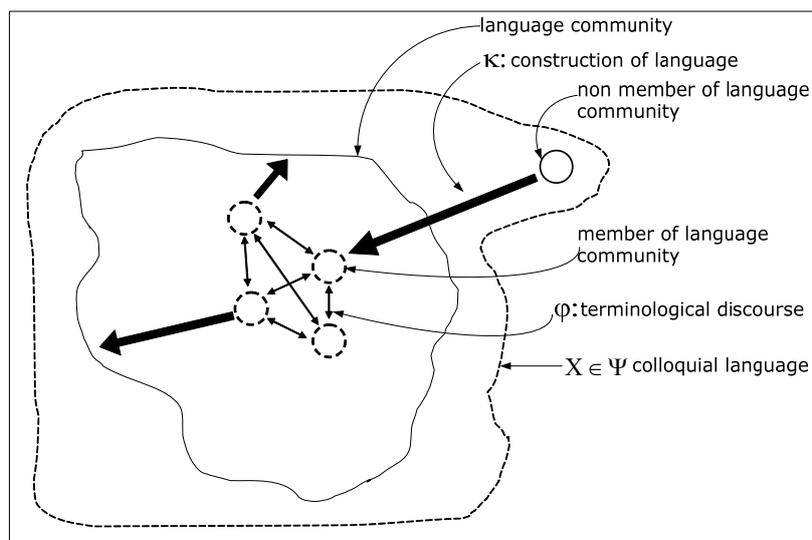


Figure 3: Entering Language Communities by Construction

It follows that participation in real world situations is imperative to assure subjective understanding of the terminology of a specific situation and domain in focus and thus is a prerequisite for the construction of data. Since any documentation must not necessarily mirror operational processes and activities as actually lived within the organization first-hand observations of actual operations are required (Mårtensson & Lee 2004, p. 513). Like an ethnographer, the researcher should begin by using and participating in everyday interactions and focus on how participants do things (Maynard 1989, p. 144). This is in line with Kamlah's & Lorenzen's (1984, p. 36) conception of "empractical" learning and a first step of entering an established language community.

Second Role: Interpretation of Data

The second role concerns the *interpretation of data*. The researcher needs to analyse and interpret the extracted data and observations. Statements about the research domain, which are based on the interpretation of the subjective understanding, are made. The researcher thus interprets the mutual agreement and the statements in the specialised language or terminology of the domain in focus. This is in line with Lee's and Baskerville's generalizing from empirical statements to other empirical statements (Type EE generalizability) (Lee & Baskerville 2003). A researcher must therefore repeatedly go from his own interpretive understanding to the subjective understanding and then back again to his own interpretive understanding, using the hermeneutic cycle (Butler 1998; Klein & Myers 1999).

In fact this matching of interpretive and subjective understanding is based on terminological as well as pre-terminological discourse. Referring to our formalization this is in line with the combined reaction

$\alpha \subseteq \Phi \times \Pi^{p^*} \times \Phi \times \hat{\Phi}^p$, integrating terminological and colloquial discourse and language critical construction (figure 3). As a result, the researcher as member of the IS as language community is able to properly describe it and the interpretive understanding thus becomes manifest in e. g. models or other abstractions used for scientific purposes – these abstractions being the researcher's reading or interpretation of the first-level, common sense understanding (Lee 1991, pp. 351-3).

To test the validity of the resulting interpretive understanding, the researcher refers back to the subjective understanding, accomplishing this e. g. by discussing with other participants to verify the sensibility of "apparent absurdities" (Lee 1991, p. 352). This means that the researcher engages into a dialogue with practitioners (Mårtensson & Lee 2004). Consequently, the language community consisting of all project participants (researchers and practitioners) creates and discusses appropriate descriptions. Afterwards, the researcher understands the situation properly in terms of the observed human subjects and does not misunderstand it (Lee 1991, p. 351).

Third Role: Matching to Theory

Finally, *matching to theory* takes place. Theory is a means for describing, explaining and predicting and a means for design and action as well (Gregor 2006, pp. 626-30). The researcher confronts a theory with the descriptions of the IS under consideration in order to deduce meaningful hypotheses. This positivist understanding is one that the researcher creates and tests in order to explain the empirical reality that is investigated, the explanation being a scientific theory consisting of formal propositions (Lee 1991, p. 351).

Given the researcher as a member of the respective language community already shares terminology T_1 the theory is formulated in, the creation of the positivist understanding is based on the integration of terminology T_2 the interpretive understanding is formulated in into the terminology the theory is formulated in. This means, the creation of the positivist understanding requires language critical construction in terms of reaction

$\kappa \subseteq \Phi \times \hat{\Phi}^p \times \Phi$ and leads to terminology T_3 hypotheses will be formulated in. Thus, a sequence of configuration transitions as instance of relation $\square_k^* \subseteq \Phi \times \Phi$ transforming T_1 into T_3 will be detectable and hypotheses are terminological statements in terms of reaction $\varphi \subseteq \Phi \times \Pi^{p^*} \times \hat{\Phi}^p$ formulated in T_3 .

Consequently, the researcher generalizes from the interpreted observations – formulated in T_2 – to a theory – formulated in T_3 . This is called type ET generalizability by Lee and Baskerville (2003) and leads to the idea that one case may yield as many information as many cases. It is acceptable because science operates with conjectures and jumps to conclusions, even after one single observation, as long as the rules of hypothetico-deductive logic do apply and the emerging theory remains falsifiable and testable (Popper 1959).

Conclusion

Accepting fundamental philosophical assumptions for research (Lee 2004; Myers 1997) should lead to the acceptance of the same assumptions for communication processes characterizing IS. Language Critique of the Erlangen School (Kamlah & Lorenzen 1984; Lorenzen 1987, 2000) is suitable to analyse both, scientific research and communication processes making IS. Since language communities cannot be observed from outside the integration – and in fact conciliation – of positivist and interpretative scientific positions is required for IS research (Weber 2004).

Based on a framework proposed by (Lee 1991) we showed the limitations of IS research in this context. We developed a formalization of IS as language communities to specify two main operations – namely terminological discourse and language critical construction – and showed that IS researchers should engage in three roles to plunge deeply into a language community making an IS. These three roles are due to the fact that empirical research – sometimes exclusively allocated to the so called positivist camp (Dubé & Paré 2003) – depends on the construction and interpretation of scientific data – sometimes allocated to the interpretivist camp (Dubé & Paré 2003).

To our view, separation of these approaches is useful to understand scientific processes, but both have to meet halfway when doing IS research. Certainly there is no testing of theories concerning IS as language communities possible without relation to the interpreted reality. This means, the so called positivist position depends on the interpretive understanding. On the other hand, there is no scientific contribution possible without integrating the interpretive understanding terminologically with theory. This means, the so called interpretivist position depends on the positivist understanding. To summarize, the way through the triangle in the framework of figure 2 has to be complete.

Future research could investigate if there really is a characterising terminology for every IS. Additionally, criteria characterising good IS and measures for this goodness are required. Furthermore there should be research concerning conditions positively influencing the development of language communities, e. g. to better understand what is really going on in IS development processes.

References

- Alvesson, M & Deetz, S 2000, *Doing Critical Management Research*, Sage Series in Management Research, Sage, London, UK et al.
- Barrett, M & Walsham, G 1999, 'Electronic trading and work transformation in the London Insurance Market', *Information Systems Research*, vol. 10, no. 1, pp. 1-22.
- Baskerville, RL & Myers, MD 2004, 'Special Issue on Action research in Information Systems: Making IS Research Relevant to Practice-Foreword', *MIS Quarterly*, vol. 28, no. 3, pp. 329-35.
- Baskerville, RL & Wood-Harper, AT 1996, 'A critical perspective on action research as a method for information systems research', *Journal of Information Technology*, vol. 11, no. 3, pp. 235-46.
- Bunge, MA 1977, *Ontology I: The Furniture of the World. Treatise on Basic Philosophy*, D. Reidel Publishing Company, Dordrecht, The Netherlands et al.
- Burrell, G & Morgan, G 1979, *Sociological Paradigms and Organisational Analysis*, Ashgate Publishing, Aldershot, UK et al.
- Butler, T 1998, 'Towards a hermeneutic method for interpretive research in information systems', *Journal of Information Technology*, vol. 13, no. 4, pp. 285-300.
- Chopra, S & Meindl, P 2007, *Supply Chain Management. Strategy, Planning, and Operation*, 3 edn, Pearson Prentice Hall, Upper Saddle River, NJ, USA.
- de Saussure, F 1974, *Course in General Linguistics*, Peter Owen Ltd., London, UK.
- Dubé, L & Paré, G 2003, 'Rigor in Information Systems Positivist Case Research: Current Practices, Trends, and Recommendations', *MIS Quarterly*, vol. 27, no. 4, pp. 597-635.
- Gregor, S 2006, 'The Nature of Theory in Information Systems', *MIS Quarterly*, vol. 30, no. 3, pp. 611-42.
- Holten, R 2003, 'Integration von Informationssystemen. Theorie und Anwendung im Supply Chain Management', Habilitation thesis, University of Münster.

- Holten, R, Dreiling, A & Becker, J 2005, 'Ontology-Driven Method Engineering for Information Systems Development', in P Green & M Rosemann (eds), *Business Systems Analysis with Ontologies*, IDEA Group, Hershey, PA, USA et al., pp. 174-215.
- Hughes, J & Wood-Harper, AT 1999, 'Systems development as a research act', *Journal of Information Technology*, vol. 14, no. 1, pp. 83-94.
- Jenkins, AM 1985, 'Research Methodologies and MIS Research', in E Mumford, R Hirschheim, G Fitzgerald & AT Wood-Harper (eds), *Research Methods in Information Systems*, North-Holland Publishing Co, Amsterdam, The Netherlands, pp. 103-17.
- Kamlah, W & Lorenzen, P 1984, *Logical Propaedeutic. Pre-School of Reasonable Discourse*, University Press of America, Lanham, MD, USA.
- Klein, HK & Myers, MD 1999, 'A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems', *MIS Quarterly*, vol. 23, no. 1, pp. 67-94.
- Langley, A 1999, 'Strategies for Theorizing from Process Data', *Academy of Management Review*, vol. 24, no. 4, pp. 691-710.
- Laudon, KC & Laudon, JP 2005, *Essentials of Management Information Systems. Managing the Digital Firm*, 6 edn, Pearson Prentice Hall, Upper Saddle River, NJ, USA.
- Lee, AS 1991, 'Integrating Positivist and Interpretive Approaches to Organizational Research', *Organization Science*, vol. 2, no. 4, pp. 342-65.
- 2004, 'Thinking about Social Theory and Philosophy for Information Systems', in L Willcocks & J Mingers (eds), *Social Theory and Philosophy for Information Systems*, John Wiley & Sons, Chichester, UK et al., pp. 1-26.
- Lee, AS & Baskerville, RL 2003, 'Generalizing Generalizability in Information Systems Research', *Information Systems Research*, vol. 14, no. 3, pp. 221-43.
- Lorenzen, P 1987, *Constructive Philosophy*, The University of Massachusetts Press, Amherst, MD, USA.
- 2000, *Lehrbuch der konstruktiven Wissenschaftstheorie*, J. B. Metzler, Stuttgart, Weimar, Germany.
- Mårtensson, P & Lee, AS 2004, 'Dialogical Action Research at Omega Corporation', *MIS Quarterly*, vol. 28, no. 3, pp. 507-36.
- Maynard, DW 1989, 'On the ethnography and analysis of discourse in institutional settings', in JA Holstein & G Miller (eds), *Perspectives on Social Problems*, JAI Press, Greenwich, Connecticut, USA, vol. 1, pp. 127-46.
- Mintzberg, H 1971, 'Managerial Work: Analysis from Observation', *Management Science*, vol. 18, no. 2, pp. B-97-B-110.
- 1973, *The Nature of Managerial Work*, Harper and Row, New York, NY, USA.
- Morris, CW 1971, *Writings on the General Theory of Signs*, Mouton, The Hague, The Netherlands.
- Myers, MD 1997, 'Qualitative Research in Information Systems', *MIS Quarterly*, vol. 21, no. 2, pp. 241-2.
- Niehaves, B 2004, 'A Framework for Analysing the Epistemological Assumptions of Research Methods in an International Context', paper presented to Innovations Through Information Technology. 2004 Information Resources Management Association International Conference, New Orleans, LA, USA, May 23-26, 2004.
- Popper, KR 1959, *The Logic of Scientific Discovery*, Hutchinson, London, UK.
- Ribbert, M, Niehaves, B, Dreiling, A & Holten, R 2004, 'An Epistemological Foundation of Conceptual Modeling', paper presented to 12th European Conference on Information Systems (ECIS 2004), Turku, Finland.
- Rosenkranz, C & Holten, R 2007, 'On the Role of Conceptual Models in Information Systems Research – From Engineering to Research', paper presented to 15th European Conference on Information Systems (ECIS 2007), St. Gallen, Switzerland.
- von Foerster, H 1996, *Wissen und Gewissen. Versuch einer Brücke*, 3 edn, Frankfurt a. M. .

- Walsham, G 1995a, 'The Emergence of Interpretivism in IS Research', *Information Systems Research*, vol. 6, no. 4, pp. 376-94.
- 1995b, 'Interpretive case studies in IS research: nature and method', *European Journal of Information Systems*, vol. 4, no. 1, pp. 74-81.
- Weber, R 2004, 'Editor's Comments. The Rhetoric of Positivism Versus Interpretivism: A Personal View', *MIS Quarterly*, vol. 28, no. 1, pp. iii-xii.
- Yin, RK 2003, *Case Study Research: Design and Methods*, 3 edn, Applied Social Research Methods Series, Vol. 5, SAGE Publications, Thousand Oaks, CA, USA et al.

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