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A PHILOSOPHICAL STAIRCASE FOR INFORMATION SYSTEMS DEFINITION, DESIGN, AND DEVELOPMENT

A DISCURSIVE APPROACH TO REFLECTIVE PRACTICE IN ISD (PART 1)

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ABSTRACT

The paper proposes a critical[1] approach to information systems definition, design, and development (ISD) grounded in discourse theory, semiotics, practical philosophy and critical systems thinking. It aims to support IS researchers and practitioners in the difficult process of identifying and scrutinizing the diverse issues they face in any ISD project. Two main components of the approach are a hierarchic arrangement of these issues, and of the basic kinds of validity claims they imply, in the form of a philosophical staircase; and a practical framework for critical discourse on these claims called critically systemic discourse. The present first part introduces the staircase and discusses the relevance of the discursive principle for dealing with the various validity claims raised by each one of its steps. The second part will present a discursive framework for applying the staircase.

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[1] The word *critical* is unfortunately ambivalent in English. In this paper, I use it in the philosophical sense of "critique" or "critical reflection" (on validity claims) rather than in the engineering sense of a "critical factor" (of success or failure). *Critique* means a systematic effort of uncovering the presuppositions and implications of claims (e.g., in the present context, claims to providing adequate information, valid knowledge, or recommendations for rational action) rather than criticism in the everyday sense of taking an adverse attitude. Thus, the phrase "a critical approach to ISD" intends an approach that provides support for reflecting systematically on the claims raised by a concrete systems definition or design, and on the implications they may have (if accepted) for all concerned parties.

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1 INTRODUCTION

In search of clear language and philosophy. We tend to talk of "information" and "knowledge" as if we knew what they are. We conceive of them like of objects that we can store, process and retrieve in material form. Some three hundred years ago researchers in chemistry were using the "phlogiston" concept in a similar way to refer to an imaginary element that supposedly was lost in the process of combustion. During more then hundred years the phlogiston theory caused chemists a lot of troubles, which could be overcome only when Lavoisier replaced it by the oxidation theory of combustion. Perhaps information system designers are in a similar situation today. Perhaps it is time to start conceiving of information and knowledge (like of combustion) in terms of processes rather than objects; we do not "have" information and knowledge but "we inform" and "we know," concepts that imply active subjects who interact and share what they think they know with others (Nissen 1992 and 2001). In this paper, I want to show that in the development and use of information systems we might indeed do well to conceive of information and knowledge as ongoing judgmental and argumentative processes, and that in order to understand their meaning and validity, as well as their relevance for rational action, we need the *discursive principle* – the idea that the meaning, relevance, and validity of information and knowledge can be established only through discourse.

In current practice, things look rather different. ISD usually attempts to objectify and nail down "information" and "knowledge" in the form of *data* and inference rules that can be stored and manipulated by computers. It is true, though, that the field of IT/IS moved long ago from its original data-processing (EDP) language to the language of *information* systems definition, design, and development (ISD). This indicates at least a progress of intentions, if not of actual achievement. By "information," IS designers and users obviously mean something more than "data"; otherwise the change of language would be pointless. I assume this "more" alludes to the meaning and relevance that the provided data should have for the intended users: when "data" acquires context-dependent meaning and relevance, it becomes information. Furthermore, we obviously expect information to represent valid *knowledge* on which users can rely for rational *action.* Unfortunately, it is less obvious how exactly the steps from data to information and on to knowledge and rational action can be accomplished (or at least supported) by ISD. The "information" language of ISD seems at the same time too ambitious and too narrow: too ambitious in that technically as well as philosophically speaking, it is far from clear how arrangements for systematic data provision by means of IT – "information systems" – can produce information as distinguished from data; too narrow in that what we really expect a good information system to accomplish is to provide users with knowledge for rational action.

One should certainly not overemphasize terminological questions. Ideas and intentions matter more than the labels we attach to them. However, inaccurate language is such a widespread phenomenon in ISD that it can hardly be accidental. Rather, I suspect, it betrays a certain lack of philosophical clarity with respect to the field's core concepts and intentions.

The idea of a philosophical staircase for ISD. If it is not entirely mistaken that the present state of the field suffers from a widespread lack of clarity concerning its core concepts, it seems vital to clarify and strengthen the philosophical foundations of ISD. My idea in this paper is to introduce what I suggest to call a *philosophical staircase* of ISD, that is, a series of conceptual steps that lead us from the prevailing, philosophically impoverished concept of "information theory" to a more adequate philosophy of ISD. The philosophical staircase is a conceptual framework that arranges basic philosophical issues of ISD in a flight of stairs that can be taken step by step, although each consecutive step depends on all the previous ones. There are nine such steps in the framework, arranged in three groups of three steps each. The third step of each group can be understood as a kind of half-landing on the way up the stairs where we can rest and reflect on what we have achieved so far (Figure 1).

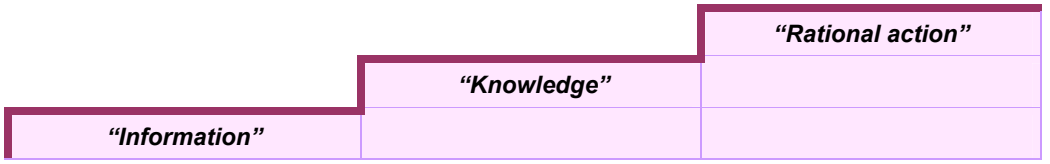

Figure 1: Three major half-landings in the philosophical staircase of ISD

The underlying definition of ISD is this: *ISD is systems definition, design, and development with a view to providing people with information for purposeful action.* The implicit idea is that the value of "information" consists in contributing to *knowledge* for purposeful action, and that the value of "knowledge" in turn consists in guiding people toward *rational* action in the sense of helping actors to choose courses of action with reason. This basic definition is still unclear as the three key terms are in obvious need of philosophical clarification. Our philosophical staircase thus requires us to relate ISD to three basic philosophical questions:

- What do we mean by *information?*
- How does information become *knowledge?*
- How does knowledge relate to *rational action?*

(See Table 1)

Table 1: Three core philosophical problems posed by information systems design

Core concept	Basic issue	Basic theory
"Information"	**The philosophical step from symbolic systems to "information"** How do we know that some signal or message (a stream of signs or symbols) represents information?	***Semiotics:*** the theory of signs and symbols ≠ "information theory"
"Knowledge"	**The philosophical step from information to "knowledge"** How do we know that some information represents valid and relevant knowledge?	***Epistemology:*** the theory of knowledge ≠ "science theory"
"Rational" action	**The philosophical step from knowledge to "rational" action** How do we know that the knowledge we rely on is conducive to rational action?	***Practical philosophy:*** the theory of rational action ≠ "applied science"

I will discuss each core concept in terms of three elementary philosophical conditions, so that in the end our conceptual staircase will consist of nine conceptual steps that lead us from computer-processed data to rational action (Figure 2).

The discursive principle. A second basic idea of the paper is that in order to take these conceptual steps, we need a methodological tool that can help us to climb the stairs both in the theory and in the practice of ISD; I mean the principle of *discourse.*

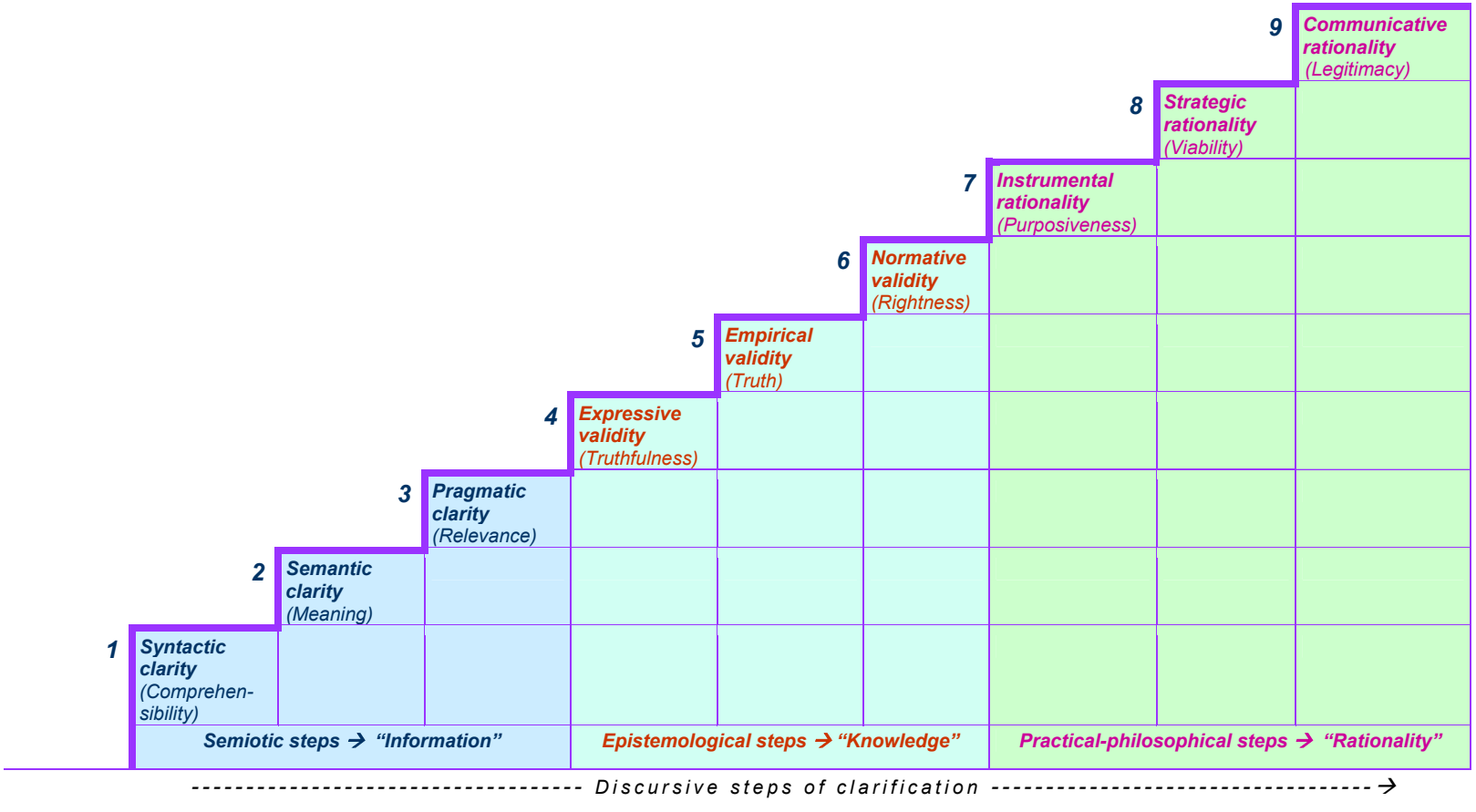

Figure 2: The philosophical staircase of ISD

Discourse as I understand it here is not just the idea that people involved in ISD should "talk together" (of course they should); rather, it is an *argumentative* method of clarifying disputed validity claims such as "this is a meaningful interpretation of the data" or "this information agrees with the facts." I propose that discourse in this sense is constitutive of what we mean by "information," "knowledge," and "rationality," insofar as each of these concepts entails different types of validity claims that can always be disputed on good grounds. Note that insofar as information gets objectified in information systems, discourses get frozen in objectified form too. This is the exact contrary of what the discursive principle intends.

Discourse can help us take the philosophical steps that lead from data to information, and then from information to knowledge and on to rational action, (a) by laying open the validity claims that underpin each step and (b) by subjecting these claims to argumentative examination by all those concerned. The methodological decision of submitting to discursive examination all the assumptions that lead us up the stairs is what I mean by the *discursive principle* in the context of ISD. The paper suggests using the discursive principle, along with the philosophical staircase, as an essential device not only for clarifying theoretically the validity claims involved in information systems definition, design, and development but also for promoting reflective ISD practice.

Organization of the paper. In *Sections 2-4,* I propose to look briefly at each of the three core concepts of "information," "knowledge," and "rational" action in terms of the philosophical issues they raise from the perspective of the basic disciplines or theories mentioned in Table 1. We will see how the discursive principle emerges from these philosophical traditions as an indispensable device both for understanding and for examining the validity claims that each concept implies. To avoid boring readers with philosophical rudiments with which most may be familiar, I have summarized a few elementary aspects of each basic theory (as mentioned in Table 1) in frames marked "*Excurses."* Readers may skip or consult these excurses according to their needs. Even so, the philosophical staircase of ISD raises issues that reach far beyond what I can hope to achieve in a single paper. I thus do not claim to do justice to all the issues involved; rather, I try to focus on some aspects that I find particularly helpful for going up the stairs, such as the role that the discursive principle may play. *Section 5* will then offer a summary interpretation of the implications of the staircase for ISD and will briefly consider the example of hospital information systems to illustrate the practical relevance of this interpretation. This will conclude Part 1.

Part 2 begins with *Section 6.* It offers a review of three papers from the ISD literature that I find exemplary for the ways in which they consider the discursive principle. We will conclude that if the discursive principle is to gain more practical importance in ISD, we need to redefine it in terms of a "critical turn," that is, an approach to reflective practice that focuses on dealing critically with the inevitable *deficits* of validation rather than understanding discourse as a means of validation of the claims involved in ISD. *Section 7* will then outline a discursive framework to this end; a framework that should help readers in identifying and examining concrete issues as they arise in ISD practice at all levels of the staircase. The framework is based on my work on critical systems thinking – especially my "critical systems heuristics" (Ulrich 1983) – and is called *critically systemic discourse,* for reasons that I will explain. The final *Section 8* will consider a practical case and outline a three-stage model for the practical application of the framework.

2 THE DISCURSIVE KERNEL OF INFORMATION

What do we mean by "information"? Philosophically speaking, information science and technology (IT) appear to have got it wrong from the start. Their conceptual and technical tools basically deal with the processing and transmission of signals (or messages, streams of signs) rather than with "information." Signals are arrangements of material (physical or electronic) signs that may carry some information but do not themselves

tell us what information they carry, except in the syntactic sense of conforming to the rules of a certain syntax. This is certainly no news, yet we continue to refer to issues of signal processing and transmission in terms of "information theory." The language of information theory makes us easily forget that not information theory but *semiotics*, the general theory of signs and symbols, is the fundamental philosophical theory on which we should rely for understanding and defining "information" (Excursus 1).

Excursus 1: Semiotics. "The general study of symbolic systems, including language." (Blackburn 1994, p. 346) The theory goes back to work by Charles S. Peirce (1931-35) on a general theory of signs and symbols and was elaborated by Charles Morris (1938, 1946) as a general study of linguistic meaning. Both authors distinguished between three fundamental (because irreducible) aspects or branches of semiotics:

Syntactics analyzes the relation of signs to other signs within a language, that is, the structure (syntax or grammar) of well-formed messages. The essence of good syntax is clarity of FORM considering given rules of coding – the "signs" constituting a message are understood.

Semantics analyzes the relation of signs or messages to that which they signify, that is, their meaning. The essence of good semantics is clarity of CONTENT considering given contexts of interpretation – the "signification" of a message is understood.

Pragmatics, finally, analyzes the relation of signs or messages to their users, that is, the way they are used in contexts of communication and action. The essence of good pragmatics is clarity of CONSEQUENCES considering given contexts of application – the "significance" of a message is understood.

The relationship between these three aspects under which symbolic systems can be considered is asymmetric: pragmatic clarity of meaning presupposes semantic clarity and semantic clarity presupposes syntactic clarity, whereas syntactic clarity presupposes neither semantic nor pragmatic meaning. It is therefore useful to conceive of the three aspects in terms of *semiotic levels,* that is, levels of communication and (mutual) understanding.

Information theory, due to its mathematical and statistical character, can deal with the syntactic level of symbolic systems only. It thus cannot supersede semiotics as a theoretical basis of information systems design. A similar relationship holds between IT and IS. Information processing machines and software can grasp meaning (and thus "understand" and "communicate" messages) at the syntactic level only; the semantic and pragmatic levels require subjective intentionality and intersubjective exchange, which are distinctive of human cognition and communication. For handling these aspects, information systems remain dependent on their human designers, operators, and users.

Semiotics and Information Theory – two concepts of "information." Semiotics includes issues of information theory but cannot be reduced to it (Figure 2, steps 1-3). As is well known, information theory (Shannon and Weaver 1949) defines the information content of a *message* – a stream of signs – by the amount of uncertainty that the message eliminates in a statistical sense. What it tells us is "Cheers, it's me, forget about all the other bloody combinations of signs that might have arrived in my place!" The lower the relative frequency of that particular combination of signs is, given a certain stock of signs that can be transmitted, the higher is its "information content." Who cares (in information theory) how poor or unimportant the content of the message may actually be to the receiver. Contrary to what we were assured by McLuhan (1964), the medium is perhaps the massage but definitely *not* the message.

In semiotics, by contrast, information is a concept that is defined at *all three* levels of communication. By implication, information we give or receive is not clear unless the intended contexts of interpretation (semantic clarity) and application (pragmatic clarity) are

equally clear (Figure 2, steps 2 and 3). The first lesson, then, is that IT/IS must learn to live with information in the richer sense of semiotics; which is why the discursive principle comes into play already before the first half-landing of the staircase.

Given that we probably have to live for some time with the ambivalent language of information processing, let us begin by saying what we mean when we talk of "information." Let us be clear at all times about which semiotic levels we intend. To avoid constant awkward references to the semiotic levels concerned, as much as continuous blurring of philosophically distinct categories, I propose we indicate the intended concept of information by means of the two alternative indices "IT" (information^{IT}) or "ISD" (information^{ISD}) *whenever* there might be any doubt at which semiotic level we are arguing. With reference to steps 1-3 of the staircase we might equally talk of information (1), information (2) and information (3), but the first solution probably has the advantage of being more self-explanatory. As the terms should make obvious, information^{IT} is defined at the syntactic level, whereas information^{ISD} is sufficiently defined at the semantic and pragmatic levels only (each of which presupposes the preceding semiotic levels). We then gain these two concepts of information:

1. Information^{IT} comprises everything that can be defined at the syntactic level, that is, all inputs, means, and outputs of data processing. "Data" in this context means *records* that can be processed *(objects* of computer processing) including the rules of inference and programs by which they are processed and the results of such processing, all *regarded at the syntactic level.* This is different from the everyday concept of "data," which usually refers to circumstances regarded at all three semiotic levels.

2. Information^{ISD}, by contrast, comprises everything that humans do with "data" (in both senses of the word) at the semantic and pragmatic levels. These activities involve human capabilities such as consciousness and intentionality, abstraction and reasoning, feeling and intuition, doubting and questioning, sensitivity to changing contexts, and last but not least: intersubjective exchange and understanding. For the sake of brevity, I will refer to these diverse capabilities as "human cognition and communication".

I will use the two indices except when the intended concept of information is clear or I mean both concepts at once. We can now redefine our preliminary concept of an information system (as contained in our definition of ISD) a bit more accurately: An information system is any systematic arrangement for providing a defined group of people with information^{ISD} for purposeful action; to the extent that the arrangement relies on IT, it must include provisions for transforming information^{IT} into information^{ISD}.

Since only humans are capable of appreciating and handling information^{ISD}, it follows that a proper design ideal for information systems must *not* design human cognition and communication out of the system. This may look like a rather obvious statement; but the fact of the matter is that many IS designs imply precisely this mistaken design *ideal* – "design man out of the system" (fortunately, ideals rarely come true). The problem is, so long as we reduce semiotics to information theory, machines are obviously far more efficient than people in processing "information" (i.e., information^{IT}).

Learning from history: the "Fitts list." In the engineering and scientific management literature, there is a classical story illustrating the problem. Fitts (1951) was an engineer who published a seminal article on the question of how systems functions in automated systems should be allocated optimally between men and machines, a question known as the problem of *human factor engineering*. He devised an empirical solution that became famous as the "Fitts list." The list consisted of two columns, one standing for "man," the other for "machine," and so contrasted the functions that humans empirically perform better than machines to those in which they are inferior to machines.

Fitts' contribution was widely hailed as breakthrough towards a clean engineering solution. The only problem was, it did not work.

Why? There was nothing wrong with Fitts' list as far as his assignment of human versus machine functions to the two columns of the list is concerned – it was never found incorrect. In an insightful discussion of the problem, Jordan (1963, with reference to Birmingham and Taylor 1954) uncovered the flaw in Fitts' assumption of man-machine comparability:

> *To the extent that man becomes comparable to a machine we do not really need him any more since he can be replaced by a machine. (Jordan 1963, p. 162)*

The faulty concept is that human performance can be measured in the same numerical terms as that of machines. The implication, of course, is that man is best when his part in automated systems is kept as small as possible. Such an approach actually begs the question. Instead of properly examining the question of how we can achieve an optimal interaction of man *and* machine – "optimal" for both man and machine – it looks at the problem in machine terms only and thereby ends up with a faulty alternative of man *or* machine – a classical case of suboptimization.

In the light of our philosophical staircase, the diagnosis of the problem is even more obvious. IT/IS must overcome its (supposed) theoretical foundation in a one-level conception of information. There is a need for redefining information science in terms of a much more comprehensive, *multi-level philosophy of information,* of which semiotics forms the foundation. We may always try push out the boundaries of what we can achieve at the syntactic level; but we should not assume that we thereby jump from step 1 to step 2 of the philosophical staircase and somehow, miraculously, transform information^{IT} into information^{ISD}. That appears to be exactly what did some of the most eminent founding fathers of the field (Newell, Shaw and Simon 1958, 1960, 1972) when they assured us that the heuristic capabilities of information processing systems could achieve the same results that have been traditionally associated with human problem-solving capabilities. (For an earlier critique of their claim in the light of a multi-level conception of problem-solving systems, see Ulrich 1977.)

Toward an adequate semiotic foundation of ISD. Concerning the role of semiotics as a foundation stone, a number of helpful discussions are already available. A few I have found helpful are Andersen (1991, 1992), Stamper (1991, 1996), Goguen (1992), Mingers (1996), Ngwenyama and Lee (1997), Klein and Myers (1999), and Nissen (1992, 2002). Andersen (1991, p. 465) summarizes the case well: "A key assumption of this approach is that IS should fruitfully be viewed as media for social interaction and not as models of reality." The staircase suggest that this assumption is indeed necessary since many of the difficulties we need to face at higher levels are strongly related to the normative[2] character of all interpersonal practice, including IS.

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[2] "Normative" is a word that is no longer well understood in contemporary everyday English, yet there is no good substitute for it. In its most general sense, it means as much as "implying value judgments." When we assert an opinion, or a proposition or any other kind of validity claim that depends on value judgments, we usually imply tacitly that our value judgments are valid, that is, that others *ought to* accept them and should act accordingly. Insofar we give our claim a "normative" meaning in the somewhat stronger sense of the term in which it is usually employed in philosophy, namely, as establishing *norms* for adequate ("right") intersubjective behavior. "Norms" are values that are recognized to provide binding criteria or standards for assessing social interaction or action that may affect others. In the present paper, I use phrases such as "normative content" and "normative validity" in this second, stronger sense of implying claims to rightness. I speak of normative *content* in the double sense of the normative assumptions (presuppositions) that underpin a claim and of the normative implications (live practical consequences) it may have (if accepted) for the different parties concerned. Accordingly, by "normative validity" (a claim raised by step 6 of our philosophical staircase of ISD) I mean the validity of a claim with respect to

The semiotic insight into the social interactive nature of IS is indeed fundamental for any effort to move beyond step 1 of the staircase. Somewhat amazingly, though, Anderson and many of his colleagues do not seem to take this insight as seriously as one might expect. Not atypically, Anderson rapidly narrows down the perspective he just opened up, by focusing on interface design from a *user perspective* rather than an observer perspective; consequently semiotics is seen as "a theoretical background for user centered systems design and assessment" (1991, p. 466). This looks to me rather like a confusion of semiotics with hermeneutics. Hermeneutic (interpretive, soft systems) approaches in many fields, including the approaches I am familiar with in the fields of management science and systems thinking, tend to avoid issues raised by the normative nature of social practice; they focus on the subjective rather than the *inter*subjective nature of information^{ISD}. There are some notable exceptions among the contributions to IS semiotics I have mentioned, though (e.g., Goguen 1992; Nissen 1992 and 2002). Semiotic analysis as I understand it aims beyond hermeneutics. It treats the pragmatic dimension as an integral aspect of semiotic clarity and therefore considers the "practical bearings" (in Peirce's original wording) of information for interactive social practice. Practical bearings mean that "the design of an information system is a natural occasion for power struggles," for "information systems are powerful engines for concentrating and applying power." (Goguen 1992, p. 11) Adequate definition of information requirements for a specific system cannot escape this implication. I can only assume the reason for the frequent escape into a predominantly hermeneutic "user" perspective is that semiotics alone cannot do the job. However, our staircase does not require us to burden semiotics with the entire load. It is sufficient that we don't try to build on faulty concepts from the start; we need not solve all problems of ISD within the first three steps.

Let us, then, be clear in what way a semiotic foundation of ISD needs to go beyond a mere "user" perspective. The point is that this perspective does not capture the full extent to which human cognition and communication (or the "human factor," in the terms of human factor engineering) are constitutive of information^{ISD}. We need to consider not only the ways people *use* IS but also, and more fundamentally, the ways in which *information is socially defined and socially momentous.* In any field of human activity, what passes for information can be a very complex and controversial issue and can affect the lives and social life-worlds of many people beyond those involved as system designers and users. Adequate design of user interfaces is certainly necessary but by no means sufficient to do justice to this sort of issue. Whose information is it, where does it come from (garbage in, garbage out)? How reliable or unreliable, accurate or biased, unambiguous or meaning different things to different people is it? What are those informed supposed to *do* with it, for which purposes should they rely on it and for which other purposes they shouldn't? What consequences may be linked to not using the information in the way it is supposed to be used, not only for those who are supposed to "use" it but also for others who may not be involved in its definition and use? In short, what *ought* to pass for adequate information and how *might* it affect people?

As an illustration we may think of the sophisticated hospital information systems that nowadays keep track of patients' medical and administrative data. How systems designers, medical and administrative staff define and manage diagnosis-related and treatment data (information^{IT}) and later use it as information^{ISD} (case histories, case-mix information, quality control, hospital performance indicators etc.) can affect the patients' health considerably and may sometimes be a matter of life and death for those affected, apart from having considerable financial implications. Or take the global weather information systems that meteorologists use to produce our daily weather report: weather forecasts too can become a matter of life and death for many people (not only meteorologists) and in any

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both its normative presuppositions and its actual consequences for those affected. Compare Excursus 3.

case may have important economic implications for many sectors of society. Aren't all these questions linked to the semantic and pragmatic content of information? Semiotic clarification as I intend it in steps 1-3 of the staircase means that in any concrete ISD project, we need to explore this kind of questions *empirically* for the particular contexts of interpretation and application concerned, according to Peirce's *pragmatic maxim*:

> *Consider what effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object. (Peirce 1878, para. 402)*

Just think of the "object of our conception" as the information output of an IS to see the relevance of Peirce's criterion of meaning. Note that Peirce does not ask us to consider what practical bearings we conceive the object of our conception to have for ourselves only. The meaning of information is not sufficiently defined by what it means to the user and how useful it is to him; rather, it includes all the implications it may have for all people concerned (cf. my discussion of the pragmatic maxim in Ulrich 2001, pp. 11-14). Of course Peirce was thinking of scientific practice rather than ISD practice; his primary concern was that empirical scientists should make the meaning of their propositions or hypotheses clear by defining them in observational terms that allow of experimental examination. But it is certainly not against the spirit of his concern for clear thinking if we interpret the pragmatic maxim as a kind of quality control for semiotic clarity in all fields of research and practice.

Concerning ISD research practice, the good news is that researchers, both in the development of new generations of software (Nissen 2002) and in the design and implementation of specific information systems (Checkland and Holwell 1998), are now increasingly taking up semantic and pragmatic aspects. Checkland and Holwell's soft systems approach is exemplary for the clarity of thinking it brings to ISD practice; Nissen's reflections are equally exemplary for a new attention to creating value for software users through social and hermeneutic-dialectic thinking. I have no doubt that such approaches can equip developers better than before in dealing with the needs of users. I see in both contributions a lot of potential for involving other stakeholders, too, and thus for doing even more justice to the spirit of pragmatic clarification that I am advocating. The bad news is only that the prevailing practice of ISD, whether "hard" or "soft," appears to be rather different. As far as it is opening up to softer approaches, it risks reducing semiotic clarification to interface design, and interface design to the user perspective.

My plea is for taking Peirce's pragmatic maxim seriously and hence, for striking a better balance between the *hermeneutic* concern about understanding the situation of users and an *emancipatory* concern for the situation of other stakeholders. That is what an appropriate semiotic foundation as I advocate it is all about. Of course, semiotic analysis alone cannot secure an adequate reconciliation, but at least it can draw attention to possible sources of failure and conflict. These can then at least become an issue of discourse among all those concerned.

The discursive kernel of information. At a merely syntactic level of information processing, the clarity of a message can be tested "mono-logically" either by a lonely human subject or by a computer according to general rules of well-formedness. As soon as we move to the semantic and pragmatic levels, clarity (as well as richness of content) requires intersubjective sharing of context-bound meaning and relevance. As the questions just considered in connection with the pragmatic maxim imply, the definition of information^{ISD}, like that of knowledge, is *socially constructed* (Berger and Luckmann 1966). It may consequently be socially more or less acceptable or contested. "Testing" then requires communicative interaction to negotiate common definitions of relevant contexts of interpretation and application.

To avoid a possible misunderstanding, reaching mutual understanding on semantic and pragmatic meaning is basically a pre-discursive affair; either we *share* a definition or we don't. If we don't, we are not either right

or wrong, we simply don't share the same interpretive framework. Strictly speaking, discourse comes into play only when we look at the practical *implications* of some shared or contested definition of information^{ISD}, for these implications entail claims that can be decided discursively.

By beginning to consider such implicit claims as early as at the semiotic levels of the staircase, we sneak a look at higher levels of the staircase, as it were. I cannot see any substantial reason why we shouldn't, as long as it serves a critical purpose in clarifying and defining what passes for information. In practice the two issues of *sharing meanings* and *accepting claims* are so closely intertwined that we tend to speak naturally of "claims" to information. I think it is symptomatic indeed that "mutual understanding" refers simultaneously to shared meaning *and* to agreement on normative implications, so much so that when we refer to mutual understanding it is rarely clear to what extent the minimal and to what extent the maximum interpretation are intended. What is clear, however, is that the nine conceptual steps of the staircase are closely interdependent, so much so that in practice they cannot be separated neatly from each other. Nor should they, as we may conclude from everything we have learned thus far.

From a critical point of view, discursive testing of claims to information^{ISD} is therefore always a relevant idea. When mutual understanding among IS designers breaks down, even if it is only intended in the minimal sense of shared and clear meanings, disagreement about intended practical implications is usually not far away. For these reasons I would suggest that in sound ISD practice, decisions on what passes for information^{ISD} should always be seen as calling for discursive procedures, for such decisions represent the points where discourse stops (perhaps before it has begun) and subsequently becomes frozen into information^{IT}. No matter how distorted the communicative practice underpinning such decisions may be, they still embody frozen discourses and therefore, as a matter of principle, should be open to previous and subsequent discursive challenge.

In conclusion, if information systems are to provide people with meaningful and relevant information^{ISD} for purposeful action, they need to support, *and to be supported by,* adequate discursive practices. We cannot hope to achieve clarity and relevance of information^{ISD} without giving a systematic place to the discursive principle from the very beginning.

3 THE DISCURSIVE KERNEL OF KNOWLEDGE

What do we mean by "knowledge"? Taking up what we have just noted, mutual understanding about the meaning and relevance of the content of some statement (its information^{ISD} content) is not the same as validity. When we make a statement, we not only imply that its meaning is clear at all three semiotic levels (i.e., everyone concerned understands what we say) but also that what the statement states is *accurate,* that is, free from errors and omissions. With this sort of claim we move from the first to the second theoretical level in Table 1, from semiotic to epistemological considerations. *Epistemological* reflection and discourse begin when we move from shared understanding about what counts as information (semiotic clarity) to the question of what counts as knowledge (epistemological clarity). Epistemology is the philosophical discipline concerned with the nature, origin and validation of knowledge, or shortly, the *theory of knowledge.*

It must astonish that in many scientific disciplines (both basic and applied sciences), the theories of knowledge underpinning theoretical propositions as well as practical proposals are hardly ever made explicit. Researchers usually write and talk as if they were a matter of course. This may be unproblematic in many natural science disciplines, where well-proven experimental methodologies make sure that false claims will sooner or later be discovered; in the social and applied disciplines, however, a lack of clarity as to what counts as knowledge can become a

serious source of deception, since in these fields false claims are not so easily uncovered. Consequently, explaining and questioning what counts as knowledge – reflecting on the assumed theory of knowledge – is never a bad idea. What, then, do we mean by "knowledge"?

Basically, in the context of academic and professional work, knowledge means *propositional* knowledge *that* something is the case (as in "water is a compound of hydrogen and oxygen"; "there is a 75% chance that it will rain tomorrow") or about *how* something can be done (as in "water can be generated from the combustion of hydrogen"), rather than non-propositional knowledge in the sense of mere familiarity with a thing or a person (as in "I know Peter"). Propositional knowledge is what a *true* proposition says is (or will, or may) be the case, *provided* the proposition can be substantiated by compelling reasons. That is to say, knowledge requires more than a belief or guess that is accidentally true; it requires *justified,* true, belief – the knower must be able to *explain* why he asserts that something is the case. If I simply guess that it will rain tomorrow but cannot explain why this is so, then I do not "know" but merely assert that it will rain. It is thus not sufficient for a knowledge claim that the proposition in question is confirmed by experience; if that were so, any guess that happens to be confirmed by experience would represent knowledge. Knowledge in the sense intended here depends on the possibility of making an *argument* to the truth of a proposition. A knowledge claim implies that the question of truth is rationally decidable.

Unfortunately, there is little agreement in the theory of knowledge about what constitutes a satisfactory argument for truth. Epistemology is a difficult and controversial subject, perhaps because it is so fundamental to philosophy and science. Like all fundamental philosophical problems, this one does not lend itself to a complete solution. It is thus hardly surprising that the history of philosophy has produced a great number of different theories of knowledge. Excursus 2 gives an overview.

The discursive turn of epistemology**.** I would like to make three basic observations concerning the present state of the theory of knowledge.

1. I think is fair to describe the development of the theory of knowledge as leading from two opposing, one-sided conceptions of knowledge as being grounded *either* in reason *or* in experience, toward increasingly sophisticated attempts at explaining the way in which reason and experience *together* can ground knowledge. It is clear today that only in conjunction, reason and experience can produce knowledge; they are but two sides of the coin that entitles us to claim knowledge. The precise nature of this conjunction, however, remains a matter of dispute in contemporary epistemology.

2. Neither of the theories of knowledge proposed thus far provides inquirers with an *operational* theory of truth, that is, a criterion that would allow "objective" (unambiguous) decisions on disputed truth claims; hence, in the practice of research, truth remains a matter of dispute, too.

3. In order to overcome the wrong alternative of grounding knowledge either in experience or in reason, all contemporary theories of knowledge rely on some *discursive* procedure as the means by which a synthesis of the two sources of knowledge (or of its justification) is accomplished. This distinguishes contemporary approaches fundamentally from Kant's (1781) earlier synthesis, which still located reason in the mind of an abstract, individual inquirer whose "apperception" (reflective perception of sensory experience) assured some "correspondence" between cognition and reality. (For a detailed analysis and reconstruction of the continuing importance of Kant's thinking for epistemology and practical philosophy today and especially for a critical systems approach to the applied disciplines, see Ulrich 1983, chapters 3-5).

Excursus 2: Epistemology. "The branch of philosophy concerned with the theory of knowledge. Traditionally, central issues in epistemology are the nature and derivation of knowledge, the scope of knowledge, and the reliability of claims to knowledge." (Flew 1984, p. 109). The theory of knowledge should not be confused or equated with so-called science theory, a sub-discipline of the theory of knowledge that focuses on the model of empirical-analytic science and tends to see this model as providing the only legitimate approach to epistemological issues.

The nature and derivation of knowledge: Traditionally, debates between empiricists and rationalists focused mainly on the question of the origin and nature of knowledge (in the terms of contemporary science theory, the "context of discovery"). For the empiricists, there can be no knowledge beyond the limits of experience; for the rationalists, all experience is constructed by the human mind. If there is any conclusive result of these debates, it is that the alternative is wrongly posed; only an approach that strikes a balance can hope to provide a satisfactory account.

The reliability of claims to knowledge: In contemporary philosophy, the focus has shifted to the question of how claims to knowledge can be validated (the so-called "context of justification"). This question is more immediately relevant to the crucial issue of what, in practice, should count as "knowledge." The central problem is the search for a satisfactory, operational theory of truth.

Theories of truth: The classical empiricist theory is the *correspondence theory of truth,* according to which true propositions must conform to what is empirically the case, or more accurately, to "facts" uncovered by systematic observation; its main difficulty is that statements of facts are themselves propositions – no kind of systematic observation provides a direct, objective access to the world. The classical rationalist theory is the *coherence theory* of truth, according to which (unless the world is self-contradictory) true propositions must conform to other true propositions; its main difficulty is that the internal consistency of a system of propositions does not provide any guarantee that the propositions are in touch with reality.

Although the basic point of both theories appears valid, both run into fundamental problems; neither has managed to operationalize its criterion of truth satisfactorily. Later theories of truth, beginning with Kant's (1781) *Critique of Pure Reason,* therefore attempt some synthesis of the two classical positions. The basic idea is that reason and experience not only depend on each other but also can control one another to make sure that either is limited (in Kant's words) to "its lawful claims."

A major example is the *pragmatic theory* of truth of Peirce and James (not to be confused with Peirce's pragmatic criterion of meaning), according to which a proper synthesis of reason and experience must prove itself by its pragmatic value in guiding human action. Peirce's (1931-58) theory is astonishingly modern today in that it also postulates that truth is the agreement at which a community of all competent inquirers eventually arrives, if only it investigates the matter long and carefully enough – an idea that anticipates later evolutionary and discursive conceptions of knowledge. Among these, Popper's (1959, 1963, 1972) *critical rationalism* is an influential approach that has gained wide acceptance among natural scientists as a theory of empirical science. It suggests that theoretical propositions cannot be verified but can only be falsified, namely, by observational statements that contradict them; and that observational statements, because they are always theory-impregnated (i.e., depend on concepts that cannot be inferred from experience), cannot ultimately be validated either but can only be subject to intersubjective criticism, so-called "critically-rational discussion." The most contemporary example is Habermas' (1979, 1984) *consensus theory* of truth, according to which all propositions imply a number of different validity claims that can be validated only through rationally motivated discourse under conditions of symmetric chances of argumentation by everyone concerned.

The discursive kernel of knowledge: Peirce. Peirce (1931-58) first replaced Kant's lonely transcendental subject by a *community of competent inquirers* and introduced the idea that truth is not a matter of individual certainty concerning "correspondence" but rather a matter of possible reference, within a theoretically infinite community of inquirers, to the judgment of others. This is Peirce's famous definition of truth:

> *The opinion which is fated to be ultimately agreed to by all who investigate, is what we mean by truth, and the object represented in this opinion is the real. That is the way I would explain reality. (Peirce 1878, par. 407)*

Ever since this *discursive turn of epistemology,* reason as the indispensable counterpart of experience needs to be conceived not only in terms of individual reflection and judgment but also in terms of cogent intersubjective argumentation. Intersubjective argumentation is what we call *discourse.* To be sure, discourse for Peirce was not, and still cannot be for us today, an alternative to empirical science; rather, it should be understood as a constitutive element of the method of science. The success of the scientific method demonstrates not the soundness of empiricism (as many people still seem to believe today) but rather the value of using discursive procedures for validating or challenging empirical evidence. In this sense, the discursive principle has become an indispensable cornerstone of all contemporary theories of knowledge.

Among today's discursive theories of knowledge, those advanced by Karl Popper and Jurgen Habermas stand out as particularly innovative and influential. I have given detailed critical appreciations of both approaches elsewhere (Ulrich 1983, Ch. 1 for Popper and Ch. 2 for Habermas) and thus can limit my discussion here to a few essential aspects, without any claim to doing justice to either work.

Their basic idea is the same as that of Peirce: empirical evidence, whatever procedures we use to gain it, does not speak for itself but requires a community of competent inquirers to decide on what it tells us and how accurate some theoretical account of it is. The only way to decide on the conclusiveness of empirical evidence for theoretical claims is by *argumentation* and eventual consensus among all those concerned and qualified. Accordingly, when we speak of the *discursive principle,* we mean the methodological concept of validating claims to knowledge and rationality through inter-subjective argumentation among all those concerned and qualified.

In the present context, the discursive principle raises two main questions: First, what should be considered to be an appropriate form of discourse? Second, what validity claims need we examine discursively when we want to take the step from information to knowledge? I will first give a very short summary of Popper's answer to these two questions. Subsequently I will describe Habermas' answer in more detail as it is much more helpful for our purpose of analyzing the philosophical staircase of ISD. I invite readers to follow my account since (I suspect) Habermas' style of writing is not particularly accessible to many IS professionals, while on the other hand less than accurate accounts are as common in the IT/IS literature as elsewhere.

Contemporary models of discourse (1): Popper. Popper's (1959, 1963, 1972) *critical rationalism* has become seminal through the way it redefined the epistemological problem of how science can justify its claims to knowledge. It shifted the focus from empirical verification of propositions to empirical *and* discursive *falsification*. Popper's falsification principle has found wide acceptance in the empirical sciences, and it has important consequences for our understanding of the process of scientific research and the growth of theoretical knowledge. It means that researchers, rather than trying to avoid theoretical propositions that may turn out to be wrong, should try to formulate hypotheses that lend themselves to empirical falsification. On this depends the progress of science. The beauty of Popper's approach is that it frees scientists from the obligation to be error-free: contrary to what had been assumed before Popper and is still popularly believed, the aim

of science is not to verify its propositions but rather to falsify them!

Unfortunately, however, Popper's discursive falsification procedure relies on a rather impoverished model of discourse. Its criterion of successful falsification attempts consists in logical contradiction between the theoretical proposition at issue and some observational statement that has been accepted by a community of inquirers. As Popper likes to say, *deductive logic* is the "organon of critique." Such a criterion of criticism cannot deal with the normative implications that the acceptance of a proposition may have in a context in which a decision, recommendation, or action is based on it. I suspect this is a major reason why Popper tends to ignore such issues or else to equate practical with merely instrumental reason (on the concepts of instrumental and practical reason, see Section 4 of this paper).

Contemporary models of discourse (2): Habermas' "formal pragmatics." Habermas' (1984) *Theory of Communicative Action* offers the most elaborate model of discourse available today. For this reason it has gained ever-increasing recognition and importance in recent years, especially in the applied and social sciences. As the name suggests, Habermas' theory introduces another far-reaching shift of focus, from the theory of knowledge to a theory of "communicative action," by which he means action oriented to reaching mutual understanding. This makes it relevant to our philosophical staircase: it promises to take us upstairs from knowledge to rational action. Accordingly, we will draw on the theory also in the next section, where it will help us to clarify the meaning of rational action. In the present context, the theory of communicative action matters to us for a different reason: its underlying "formal pragmatics" (also called "universal pragmatics," see Habermas 1979, 1984) can help us to understand the validity claims involved in the conceptual step from information (semiotic analysis) to knowledge (epistemological analysis).

By *formal pragmatics,* Habermas (1984, p. 139 and p. 277) understands the reconstruction of universal conditions of successful communicative action in terms of a "pragmatics of language," that is, a *theory of speech acts* that starts from the pragmatic level of language analysis in semiotics. A speech act, according to Austin (1962) and Searle (1969), is an utterance (an elementary unit of communication by means of language) that expresses a statement, a question, a command, and so on. Habermas calls his analysis of the pragmatic level of speech *formal* to distinguish it from the original pragmatic approach of Peirce (1878, 1931-35) and Morris (1938, 1946), which aims at an *empirical* analysis of particular contexts of communication.

Like other earlier approaches to analyzing communication (e.g., in information theory, analytical and linguistic philosophy), formal pragmatics aims to uncover *general* conditions of successful communication rather than context-bound characteristics of *particular* speech situations and related particular competences of individual speakers; in this sense too it is "formal" or, as Habermas originally said, "universal." Unlike these earlier approaches, including semiotics, formal pragmatics does not assume that such formal analysis is possible only in respect to the syntactic and to some extent also the semantic dimensions whereas the pragmatic dimension is accessible to empirical analysis only (e.g. psycholinguistics and sociolinguistics). Instead, it understands the pragmatic dimension as an integral dimension of the *logic* of speech acts. In this double sense it represents a "formal pragmatics" of speech acts. This makes it understandable why Habermas (1979, pp. 26-29) also calls his approach a theory of *communicative competence,* in contrast to Chomsky's (1957, 1965) earlier theory of linguistic competence which focused on the phonetic, syntactic and semantic properties of language while leaving the pragmatic dimension to an empirical theory of linguistic performance.

Let us now look at the general structures of communicative competence that Habermas' analysis reveals. Communicative competence for Habermas is "the ability of a speaker oriented to mutual understanding to embed a well-formed sentence in relations to reality" (Habermas 1979, p. 29). Three such relations are crucial in Habermas' (1979, pp.

53-68; 1984, pp. 288-295 and 307-309) analysis:

1. Speech acts state something about external reality, that is, "the" world of objects and circumstances that we may perceive and describe in a more or less objective attitude – the *constative* function of speech acts. Austin (1962) speaks of *locutionary* acts; they state the propositional (locutionary) content of a sentence.

2. Speech acts state something about social or interpersonal reality, that is, "our" social life-world of shared norms and conventions that regulate interpersonal behavior (in particular the relation between speaker and hearer) and to which both speaker and hearer may more or less conform – the *regulative* function of speech acts. Austin (1962) speaks of *illocutionary* acts; they express the intended "mode" of a sentence as an assertion, promise, command, avowal, disapproval, and so on.

3. Speech acts express something about the speaker's internal reality, that is, "my" subjective world of wishes, feelings, intentions, and so on, which a speech act may make more or less transparent – the *expressive* function of speech acts. This is related to what Austin (1962) calls *perlocutionary* acts, that is, the speaker's attempt to produce certain effects upon the feelings, thoughts or actions of the hearer; but Habermas' analysis does not follow Austin in this respect. He agrees with Austin that perlocutionary acts cannot be identified through the manifest constative and regulative functions of speech but only through an attempt to understand the speaker's true intention (for instance, a command can be expressed in the form of a polite request or question). In distinction to locutionary and illocutionary aims, perlocutionary aims may be pursued without making them known to the hearer; a speaker can use them strategically so as to leave others unclear or even deceive them about her or his true motive. Habermas (1984, p. 293f) therefore considers this possible function of speech acts as a form of non-communicative teleological action rather than of communicative action. Consequently, he restricts his analysis of the constitutive conditions of successful communication to the locutionary (propositional) and illocutionary (intersubjective) components of speech acts, whereby the illocutionary component includes both the regulative and the expressive functions: "What we mean by reaching understanding has to be clarified *solely* in connection with illocutionary acts." (1984, p. 293) The expressive function thus stands only for what a speaker manifests about herself with an orientation to reaching mutual understanding.

The three functions of speech acts are effective *simultaneously* in every speech act that aims at mutual understanding. Thus the propositional content of a speech act always goes along with its *illocutionary force* (Austin 1962, p. 99 and p. 147; Habermas 1979, p. 34), that is, its capacity to move the listener to enter into a communicative relationship and to recognize the speaker's intention as sincere: "To be understood in a given situation, every utterance must, at least implicitly, establish and bring to expression a certain relation between the speaker and his counterpart. We can also say that the illocutionary force of a speech action consists in fixing the communicative function of the content uttered." (Habermas 1979, p. 34).

The propositional and the illocutionary (relationship-establishing) components of a speech act form a characteristic *double structure of speech* (Habermas 1979, p. 41); although we may give more importance to one of them and can vary them separately, the pragmatic meaning and validity of a speech act always depend on both components. For instance, when I say to my partner, "Charles is driving," the same propositional content of Charles' driving may intend an assertion, a suggestion, a command, a promise, a warning, or an expression of disapproval. By making such a statement, I claim not only that its propositional content is or will be *true* (Charles is or will indeed be driving) but also that I am *right* to assert, suggest, promise, warn, or disapprove, in the sense that my

intention is both sincere and legitimate and hence, that the hearer ought to act accordingly.

It follows that every speech act aimed at mutual understanding simultaneously embodies *validity claims* regarding its constative as well as its regulative and expressive functions, no matter which one is of primary importance to the speaker. Apart from the implicit presupposition of comprehensibility (semiotic clarity), every speech act claims (1) the *truth* of its propositional content, (2) the *rightness* (appropriateness, legitimacy) of its regulative content, and (3) the *truthfulness* (sincerity, authenticity) of the speaker. This is for Habermas the universal validity basis that underpins all successful communication.

Let us now return to our philosophical staircase (Figure 2). In what order should we incorporate these validity claims? Since the three claims are raised simultaneously and are interdependent, the answer is to some extent arbitrary. However, as in the case of the preceding semiotic steps, I would argue that the relationship between them is in a sense asymmetric. Without some mutual recognition of sincerity, communication is bound to fail from the beginning, before its propositional and regulative functions become fully effective. The expressive function and hence, the speaker's claim to *truthfulness,* is thus basic; I therefore locate it at step 4 of the staircase. Next, given that our point of departure was the question of what constitutes propositional *knowledge,* the constative function and hence, the claim to *truth,* seems essential; I locate it at step 5. Finally, the philosophical staircase is to help us reflect on what it means for an IS to provide relevant information and valid knowledge *for purposeful action.* It makes sense to locate the regulative function of speech and hence, the claim to *rightness,* at the highest of the three epistemological levels, step 6, which can then lead us on to the subsequent steps concerned with *rational* action. Before raising claims to rationality, it is necessary to identify and examine the normative implications that knowledge – the propositional content in question, provided we accept it as true – may have in a context of application.

In Figure 2, I therefore locate the three validity claims in this order. Deviating slightly from the original terminology of Habermas that I have used thus far, I will refer to the three validity claims as claims to expressive, empirical, and normative validity, respectively; this conforms to my earlier terminology in *Critical Heuristics*, where I referred to the three components of speech acts and knowledge claims as regarding their expressive, empirical, and normative content[3] (Ulrich 1983, e.g. p. 135, p. 138).

Finally, a note for those readers who for whatever reasons may prefer not to base their practice of critical reflection on Habermas. Once we have identified the three types of claims, the reader may also relate them at least approximately to the general definition of knowledge from which we started: knowledge is *justified* (step 6), *true* (step 5), *belief* (step 4). Adopting the staircase as a guide for reflective practice thus need not mean to subscribe to a Habermasian critical theory or even to a Marxist concept of criticism, with which Habermas is still frequently (although mistakenly) associated.

From communication to discourse. In everyday communication, the validity basis of speech is often treated as unproblematic. The purpose consists in exchanging information rather than in examining validity claims. None of the three validity claims is then made an explicit subject of discussion. It is sufficient for the partners to *assume* (or *anticipate,* as Habermas likes to say) that speakers are prepared to substantiate their claims if asked to do so, and that it is at all times possible for the participants to switch to a different mode of communication in which one or several validity claims are actually tested. Only when validity claims do indeed become problematic, as one of the participants feels compelled to dispute either the speaker's sincerity or the empirical and/or normative content of his statements, ordinary communication breaks down and *discourse* begins. This is where the discursive principle, once again, comes into

[3] Compare note 2 for the meaning of "normative content."

play in our staircase; it provides the methodological basis for challenging and defending *argumentatively* the validity claims underpinning ordinary communication.

How this is possible is the central concern of Habermas' widely known model of rational discourse. Since the model is well known, I can be brief; the reader can find a detailed introduction elsewhere (Ulrich 1983, pp. 116-151, esp. pp. 137-141). Rational discourse is argumentative examination of validity claims under conditions that preclude systematic distortion as it may result, for instance, from unequal status, access to information, skills and power of the participants. Accordingly, consensus reached in discourse is "rational" (i.e., rationally justified rather than merely factual) to the extent it approximates an "ideal speech situation." This is a discourse situation that (a) would allow all those concerned to participate, and (b) would ensure to all participants symmetric chances of argumentation, a requirement that includes the idea of symmetric communicative competences. Discourse that examines claims to empirical validity is called *theoretical discourse;* discourse that examines claims to normative validity is called *practical discourse,* a concept that should not be confused with discursive practice. Expressive validity can equally be challenged and defended argumentatively; but ultimately, a speaker can substantiate the sincerity of his intentions only through consistent behavior. Strictly speaking, there is thus no model of rational discourse on claims to expressive validity, although they can become thematic in all communication. But let us not forget that every speech act implies *simultaneous* claims to truth, rightness and truthfulness; in discursive practice the different kinds of claims and corresponding forms of discourses cannot be separated as neatly as in theory. Although the emphasis will usually be on one type of validity claim at a time, we should understand theoretical and practical discourses as ideal types that in practice hardly exist in pure form.

The structure of cogent argumentation: Toulmin. Once ordinary communication has turned into discourse, the question remains: what is valid *argumentation?* What constitutes a "strong" (cogent) as distinguished from a "weak" (questionable) argument? In order to explain the precise structure of cogent argumentation, Habermas relies on Toulmin's (1964) analysis of *The Uses of Argument.* It explains the structure of a valid argument in terms of the kinds of speech acts that must follow each other (Figure 3): A contested conclusion (claim **C**) can first be explained by referring to facts and norms that provide some evidence for the truth and rightness of the claims involved (data **D**). (In the case of controversial claims to truthfulness, the speaker will be expected to be able to refer to credible motives consistent with previous behavior.) Obviously such evidence may in turn be disputed, or its relevance for the conclusion in question may be doubted. The speaker then needs to be able first, to explain the underlying theoretical propositions or evaluative standards (e.g. moral principles) that warrant the inference from the evidence D to the conclusion C (warrant **W**); and second, to provide further evidence for the claimed facts or norms by referring to specific observations or needs and values in their support (backing **B**).

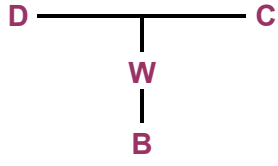

Figure 3: The structure of argument according to Toulmin

This structure resembles the well-known Hempel/ Oppenheim (1948) scheme of explanation, where C = explanandum, D = initial conditions (in classical logic called the minor premise), W = law or nomological hypothesis (major premise), and B = the empirical basis for W (basic observational statements); W and D together are also called the explanans. However, the Hempel/ Oppenheim scheme is conceived in terms of deductive logic and therefore remains at a syntactic level of speech; there is no place for pragmatic considerations ("How does it matter to me?") regarding the propositional, normative and expressive content of the claims in question. This is different in Toulmin and

Habermas' scheme; it captures the pragmatic level of speech. Speaking at a merely syntactic level of speech, an argument is conclusive if C follows logically from D in connection with W (which in turn needs to be consistent with B). Moving to the pragmatic level, an argument is *cogent* not if it is logically conclusive (necessary) but if it is logically possible (that is, the facts and norms it asserts are not in contradiction with W and B) *and* if the discourse participants can be motivated, by virtue of the backings, to recognize it as valid (cf. Ulrich 1983, pp. 137ff, and 1988, p. 143).

This pragmatic concept of *argumentative force* does not reduce argumentation to deductive logic but allows the participants to consider the ways an argument may concern them with regard to its normative and expressive as well as its propositional content; they can require the proponent to provide good grounds (credible "evidence," compelling "reasons") for all these validity claims involved. This is why I said earlier that Habermas' model of discourse is much richer than Popper's model, which we can now characterize as relying on the Hempel/ Oppenheim scheme.

Unfortunately, despite its theoretical richness, Habermas' model of rational discourse shares with Popper's model, as well as with all other available approaches to the theory of knowledge, the lack of an operational criterion and procedure for *discursively* establishing truth or other validity claims in practice. (I emphasize *discursively* because an operational rule in the usual non-discursive sense of the term would of course be against the spirit of the discursive approach). I would like to limit my discussion here to three points (for a detailed analysis, see Ulrich 1983, pp. 152-172):

1. The insight that entering into a discourse implies the anticipation of an ideal speech situation does little to make the anticipated situation real. Habermas' theoretical point is that the ideal speech situation is operatively effective even where it is completely counterfactual. Practically speaking, however, the implication is that every consensus reached in discursive practice is to be regarded as merely factual; anything else would mean to claim the ideal is real. On this basis we cannot hope to establish any validity claims. This is why Habermas' model cannot supply any operational criterion for truth or rightness, not anymore than all the previous theories of knowledge. As insightful as I find Habermas' analysis as a theoretical model of discourse, we should not misunderstand it (as many commentators do) as a model for discursive practice. It can give us some guidance for reflecting on the shortcomings of actual discourse situations and for improving them, but it cannot secure rationality. Mistaken for a prescriptive model, it cannot help but presuppose what it is meant to achieve, namely, a discourse situation characterized by a general symmetry of discursive chances.
2. Even if we assume that under fortunate conditions, the ideal of discursive symmetry can be sufficiently approximated to give credibility to resulting consensus, the underlying consensus theory of truth still limits the model's range of application severely. In real-world discursive practice, consensus is a scarce resource. After all, discourse is required when validity claims are controversial! In a world of seemingly ever-increasing pluralism of values and worldviews, it appears counterproductive to tie the concept of rationality so exclusively to ideally rational consensus as Habermas attempts this. If we really wish to promote rational practice, I do not think we should limit our concept of mutual understanding to this kind of consensus; can we not at least try to reach mutual understanding on the reasons for our differences, and thus to appreciate genuine conflicts of values, needs and worldviews in a way that allows for reasonable cooperation?
3. Finally, there is a third fundamental barrier to complete rationality, one that I find almost totally absent in the huge body of literature surrounding Habermas' theory; I mean the problem of boundary judgments (Ulrich 1983). In the practice

> of discourse, even the most completely rational argumentation needs to begin with some premises that it cannot justify any further and needs to end with some conclusions that it cannot explore any further. Every chain of argumentation begins and ends with boundary judgments, that is, judgments that define the points at which rational justification stops and which consequently delimit the range of application of the validity claims in question. As I will argue in Section 7, this problem is of great practical relevance for developing a reflective approach to discursive practice: it opens up a path for dealing rationally with everyday conditions of incomplete rationality.

The problem of boundary judgments provides the starting point for my work on critical systems heuristics, and in particular for its attempt to pragmatize the ideal speech situation so that in everyday discourses we can begin to deal critically with the inevitable lack of complete rationality. I will introduce this approach in Section 7 of the present paper.

Our conclusion, once again, is clear: *Knowledge is fundamentally discursive,* at least in the critical sense that claims to knowledge must always remain open to argumentative challenge.

ISD's loss of epistemological innocence: toward a critical turn. The development of the theory of knowledge as we have traced it from Kant to Habermas is certainly somewhat ambivalent. The more we understand what it means to claim knowledge – and I believe we do understand more today than 100 or 200 years ago – the more we are compelled to be careful about such claims. Whether we like it or not, the present state of the theory of knowledge has relativistic implications for ISD. The least we can do in this situation is to make ourselves and everyone concerned aware of the theory of truth on which we rely for our claims, and to be open to the possibility that other people rely on different theories. What we have noted before with respect to the coming semiotic turn of ISD applies to its coming loss of epistemological innocence as well: it is not a good idea to rely on faulty conceptual foundations just for the sake of avoiding difficult but fundamental issues. It is certainly better to face these difficulties, even though they may have some relativistic implications.

I am not advocating a fashionable epistemological relativism, though. Recognizing that epistemological relativism is normal need not mean elevating it to a norm. Normatively speaking, the point of epistemological relativism for ISD is a critical rather than a skeptical one: we cannot avoid claims to knowledge, but we can learn to do better when it comes to handling such claims in an open and self-critical way. Such a *critical turn*[4] of our epistemological approach offers

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4 The idea of a "critical turn" is a key concept of my understanding of reflective practice in systems design, and in applied science in general. Basically, claims to truth, normative rightness, and rationality imply that we consider all possible evidence and arguments in favor or against what is claimed. This conventional ideal of sufficient justification has clearly holistic implications – the basic point of "systems thinking." In practice, however, the quest for comprehensiveness is a difficult undertaking. Claims to comprehensiveness, and hence to sufficient justification, usually beg the question of how under normal conditions of imperfect rationality we can be arguably rational. Particular standpoints and perspectives unavoidably condition all our thinking and knowledge. The question is not whether our knowledge and arguments are comprehensive but rather, how we deal with the fact that they never are. From a self-reflective standpoint, we should never assume comprehensiveness but instead make a sustained effort to uncover the conditioned nature of our claims. Thus, we will regard some practice of systems design and applied science as "rational" only to the extent it lays open to everyone concerned its inevitable selectivity with respect to the facts and values it considers, as well as the practical consequences that this selectivity may have. This is what I mean by a "critical turn" of our thinking on applied science, systems design, and rational practice. For a detailed elaboration of the concept, see Ulrich 1983; short discussions of various aspects of the critical turn can also be found in Ulrich 1987, 1993, 1994, 2000, 2001, 2002a,b and c. In the present paper, I will take up the implications of the critical turn in Part 2 (Section 7).

not only philosophical but also practical advantages. It takes from the shoulders of IS designers the burden of ensuring "true knowledge"; it frees the profession from the false and hopeless presumption that information systems can and should provide information which by itself can justify claims to knowledge, regardless of changing contexts and independent of institutionalized discursive procedures. It also gives us a new design ideal for information system that I find challenging indeed: rather than aiming to establish knowledge claims, a proper IS design ideal will incorporate some arrangements that promote discursive processes of critique regarding the information it provides; critique, that is, with respect to its meaning, relevance, and validity, or in one word, its claims to represent knowledge.

Designing for sufficient critique rather than for sufficient justification: could that be a meaningful design ideal for ISD? I doubt whether anyone has the answer today, but I certainly think this kind of design ideal is worth trying. In this alternative ideal, a good information system will systematically promote critique and hence, lay open the ways in which any piece of information provided could be criticized and could be used for substantiating alternative claims to knowledge. We might say the idea is to *internalize critique,* out of the recognition that critique is the only possible (though imperfect) guarantor of knowledge. Based on the preceding account of the Toulmin-Habermas model of argumentation, two starting points for internalizing critique offer themselves:

1. *Internal warrant disclosing and questioning:* A good information system will make explicit the "frozen" argumentative structure behind its information^{IT}. That is, it will not offer "information" without at the same time disclosing the evidence (D) and the warrant (W) as well as corresponding backings (B) that together support its claim to informing the user adequately (C). A very good system might also invite users to examine the claim, e.g. by proposing counter-evidence (D') or alternative warrants (W', B') or by suggesting questions that might help users in assessing the validity claims involved in applying the information to a specific context of application. It might even suggest complete rebuttals (e.g. in the form of alternative claims C' inferred from various combinations of D' and W') and invite users to examine these counter-claims in respect of their relevance to the specific context at hand. Thus the system could support users in their task of transforming information^{IT} into information^{ISD}, to avoid what is now common practice, namely, that users are led to take the argumentative structures built into the system for granted. As Nissen (1989, p. 107) notes, today's possibilities of designing interactive user interfaces offer a computer-supported approach to allowing users to be responsible.
2. *External critical discourse:* A good information system will motivate users not only to examine the built-in argumentative structure but also to submit their assessment of it, as well as the resulting interpretation and use of information^{IT}, to the scrutiny of all those concerned. That is, it will not offer information^{IT} *as if* it represented information^{ISD} but rather will cause users to take the step from information^{IT} to information^{ISD} consciously, by suggesting some discursive settings that might be useful for taking the step and possibly for improving the argumentation basis. A very good system might even invite users to assess the extent to which alternative discourse settings might better approximate an ideal speech situation, for instance by suggesting a checklist of stakeholder groups that might need to be involved, or by suggesting alternative sources of expertise that the system itself has not considered in its argumentative structure. Again, interactive user interfaces might invite users to feed back results of context-related discursive examinations to the system and then offer them adapted information in the form of further evidence/ counter-evidence, warrants/ counter-warrants, etc.

These are merely a few preliminary suggestions for a critical turn inspired by a careful reading of contemporary discursive theories of knowledge. A more substantial outline of the critical turn must await the announced explication of the problem of boundary judgments.

4 THE DISCURSIVE KERNEL OF RATIONAL ACTION

What do we mean by "rational" action? Since information systems are to provide people with information^{ISD} for purposeful action, it astonishes that ISD theorists have hardly attempted to ground the field in *practical philosophy,* the branch of philosophy concerned with the nature of rational action. If a conceptual framework of ISD is to do justice to the pragmatic dimension of information (step 3 of our philosophical staircase) as well as to the normative dimension of knowledge (step 6), it certainly needs to relate its concepts of pragmatic clarity of information and normative validity of knowledge to a conforming concept of rational action. The point is that clear information and valid knowledge alone cannot secure rational practice; only proper standards of rational action can. Practical philosophy is concerned with this sort of issue (Excursus 3).

In practical philosophy, an activity is usually called an *action* when it involves a degree of human freedom of the will and consequently implies the agent's responsibility for the possible consequences. The *practical* in philosophy is what relates to action, in particular to this ethical core, as distinguished from the theoretical, which relates to thought and knowledge about what is empirically the case. Of course action also implies purposeful choice with respect to other aspects, not just ethical ones; they may concern, for instance, economic, ecological, and political aspects. But the core issue of interest to practical philosophy is the common normative content of such choices as it manifests itself both in the value judgments on which the choices rely and in the actual consequences they may have for people concerned. With respect to this normative content, action can be more or less reasonable for different parties concerned, that is, its normative rationality can be contested as much as its efficacy. Acceptability to all parties concerned is the basic intent of *practical reason.* Although the core of practical reason relates to the ethical justification of action, concerns of economic efficiency, ecological sustainability, political legitimacy, and so on, will equally matter. Practical reason cannot ignore these concerns but will seek to integrate them with ethical concerns. In this comprehensive sense, practical reason is concerned with the intrinsic value and interpersonal "rightness" (appropriateness, desirability, legitimacy) of actions, in distinction to merely instrumental reason or means-end rationality, which is only concerned with the value (success, utility) of an action for those who benefit.

We can thus say that practical philosophy is the philosophical discipline concerned with the *problem of practical reason:* How can we identify and justify the intrinsic value and rightness of actions? Obviously, we are once again dealing with a philosophical ideal. Although we cannot hope to achieve it completely, it makes an important practical difference to the common notion of rational practice. This common notion relies for its validation on epistemology. Except in the case of Habermas' theory of knowledge, which naturally leads on to the practical-philosophical steps of the staircase, this notion gets stuck at step 5 of our staircase. Rational action is inadequately identified with action based on justified claims to knowledge; insofar, and only insofar, an actor is expected to justify his choices rationally. This is different as soon as we move to the practical philosophical level (steps 7-9). Rational practice, and accordingly the theory of rational action, now gains another dimension of rationalization, the dimension of practical reason. In this second dimension, claims to rational action oblige actors to make a credible argument to the interpersonal rightness of their actions, that is, to defend their underpinning concepts (or standards) of rationality. *Whose* rationality is it? What notion of improvement

Excursus 3: Practical philosophy. The branch of philosophy concerned with the problem of rational action. The central issue is how we can rationally determine and justify the normative content of human action, that is, its underpinning normative principles and implications. Normative principles (or simply norms) are standards or rules that regulate human interaction in social contexts, from communication (linguistic norms, norms of etiquette) to legal (law) and moral norms (proper conduct); normative implications are the norms that are contained, whether intentionally or not, in the consequences of specific actions in that they are needed to justify these consequences. In the philosophical tradition since Aristotle, the use of human reason for analyzing norms of action is called the 'practical' use of reason, or simply practical reasoning. The ideal of practical reasoning is *practical reason,* that is, rationality of action as judged not only by instrumental success (an action achieves what it is meant to achieve) but also by the *ethical* acceptability of its normative content to all those effectively or potentially affected. Practical philosophy can therefore also be defined as "the philosophical effort to come to grips with the problem of practical reason." (Ulrich 1983, p. 26, and 1988, p. 140)

Like all fundamental philosophical problems, the *problem of practical reason* – of how we can secure rational action in the sense of practical reason – does not admit of an easy solution. A major core problem consists in the question of what rational justification means when the needs, interests, and worldviews of the people concerned by an action conflict. Basically we can distinguish two possible approaches to this issue, substantive (or normative) ethics and formal (or procedural) ethics. Substantive ethics seeks to formulate norms of action that can guide action in such a way that a rational choice between conflicting positions becomes possible. Major examples are Aristotle's ethics of "virtue," Kant's (1786, 1788) ethics of "duty," Bentham's (1789) ethics of "utility" (utilitarianism), M. Weber's (1991) ethics of "responsibility," A. Schweitzer's ethics of "respect," and Rawls' (1971) ethics of "fairness" (distributive justice); domain-specific codes of professional conduct in medicine, legal practice, consulting and so on also fall under this approach. Formal ethics, in contrast, formulate procedures by means of which agents themselves can identify proper norms of action. Among these we can distinguish non-discursive (monological) approaches such as Kant's "categorical imperative" or Bentham's "hedonic calculus" (cost-benefit analysis), and discursive (dialogical) approaches such as the "Socratic method" of dialogical examination of actions or Apel (1980) and Habermas' (1990) "discourse ethics."

In modern pluralistic societies, substantive approaches increasingly lose applicability and credibility, for they presuppose some societal consensus about fundamental values, regardless whether we conceive of these values as "virtues," "utility," "distributive justice," and so on. The procedural approach seems more credible but of course runs into its own difficulties, particularly with respect to who should be regarded as "competent" (entitled) to apply the procedure. The distinction between "monological" and "dialogical" approaches appears relevant in this respect; monological approaches impose the burden of moral judgment on the individual agent or the group of those involved, dialogical approaches on all those concerned regardless of whether they are involved. The Toulmin-Habermas model of discourse offers itself as the most promising procedural approach available at present; however, its application requires a previous clarification of the standards of "rational" action that should be used. Obviously, practical-philosophical considerations will need to inform an adequate framework for a discursive validation or critique of claims to rational action. Conceiving of rational practice in terms of "applied science" does not represent a sufficient answer to the problem of rational action.

does it imply? What are its actual consequences for all those concerned? Can they be moved to agree of their own free will? Rational practice thus becomes a *two-dimensional* concept that requires both theoretical-instrumental reason (justified knowledge and its successful transformation into effective and efficient action) and practical reason (justified normative implications for those involved *and* affected, a core concept of critical heuristics, Ulrich 1983).

Practical reason: a "strong" concept of rationality. It becomes then clear what is wrong with the commonplace notion that rational practice can be secured by means of applied science and expertise: the underlying concept of rationality is one-dimensional and thus is blind to the "other," practical dimension of reason. Although it is true that in many situations rational practice cannot be secured *without* applied science, it is equally true that rational practice cannot be secured *by means of* applied science. Insofar they represent complementary concepts of rationality. But practical reason is the "stronger" concept: without its guidance, instrumental reason risks amounting to mere pseudo-rationality – the use of efficient means for the wrong ends. The quest for practical reason thus represents not just another dimension but rather a higher, more comprehensive level of rationality, or in the terms of our philosophical staircase, an additional discursive step that leads us further toward a reflective practice of ISD.

Another interesting implication of the two-dimensional concept of reason is this. Instrumentally successful action is often considered to possess a higher degree of rationality than practical reason (interpersonal rightness), as it is seen to demonstrate the "objective" empirical validity of the underpinning theoretical claims. This may be true; but from the viewpoint of practical reason, a rationalization of practice that is guided only by instrumental reason nevertheless represents an utterly subjective form of rationality! It succumbs to a fundamental confusion of nontechnical rationality with irrationality (Ulrich 1988, pp. 143-146). Because the underlying concept of rationality does not include the dimension of practical reason, disciplines that conceive of themselves in terms of applied science tend to reduce practical to instrumental rationality, a form of rationality that captures only the expediency of actions for attaining the chosen ends of those in control of actions; inadvertently, a merely utilitarian concept of practical reason is thus adopted.

ISD and practical philosophy. As an applied discipline, ISD cannot help relying on strong normative assumptions regarding the nature of rational practice. What we just observed about the "strong" nature of practical reason suggests it is not sufficient for ISD to conceive of its rationality in terms of applied science. Rather, a satisfactory multi-level framework for ISD as we intend it with our staircase needs to include practical philosophy at its highest level of practice reflection and validation. Given the manifold validation issues that we have already identified in steps 1-6 of the staircase, how could an applied discipline as difficult as ISD hope to contribute to socially rational practice except by *developing a strong tradition of reflective practice,* regarding the strong assumptions in question as well as the weak theoretical and philosophical foundations on which it can presently rely?

This is indeed the question that motivated me to undertake the present effort of developing a philosophical staircase for ISD. The idea is not that IS professionals ought to become philosophers (although to a certain extent that might not be a bad idea!); the idea is, rather, that developing true competence in ISD is impossible without a *new notion of professional competence* in systems design*,* one that would be grounded in the quest for reflective practice. I think an adequate notion of reflective practice – defined in terms of how we deal with the problem of practical reason rather than in the "soft" terms of Schön (1983) – can indeed provide IS researchers and practitioners with a new sense of professional competence. At the same time I am convinced that a firm grounding of ISD in reflective practice is also vital for defining – and improving – the role it plays in and for *civil society*. I have dedicated two recent studies to these issues and found them to be closely interdependent: reflective practice has a lot to do with both, the quest for competence (Ulrich 2001) *and* for a living civil society (Ulrich 2000a).

My question also implies that there is an urgent need in ISD for developing standards for critical reflection on practice. I believe practical philosophy – along with the other sources of reflection suggested by the philosophical staircase – can and should become a major source of such standards. In particular, I suggest that we refer to practical philosophy for deriving our concepts of

rational action, rather than deriving them from the notion of applied science and from a foundation in the theory of knowledge alone. Let us try and see. Once again, Habermas will be our guide.

A typology of rational action. A proven method for developing analytically useful categorizations of complex social phenomena is by defining *ideal types* (in this case, of "rational" action). Ideal types need not be "realistic" but they should characterize in pure form, as it were, some crucial features (in the present case, kernels of rationality) that in reality combine to the phenomena in question and in terms of which we can better understand those phenomena. Such a categorization could then help us understand and examine the extent to which concrete actions are assuming different standards of rationality. The four basic validity claims contained in speech acts are such ideal types; however, they apply to levels 4-6 of our philosophical staircase of ISD. The issue now is what additional validity claims we should consider at the three highest level of staircase, levels 7-9. The point is that when it comes to assessing the rationality of actions, the four validity claims that are constitutive of knowledge provide a necessary but not a sufficient basis for claims to rationality; for, as Habermas makes clear, "rationality has less to do with the possession of knowledge than with how speaking and acting subjects *acquire and use* knowledge." (Habermas 1984, p. 8)

In his *Theory of Communicative Action,* Habermas (1984, p. 279-286, esp. 285) proposes a typology of action that can help us deal with this requirement. The typology is conceptually simple yet powerful. It provides a framework that I have also found practically relevant in my experience as a policy analyst and evaluation researcher in government. It captures fundamental differences in the standards of rationality that actors pursue in their attempts to be "rational." What is more, it also does justice to the concept of practical reason introduced above. Building on previous work by the sociologist Max Weber (1978), Habermas suggests two basic dimensions for classifying actions (see Table 2).

Table 2: Types of action according to Habermas (1984, p. 285)

Action orientation / Action situation	Oriented to success	Oriented to reaching understanding
Nonsocial	Instrumental action	———
Social	Strategic action	Communicative action

Depending on whether or not interpersonal relationships matter, actions are either "social" or "nonsocial." Habermas calls this dimension the *action situation;* to some extent it mirrors Weber's concern about the diminishing role of interpersonal coordination of actions in the "social life-world" as compared to the ever-increasing reach of impersonal coordination according to merely functional criteria of purposiveness and bureaucracy. The defining feature of *social* action situations is for Habermas that unlike in nonsocial situations, rational action is impossible without taking into account the actions and views of other actors. This may happen in different, more or less cooperative ways; the second dimension of the typology captures this issue.

Depending on whether or not actors consider only their own interests or also those of other persons, actions are either "oriented to

success" or "oriented to reaching understanding." Habermas calls this second dimension the *action orientation;* it reflects his earlier well-known distinction of two fundamental orientations of practice, to "work" or to "interaction" (Habermas 1971). Rationalizing these two aspects of practice means different things. The rationalization of "work" implies an expansion of technical control so as to ensure success, whereas the rationalization of "interaction" implies an expansion of communicative means for achieving mutual understanding. In the present context, we can capture the step from a mere success orientation to a concern for mutual understanding by the simple formula: *"from calculation to communication."* This shift of orientation is distinctive of rational action as intended by practical reason.

At first glance, the intent of the two dimensions seems to be almost the same. However, when we cross tabulate them as shown in Table 2, an important point becomes apparent: recognizing the social nature of an action situation is not the same as approaching it with a cooperative orientation. It may amount to merely *strategic action,* which the typology reveals to represent an extension of *instrumental action* to social situations rather than the step from calculation to communication *(communicative action)*. Habermas explains:

> *We call an action oriented to success instrumental when we consider it under the aspect of following technical rules of action and assess the efficiency of an intervention into a complex of circumstances and events. We call an action oriented to success strategic when we consider it under the aspect of following rules of rational choice and assess the efficacy of influencing the decisions of a rational opponent. Instrumental actions can be connected with and subordinated to social interactions […]; strategic actions are social actions by themselves. By contrast, I shall speak of communicative action whenever the actions of the agents involved are coordinated not through egocentric calculations of success but through acts of reaching understanding. (Habermas 1984, p. 285f)*

Note that a teleological, purposeful orientation is fundamental to all three concepts of action. It would be a misunderstanding to equate communicative action with action that pursues no other purpose than communication for its own sake. Communicative action *includes* a cooperative orientation to mutual understanding – this distinguishes it from the two other concepts of action – but it does not *exclude* the pursuit of purposes. Communication is a means of coordinating individual purposeful actions rather than the end. The point of the classification is that actors may pursue purposes in different ways, dependent on their individual orientation as well as the nature of the situation.

The discursive kernel of rational action. The reader may miss in this typology a fourth concept of action, *discursive action.* However, it should be clear from our previous discussion that discourse is a way of examining the validity claims contained in any of the three basic forms of purposeful action. For this reason it is not advisable to conceive of it as a separate fourth kind of action, although this is what a few contributors have suggested who have considered Habermas' typology of action in the ISD literature thus far. When the instrumental or strategic rationality of a course of action is in doubt, actors can switch to theoretical discourse; when its communicative rationality is in question, they can switch to practical discourse. Conversely, when the legitimacy of merely instrumental or strategic action as such is contested, actors may subject it to a practical discourse; and when the technical or economic feasibility of some communicatively defined action is in doubt, theoretical discourse may be indicated. (Bear in mind that all action implies both empirical and normative validity claims, regardless of the orientation that effectively guides the actors involved). The point thus is simply that *any* kind of purposeful action offers itself for discursive scrutiny. This is why "discursive action" does not exist as a separate category in Habermas' typology.

Returning now to our staircase, the same point applies: no single step but rather the staircase as a whole embodies the discursive principle. It makes sense, however, to conceive of instrumental, strategic and

communicative action as three ideal types of rationality that come into play at the highest three levels of the staircase and as such may require discursive scrutiny in any concrete case of IS design. We can understand the three concepts of action as representing not only three complementary dimensions of systems rationalization but also a natural hierarchy in which each level presupposes the previous ones. Table 3 shows this *three-level model of rational systems practice,* a model that I have introduced in more detail elsewhere (Ulrich 1988).

Table 3: Three-level concept of rational systems practice (adapted from Ulrich 1988)

Dimension of systems rationalization	Core problem	Level of systems practice	Tradition of systems thinking
Communicative	**Management of conflict** Social integration of conflicting interests	**Normative systems management** Building up potentials of mutual understanding (interactive capabilities and discursive chances)	**"Critical"**
Strategic	**Management of complexity** Effective steering of complex systems	**Strategic systems management** Building up strategic potentials of success (steering capacities in view of uncertainty and change)	**"Soft"**
Instrumental	**Management of cost** Efficient allocation of scarce resources	**Operational systems management** Building up potentials of productivity (optimization)	**"Hard"**

The level of *operational systems management* stands for a nonsocial, instrumental concept of rationality. It is concerned with the efficient use of means rather than with developing interpersonal relationships. Rationality at this level is defined and measured in terms of means-end rationality, that is, purposiveness (also called purposive-rationality). We conceptualize it as the lowest of the three levels because none of the higher levels can fulfill its promise of further rationalizing practice before the problems of this lowest level are mastered.

The level of *strategic systems management* stands for a social yet utilitarian concept of rationality. Its orientation remains purposive-rational even though interpersonal relationships and intentions of other actors are taken into account. Strategic management is concerned with the complexity and uncertainty that is characteristic of social action situations in which third parties co-produce the system's success (or may threaten it). Under such circumstances, the immediate orientation to results that distinguishes the previous level needs to be complemented by a longer-term concern for securing "strategic potentials of success," that is, capabilities of self-regulation, flexibility, and innovative adaptation in the face of turbulent environments (Emery and Trist 1965) and changing needs of all the parties concerned.

The level of *communicative systems management,* finally, stands for a social *and* communicative concept of rationality. It is concerned with the normative implications of

purposive rationality as represented by both instrumentally and strategically rational action. In particular, it examines the ways in which purposive-rational action may affect third parties and how "rational" its rationality claims may look from their perspective. What does it mean to be rational when there is a genuine conflict of rationalities, due to different needs and interests, values and worldviews? Rather than simply imposing its own rationality on other parties and thereby treating them as mere means for the pursuit of its own success, systems rationalization at this level seeks to achieve mutual understanding with respect to the normative basis of rational action. It overcomes the limitations of a merely strategic handling of conflicts of interests by a concern for normative acceptability and rationality in the comprehensive sense intended by the concept of *practical reason.*

Practical reason aims to expand the reach of rationality from purposive-rationality to the interactive dimension that is constitutive of normative (evaluative) issues. To this end, it strives to coordinate individual actions not only based on interest positions alone but on agreement concerning guiding standards of value as well. Of course such agreement can claim rationality only to the extent that it withstands discursive challenge by all those concerned; but the same limitation is basically true of all other conditions of purposeful action as conceptualized in the staircase.

The importance of this level of systems rationalization is not merely that the interactive dimension of rational practice is different but first of all, that it *exists* and should not be ignored. As we have seen in our brief discussion of the concept of applied science, this is by no means obvious. This highest step in the staircase should remind us, in every concrete case, that we may need to examine carefully whether and in what ways we might succumb to the earlier-mentioned confusion of nontechnical rationality with nonrationality, according to which "rational" is only what can be explained in the terms of empirical-analytic science. By implication practice would be rational only to the extent that practical decisions can be reduced to theoretical issues – a conception of practical rationality that in effect immunizes utilitarian rationality against the efforts of practical reason. I find it difficult indeed to see why introducing a complementary level of communicative rationalization should imply a loss rather than a gain of practical rationality; as soon as one does not limit rationality *a priori* (merely by definition) to technical rationality, this highest level of our staircase becomes an indispensable effort of critical reflection and discourse in the quest for rational practice.

5 PRELIMINARY CONCLUSION

Uncovering the hidden argumentative structure of information systems. We have now completed the introduction of the philosophical staircase. As I have attempted to make clear, its nine steps all stand for considerations that are as vital practically as they are philosophically indispensable for ISD, and in fact for all systems design. I have equally tried to make clear that for each step, the discursive principle is constitutive for justifying or questioning the validity claims involved. Since each step represents an additional level of systems rationalization, it also implies additional assumptions and corresponding claims that need to be open to argumentative challenge, which is what discourse is all about. This suggests to me a first, basic interpretation of our staircase:

The philosophical staircase embodies a summary account of the relevance and application of the discursive principle to ISD.

By arranging the issues to which it points in a theoretically based hierarchical order, the staircase offers a systematic (although iterative) way of proceeding. To the extent it achieves its purpose it can guide IS designers and users alike in reflecting upon, and discussing, the concepts of "information," of "knowledge," and of "rational" action that are, or ought to be, built into a system:

- Steps 1-3 represent the philosophically unavoidable assumptions and validity claims underpinning a specific information system's built-in concept of *information.*

- Steps 4-6 represent the additional assumptions and validity claims that come into play if the information provided by the specific system is to be considered as representing a *knowledge* basis for decision-making and action.
- Steps 7-9, finally, represent the additional assumptions and validity claims that need to be addressed if such action is to be conducive to *rational* practice.

An interesting implication is this. Since discursive reality is never ideal, we can understand the assumptions that flow into a specific IS design as representing the break-off points of discourses that have been terminated implicitly or explicitly at some point of reflection by those involved. Their assumptions concerning the nine steps thus represent the hidden argumentative structure of the specific information system in question. This conjecture yields a second interpretation of the staircase:

The nine conceptual steps of the staircase also embody the hidden argumentative structure that in one way or another is built into any information system.

As an example we may consider once again a hospital information systems. Such systems basically serve to control the huge flow of data that is necessary for treating and billing patients as well as for administrating the diverse organizational units of a hospital. More recently, the trend goes toward so-called case-mix measurement. "Case mix" is a hospital unit's specific mix of patients with regard to their treatments needs, that is, the severity and complexity of their conditions. The idea is that performance and cost measurements cannot be meaningfully compared among different organizational units and used for improving the effectiveness and efficiency of hospitals unless they are standardized with respect to the changing case mix of the units considered. The most widely used system of case-mix measurement today is Yale University's "diagnosis-related groups" (DRG) system (Fetter et al. 1980; for a comprehensive hospital indicator system based on case-mix and service-population measurement see Ulrich 1987b, 1990). In many countries the financing arrangements for hospitals now depend on such systems, that is, case-mix measurement is linked to rewards and sanctions that can be vital for the financial viability and the development of hospitals. The specific case-mix based indicator system used thus represents an important (and complex) part of the hidden argumentative structure of these hospital information systems. The question is, how well does this argumentative structure reflect the medical needs of patients, the quality and efficiency of the care they receive, regional needs for the provision of hospital services, the contribution of hospitals to the training of doctors and nurses, and so on? Who knows what is the "right" argumentative structure? How can medical staff and administrators act responsibly without being in a position to question and modify this argumentative structure? To what extent, then, should the system be relied on as a source of relevant information and valid knowledge for rational action in hospitals, given its power to sanction hospital units for not acting according to its measurements?

Surely it would make sense systematically to subject the information provided by this kind of hospital IS to institutionalized discursive procedures in which all concerned parties participate in the examination of case-mix measures and other parts of the system's argumentative structure with regard to its semiotic clarity, the empirical and normative validity of the conclusions derived, and the rationality of conforming action proposals. I assume that some formal procedures of this kind exist in most hospitals and financial authorities, but I doubt whether those involved are all in a very good position to assess the claims in question. A good system might improve the situation by offering methodical help in identifying and judging the underpinning argumentative structure. I am thinking, for example, of interactive system capabilities that would highlight the specific inference structure underpinning any considered hospital indicator and allow everyone involved making their own "sensitivity tests" as to how results depend on the structure (and of course also on the data). The system might also offer relevant questions for interpreting the result obtained, perhaps even along the lines of our staircase. The aim

would be to put all the parties concerned in a position in which they can meaningfully interpret the system's information^{IT} and then use discursive opportunities, whether institutionalized or informal ones, to support or challenge proposals for actions in a competent and responsible way. I cannot pursue the example here any further, but I think it does illustrate the suggested, twofold interpretation of the philosophical staircase and thus also the practical importance of the discursive principle.

In Part 2, we will review the way in which the discursive principle has been considered thus far in the ISD literature. Subsequently, I will outline my own discursive approach to reflective practice in ISD.

(References: see Part 2)