Position paper on "How far harmonisation?": Information system modelling myopia

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1 INTRODUCTION

In this position statement on the question, How far harmonisation? I expresses the view that, in the context of our profession, our theories, as far a possible, must meet the stringent quality criteria which philosophers of science impose on other disciplines that deal with problems in domains of inter-subjective activity, such as the natural sciences. I also show that our present 'tunes' are played on almost one note, making any harmony rather thin and uninteresting. Sometimes I despair of our profession ever abandoning old, demonstrably weak ideas (conceptualist or naive objectivist ontologies, for example) or of ever raising its eyes above the technical layer of problems to face the other half of the issues before us. However, I justify my long-term optimism because I have not encountered any intrinsic difficulty in meeting the most exacting criteria of scientific quality in dealing with information systems. Only a general unwillingness to apply those criteria obstructs our progress.

For purposes of economy, this position paper draws upon ideas that other authors addressed at this conference, by Holm and Karlgren and by Calway. I have summarised them in my two discussion papers, referred to here as h&k and cy.

2 DO WE NEED ALL THE "DIALECTS AND VARIANTS"?

I agree with the implied criticism in this, the chairman's key question. *We need less embroidery but a stronger fabric which contains more threads.* The methods available today display a rich but superficial diversity restricted to the technical aspects of systems but a poverty of other ideas. Unable to take proper account of the essential social aspects of information, we too often deliver systems of low quality, and we conduct research into an unwisely restricted range of technical issues.

The root of the problem lies deep in the underlying philosophies guiding work on IS methods. The dominating, tacit, philosophical position today suits our work on the technical aspects of an IS but not the social aspects. FRISCO has agreed on one important point: to distinguish between the IS in the broad, all-inclusive sense (ISB) from the IS in narrow technical sense (ISN) contained within the ISB. This raises the question: How should we modify our assumptions concerning ISN in order to deal with the additional, social, ISB issues?

The poverty of ideas to which I referred stems from our failing to answer this question. Technology alone will not guarantee the effective use of information. Somehow we must find a way of incorporating the relevant social concepts. We shall continue to deliver technically good systems that fail organisationally until we have the answer. These issues have given rise to two warring camps: a technical camp accusing the social camp of vagueness, accused in return of reducing people to just another sort of machinery. Each has a measure of justice on its side. But a kind of religious fervour prevents them reaching a peaceful consensus.

3 'RELIGIOUS' DIFFERENCES

The religious differences lie at the metaphysical roots of our discipline: the semantics and ontologies we favour. The technical camp usually favour the diadic theories of meaning which assume an absolute relationship between signs (data) and reality, with no need for an interpreter to intervene. The social camp prefer the triadic theories where meaning does not exist without an interpreter providing it (see h&k).

You will find the almost every textbook on databases, information modelling, methodology, computer applications and MIS employs the commonest diadic theory of meaning, the *tin-can-and-the-cloud* semantic theory (Figure 3 in H&K) where a database (the tin can) models reality (the cloud) without the intervention of any agent. (Object Orientation deploys a variant on this theory which talks of objects as things in the real world, although, on closer inspection you always discover that OO-theories concern computational objects or signs within the computer. OO-theory, therefore, relates symbolic meta-models to sign objects, in what one might characterise as a "tin-can-and-tin-can" semantic theory, never attempting genuinely to deal with the cloudy issues of reality.) One may have faith in an objective reality if one lives and works in a community where a high level of consensus prevails, as in most *routine* administration, engineering and science. Entering any world of practical affairs soon shatters this faith because, there, people continually dispute about meanings (if only to bend the tax rules to minimise their liabilities). In practical affairs, people clearly construct their own subjective realities, reaching provisional agreements about them which they call 'objective' for purposes of *routine* administration, engineering and science.

The triadic semantic theories (see Figure 1 in cy) make it clear that only an interpreter can link signs to reality. The person who utters a sign may interpret it in quite a different way from the person who decides what it should signify. By reaching agreement they socially construct an objective reality. This process of negotiating agreement about meanings calls into play one of the major functions of information in organisations. Despite the apparent variety of IS meta-models, which we so fervently deplore, they all share the same limiting metaphysical principles that make it difficult to take account of the subjective character of semantics in practical affairs, so ensuring that the can only specify the simplest information systems, the ISNs not the ISBs.

4 ONTOLOGICAL POVERTY

Every semantic theory implies an even more basic metaphysical commitment to the kinds of things that exist in our scientific domain. Using one of the three different diadic semantic theories, we must explain meaning, variously, in terms of a mystical *meaning-substance* carried by signs, or as relationships between signs and *concepts-in-the-mind* or between signs and *possible things*. Denied empirical access to these hypothetical things, we must either explain them in the context of an empirically justified theory (as physicists do with notions such as 'electron', 'momentum' etc.) or, in blind faith, justify our using them as primitive concepts. The triadic theories require us to believe only in the existence of patterns of behaviour

concerned with the usage of signs. These we can deal with empirically by observing how people use signs to get things done. It may appear, at first, that a triadic semantic theory will make our problem of modelling more complicated, but it will not, as I briefly illustrated in my discussion of Calway's paper. It only forces us to be more honest and accurate in the way we describe the use of information.

Converting diadic models into their triadic equivalents reveals their strangest, shared, ontological defect: the nature of the hidden interpreter. We have to include God or the Great-Analyst-in-the-Sky into our theoretical vocabulary, for who else could furnish those absolute meanings? I prefer theories which meet more stringent criteria of scientific quality, and so I will only admit those interpreters whom I can investigate empirically (theology has its place in my life but only among primitive peoples does it fill the role we now accord to science.) When I encounter signs used intentionally, I want to know who uses them, why and how they justify their choice of or interpretation of them, in other words.

The ontological poverty of the diadic theory of meaning leads our present meta-models to rely on of the *conduit metaphor* (Reddy) which treats an organisation as a 'plumbing system' through which flows a mystical fluid called 'information'. Naive metaphysics leads to sloppy use of language.

5 WHAT ON EARTH IS INFORMATION?

When one looks for a definition of 'information', the typical IS textbook supplies a definiendum in terms of 'meaning', 'knowledge' or 'decision-making' or some other, concepts vaguer than the definiens. Even the draft FRISCO report before us today defines information as "knowledge" (p.63), and knowledge as "conceptions (in a person's mind)" (p.62). Personally, I want my theoretical concepts to be grounded in simple, primitives that can be demonstrated empirically, that is *defined by ostention*.

Note: I use words such "concept", "meaning" and "knowledge" quite happily in the meta-language of ordinary English for talking *about* any object language of a scientific theory, including a theory of information systems. Should I wish to use any of these terms *within* my theory, then I feel obliged to account for their meanings in terms of ostensible primitive which I can observe or use empirically, just as a physicist would build on the simple, undefined but easily-demonstrable concept of a physical 'body' to which physical event occur.

We, in our scientific domain, have available the notion of a 'sign' as a primitive. Physics classifies the properties and explains the behaviour of physical bodies; likewise, our discipline should deal with the properties and behaviour of signs. As physics does not attempt to study every aspect at once, so we can conveniently subdivide the study of signs on the lines depicted in Figure 1.

Figure 1: The Semiotic Framework

Within this framework, we can define 'information' in many different but precise ways by measuring signs using different operational procedures, each of which represents, in some aspect or other, the informative capacity of the signs. Our present ill-use of the term 'information' resembles some crazy physicists limiting themselves to talking about the 'size' of a body without differentiating between its length, volume, mass, area, . . . each of which demands a different operational procedure. Moreover, treating information as a kind of fluid that supplies meaning and knowledge, as we do, compares with the crazy physicists treating size as a kind of fluid that makes things big! On each semiotic level, we can apply different operational procedures for measuring signs and so produce many, very different, but precise definitions of information (Stamper 1971).

6 LINKING THE TECHNICAL AND THE SOCIAL

Semiotic Framework provides the missing link between the technical and the social aspects of information systems. Information of any use functions correctly on all levels. The hardware must provide adequate, reliable physical signals. Noise must not make the signals equivocal or we must use redundancy to overcome the problem, on the level of empirics. When we succeed in producing reliable signs we can build elaborate formal structures from them on the syntactic level. Only then can we construct signs with elaborate meanings. Meaningful signs are necessary before we can express our intentions and only then, can the information have any use. The resulting communication gains its value only by creating a commitment, belief, judgement or a perception in the form of an attitude or norm adopted by one or more persons.

The Semiotic Framework locates all the costs of signs (information) at the physical level (allocation of scarce resources), and it also shows that the value of signs depends upon what happens at the social level where their usefulness depends entirely upon the social effects they produce. Any purely technical theory of information can account for the costs of signs but can have nothing to say about their value.

7 THE NARROW FOCUS OF MOST IS MODELS

If not about signal speeds, hardware costs, energy and material consumption, or about noise, channel capacity, equivocation, redundancy and so on, the technical IS methods we use almost exclusively concern aspects of information at the syntactic level. A careful examination of their underlying theories confirms that these methods tell us either about engineering or mathematical structures but not about the meanings establish in a society or about the intentional uses people make of the signs or about the transformations of attitude or norms which the information (signs) produces. In making this analysis, we must not allow the terminology *appearing* to denote aspects of the real world of practical affairs (intelligence, knowledge, mind, society, entities, relationships, attributes, objects, . . .) to mislead us. For example, given ERA analysis, one can always show that whatever one analyst called an entity and a relationship, another analyst can equally justifiably represent as a relationship and an attribute; and, similarly, objects spoken of in OOD reveal themselves as syntactic constructs which computers can manipulate, so that, on closer inspection the purported "real-world" meanings of these terms turn out to be illusory. Analysis confirms the essential syntactic character of most of our IS modelling languages.

Our current meta-models only play variations on a syntactic tune. Method Engineering, therefore currently makes only marginal improvements within the syntactic level of analysis and design. *We need a choice of techniques and methods in ISB designed to fit every one of the semiotic levels. As every information system of any value must function on all six levels, the range*

of our IS models must handle the essential concepts encountered on all these levels. We need to address the issues that belong to the neglected levels of the Semiotic Framework.

We should begin to pay attention to questions on the social levels of information systems design - questions about meaning (analysis of semantics), about intentions and the responsibilities of human agents (pragmatic analysis) and about the information products of the social world (norms and attitudes) through which information determines the behaviour of people and organisations.

Only when we take our heads out, from under the 'bonnet' of the computer, and start to drive it responsibly and meaningfully in the social world, shall we begin to create "a more unified and well-structured view on information system modelling." The quality of our systems will improve, the documentation we produce will shrink in volume and become understandable and we shall transform the economic performance of IT. I can only say this with such confidence because my colleagues and I have achieved it in practice (Liu *et al*). Also based on experience, I can assure you that such a 'revolutionary' transformation in Kuhn's sense (1962), will provoke bitter resistance in both the organisational and computer camps. Information Systems will not take off as a scientific discipline until it takes the revolutionary step of embracing equally the technical and social in a single theory.

In my view, to cure our IS modelling myopia or "to get a more unified and well-structured view on information systems modelling", in the words of our chairman, we should start by clarifying our terminology, starting perhaps with 'information'; and we should enlarge our scientific vocabulary so that we can refer precisely to all the features of an ISB that matter, whether technical or social.

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