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Multiple axiomatization in information management

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Abstract*:* Information management is essentially multidisciplinary, requiring multiple axiomatization. Types of causality provide grounds for a productive framework. After developing a framework for multiple axiomatization in information management, Maes's framework is introduced. From the ordering of the so-called disciplinary types in the multiple axiomatization framework, a suggestion is made to modify the framework of Maes. An attempt follows to match both frameworks. The concept of significs is presented as the disciplinary type for researching motivational phenomena.

Keywords

Philosophy of science, axiomatization, information management, motivational turn, significs, Rik Maes.

CONTENTS

1. Introduction

It might practically serve to define studies in information management that researchers participate from a large, in fact, from a still increasingly large, variety of disciplines. Consequently, different researchers may be working from quite different assumptions. By the same token, development of information management as a multidisciplinary effort essentially depends on such mutually reinforcing differences. Relevant disciplines range, for example, from electronics to psychoanalysis.

As it happens, however, researchers often implicitly hold and apply particular monodisciplinary assumptions while usually acting as if those are generally valid. Such lack of awareness about so-called first principles or axioms *and* about their limited reach or relativity poses a serious threat to an especially multidisciplinary effort such as studies in information management. Productive cooperation, discussion, etcetera, immediately come to a halt when participants deny the importance — or even the existence — of realistic differences.

Researchers in information management therefore require an explicit overall framework for recognizing axiomatic differences and for subsequently making optimally coordinated specific contributions. This paper outlines a preliminary, informally developed proposal for such a framework for multiple axiomatization in information management.

2. Cause types

In conceptualization, there is no escaping axiomatization. It simply follows that 'multiple axiomatization in information management' requires axioms, too. Those are meta-axioms, I assume.

I start off with Schopenhauer's classification of causality (1813, 1847).[1] In his case, axiomatically he abstracts from specific causes by arguing from a sort of field theory of causality. Then Schopenhauer acknowledges, in a Kantian sense, the categorial imperative of knowledge about specific causes for which he proposes three types: physical, impulsive, and motivational. I will let Schopenhauer himself explain how he views each cause type.[2] First of all, a physical cause 'acts' when

> *the preceding state (the cause) undergoes a change which in magnitude equals the change (the effect) brought about by that state. Further, it is only in this form of causality that the degree of the effect always corresponds exactly to that of the cause, so that the one can be calculated from the other.*

The second cause type is impulsive, i.e., a stimulus 'acts' when

> *action and reaction are not equal to each other, and the intensity of the effect through all its degrees by no means corresponds to the intensity of the cause; on the contrary, by intensifying*

the cause the effect may even be turned into its opposite.

Thirdly, a cause may be a

motive. In this form causality controls animal life proper and hence conduct, that is, the external, consciously performed actions of all animals. The medium of motives is knowledge; consequently susceptibility to motives requires an intellect. Therefore knowing, the forming of a representation or mental picture, is the true characteristic of the animal.

3. Order of disciplinary types

When science is understood as the enterprise of attempting to provide causal explanations, the three cause types as referred to above directly lead to the assumption of three disciplinary types. My labels read: physics, cybernetics, and significs. My choice of significs, rather than semiotics, for example, as a label is explained in the last paragraph of this paper. The derivation of disciplinary types from cause types is also sketched in figure 1.

cause type	disciplinary type
physical	**physics**
impulsive	**cybernetics**
motivational	**significs**

Figure 1.

From cause types to disciplinary types for science.

Figure 1 is also supposed to establish an order between disciplinary types. This helps to distinguish types of explanation.

4. Explanation types

Causes and effects are not related in isolation. They may be considered to form chains, where an effect of an earlier cause turns into a cause itself, etcetera. I will call an explanation in terms of cause/effect chains a causal model. This explanation type focuses on *what* happens in change. Please note that for a causal model the cause — and effect — type must always be kept constant.

Other explanation types exist, amounting to a shift in disciplinary type. Taking the directions suggested by figure 1, an inquiry into *how* change happens involves the shift upwards. This might be called the empirical or material direction, as it strives at empirical explanation, i.e., at a more material level of

concepts. The shift in the opposite direction, downwards, that is, is required to arrive at an explanation *why*. An apt label would be the teleological direction.[3] Figure 2 attempts to sketch an overview of the dynamics of explanation types.
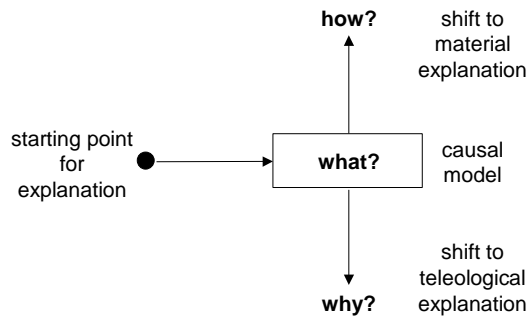

Figure 2.

What, how and why in explanation.

What follows in more detail at another level, should again conform to the explanation type of the causal model.[4] That is, its characteristic cause — and effect — type may not be compromised in the resulting model.

From yet another causal model, it is now evident that a how- and/or why-shift can be repeated in order to (re)search for an explanation at another level of cause/disciplinary type. See figure 3, where the circuit of explanatory dynamics is closed by taken the arrival points of how- and why-shifts as yet another starting point for causal modeling as explanation.
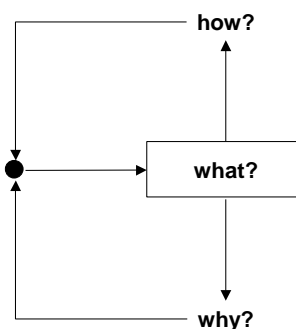

Figure 3.

Explanatory dynamics of types.

Dynamics of shifting explanatory levels can not continue indefinitely. In fact, Schopenhauer's original classification of causality sets a firm limit. Beyond physical causes upward explanations cannot 'materialize,' just as they cannot increase downward in their teleological nature beyond motivational causes. At those levels, however, models may be reordered for additional abstraction, detail, etcetera. See the next paragraph for an additonal dimension in the framework for multiple axiomatization. In

figure 4, the opportunities for actual explanatory dynamics are summarized on the basis of the concepts presented so far.
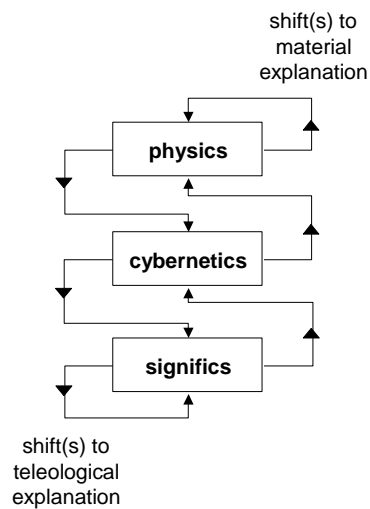

Figure 4.

Upper and lower limits of type shifts.

5. The dimension of particulars and universals

In the framework for multiple axiomatization, physics is 'only' one of three disciplinary types in science. Its researchers have however exerted a strong influence on what counts as science throughout. Their emphasis on prediction and replication naturally led them to state models in terms of laws, rules, etcetera.

In order to qualify as scientists, researchers occupied with other disciplinary types while imitating the axiomatic tradition of physics have subsequently also concentrated attention on law-like, rule-based models. It is not that they are necessarily wrong to follow the lead from researchers in physics. But, then, neither are those researchers in physics necessarily right.

My idea is that within *each* disciplinary type, researchers should be ready to address phenomena across the full range between particulars and universals. Indeed, often a strictly physical phenomenon is best considered as a singular event. And underlying a strictly unique action, a person usually harbors motivational patterns such as habits and so on.

Adjusting and augmenting figure 1, a two-dimensional framework results as shown in figure 5.

scope of cause relevance

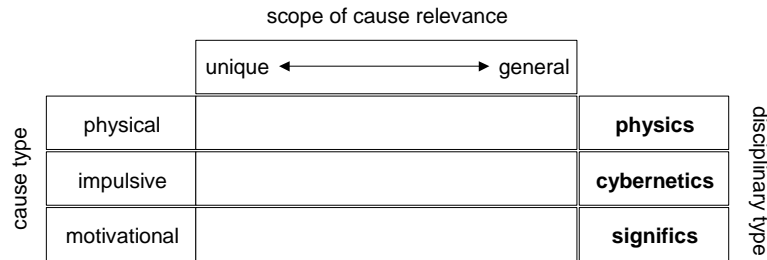| cause type		unique ←————————→ general	disciplinary type
	physical		**physics**
	impulsive		**cybernetics**
	motivational		**significs**

Figure 5.

A scope of cause relevance for each disciplinary type.

At this stage, the framework already helps to indicate how axiomatic confusion may arise. An extreme case, for example, is when explanation is sought for a unique motivational phenomenon (down to the left, in figure 5) while applying axioms from which to build general models in physics (up to the right, in figure 5). As the framework for multiple axiomatization suggests, any mismatch inevitably leads to contradictions.[5] Researchers can only avoid them — as much as possible — when they accurately position the 'object' of their interest and choose axioms for — further — explanation accordingly.

It is of course hard to image that a researcher proceeds in a linear fashion from an object-of-study to a choice of axioms. Most likely, it usually happens the other way around. Then, with his[6] axiomatic system he determines what objects to study. Giving once again explicit attention to axioms in terms of multiple axiomatization should at least make the researcher acutely aware of compatibility.

6. Configuring contributions

Researchers should acknowledge both — ever changing, for that matter — axiomatic variety and application dynamics of axioms. A conclusion on information management's disciplinary status may therefore safely be drawn from the previous paragraphs. In fact, information management is *not* a scientific discipline in the traditional sense (if there ever really existed such a singular discipline). It is *not* for it is and will continue to be impossible to develop a stable, mono-axiomatic foundation.

So, in terms of singular axioms and boundaries the question 'What ìs information management?' is unproductive. Axioms, multiple at that, and boundaries remain in flux. And primary axiomatic shifts occur when pursuing how- and why-inquiries. (A secondary shift may be involved when moving from a particular approach to a universal approach, vice versa.)

Instead, information management is better viewed as a program label. As such it primarily serves researchers to configure diverse contributions into cohesive conceptualizations.[7] Loosely at the early stages of research, with increasing rigor to the extent that disciplinary configurations yield results.[8]

7. Do 'pure' scientific disciplines exist?

The answer whether pure disciplines exist depends on the meta-axioms. Staying with Schopenhauer's classification of causality, only — scientific disciplines of — the disciplinary type of physics don't rely on any other cause type for pursuing how-inquiries. In that sense they may be considered pure or self-contained scientific disciplines which explains the relatively simple nature of productive axioms (and subsequently their attraction).

A why-inquiry starting from a causal model in physics requires cybernetics and, further on perhaps, significs for explanation. In the direction of how-inquiries, significs needs so-called reduction to cybernetics and, with continued inquiries into how, to physics. Cybernetics therefore doesn't entail pure or self-contained disciplines. Significs even 'rests' on two levels of auxiliary disciplinary types.

Upon close analysis, sometimes work of influential, highly-reputed authors can be seen to suffer from failure to recognize dynamics across multiple axiomatization. An example is Habermas (1981) with his treatment of the concepts of life world and system world. At the danger of making a caricature out of them, I interpret his life world as the community of free individual persons. The system world, according to — my interpretation of — Habermas, is occupied by impersonal institutions (state, technology, etcetera). The system world colonizes the life world in that such institutions undermine the individual person's freedom.

The contradiction Habermas inevitably runs into is that he mixes concepts attached to different cause types. My framework suggests that a free individual person should be positioned at the level of significs. An institution from Habermas's system world, however, is a cybernetic concept at best. See figure 6 for the different disciplinary types those concepts are classified under. No single causal model can encompass them.
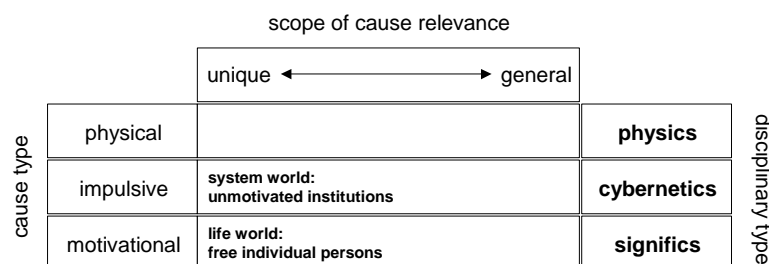

Figure 6.

Incompatibility of Habermas's concepts for a single causal model.

Habermas, and other sociologists, are of course not completely unaware of problems caused by mixing concepts of different types. However, they have looked for conceptual balance, not by acknowledging the motivational phenomena (also read: individual persons) 'behind' institutions, but by

'institutionalizing' the individual person, i.e., by essentially denying uniquely personal motives and behavior. That is, they declare the person a social phenomenon. I agree it brings the concept of person at a par with the concept of institution. As it excludes motivational causes, leaving significs behind it also reduces causal models to the level of cybernetics or even physics. Then again, sooner or later, the unique person needs to be recognized. Regretfully, sociologists of repute usually name such behavior exceptional, and leave it at that. The confused axiomatization remains established.[9]

Habermas's concepts of life world and system world may be given different axiomatizations, each internally consistent.

Both concepts could be abstractions at the motivational level (significs). The system world, then, is a short-hand notation for all individual persons in their capacity of, as Habermas calls it, acting strategically. All persons acting with an orientation at mutual understanding would then comprise the life world. Whenever such abstractions, or universals, fail as motivational concepts in a causal model, the researcher should choose motivational concepts of increased particularity.

Another consistent axiomatization is, indeed, to forget about motives and apply detailed behaviorism, instead. Both individual persons and individual institutions act on the basis of cybernetic stimulus/response mechanisms.

Moving in the direction of universals at the level of cybernetics, not individual persons and institutions may be addressed but persons and institutions as groups, Etcetera.
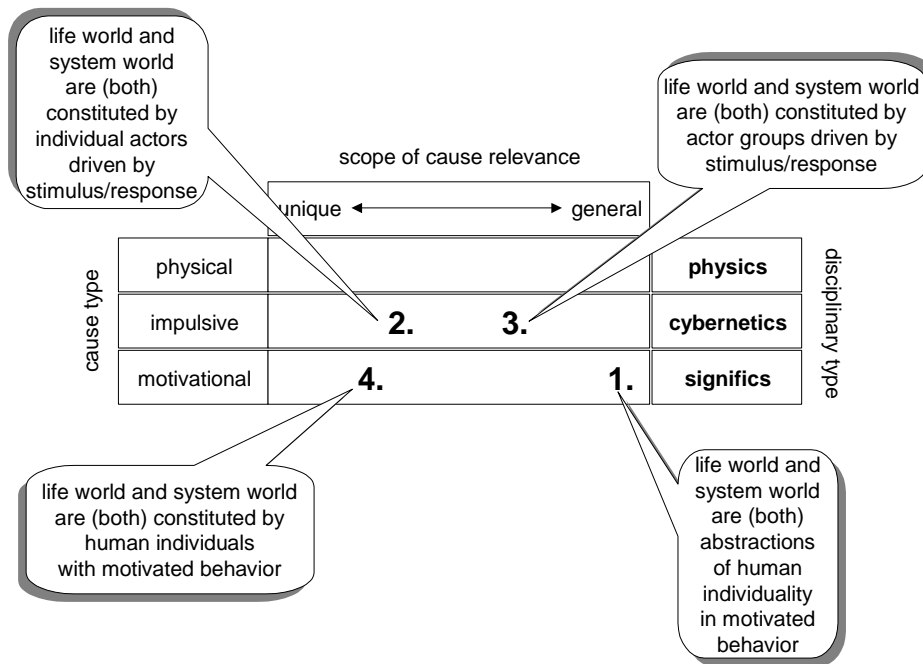

Figure 7.

Some possibilities for consistent axiomatization of concepts from Habermas.

Ultimately, for a proper explanation in terms of motives, the life world and the system world need to be deconstructed in motivated actors, i.e., unique human beings. Figure 7 points out several consistent axiomatizations for relating the life world with the system world.

8. Information management following Maes's maxims

Maes (1999) has earlier presented a framework for information management. It is sketched in the next paragraph. Here, I report that Maes mentions several maxims derived from his "generic framework." They lead him to remark on general characteristics of information management. I have listed several of his remarks below.

[N]o [element[10]] can be omitted from the framework without damaging the integrative nature of information management.

[I]nformation management is by definition a multifaceted management subdiscipline[.]

[F]rom the point of view of information management concerns, no one [element] of the framework is more important than another. [... W]e strongly argue in favor of a contingency approach to information management!

Information management is a [...] creative discipline!

The framework for multiple axiomatization in information management articulated here essentially confirms Maes's conclusions. From my perspective, however, there is an exception. One of Maes's maxims reads that his "framework is well-ordered." I believe its order can still be improved. As a basis for my suggestion, the framework itself that Maes designed is introduced first.

9. The framework of Maes

Maes took yet another framework as his basis for improvements. He started "from the strategic alignment model as proposed by Henderson and Venkatraman." While modifying the original two dimensions somewhat, the major change Maes implemented was adding two intermediary concepts. His framework therefore is no longer a 2x2 but a 3x3 matrix.

The vertical dimension now reflects — what I recognize as — ordered levels of management control: strategic, tactical and operational. Or, in Maes's own words: strategy, structure and operations.

His horizontal dimension is shaped by the concepts of business and technology, with information/communication placed as a pivotal concept in between. Figure 8 is copied from Maes.
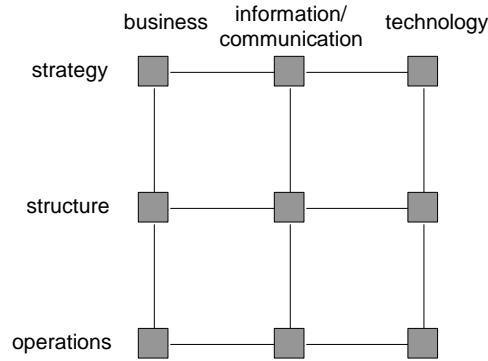
Figure 8.

Maes's generic framework for information management.

My first modification is minor, though yet again the vertical dimension shifts somewhat. I propose to change the label of structure into that of governance. As I see it, it captures well what Maes intends to introduce to his framework. A benefit for my purpose ist that 'structure' become available. I will later apply it elsewhere as 'system.' Figure 8 is not redrawn to reflect this single change. Governance appears the next time around — a modification of — Maes's framework is illustrated (see figure 9).

10. Business bias

Maes favors the "contingency approach to information management" by arguing it

contradicts the premises of the strategic alignment literature that alignment has an inherent direction and that all the dominant alignment perspectives have the strategy building blocks as their starting point.

In similar vein, my criticism of dominant perspectives on information management is that their starting point is the concept of business. Maes, too, retains this bias in his framework. He writes:

The generic framework is conceived at the level of an individual business unit.

His procedure for allowing to relate business units at different levels "along a third axis" is of course elegant. However, it doesn't detract from the continued business bias.

11. A crucial concept, but repositioned

The framework for multiple axiomatization in information management distinguishes significs as a disciplinary type. It can then be readily recognized that Maes made a crucial improvement by including the explicit concept of information/communication for it more or less corresponds to significs.

However, my framework also suggests to question where Maes positioned the concept of information/communication. I would say that the order between physics, cybernetics and significs is tightly reasoned from a basic classification of causality. In that order, significs is *not* an intermediary concept. I would therefore let information/communication change position with business, as figure 9 illustrates.
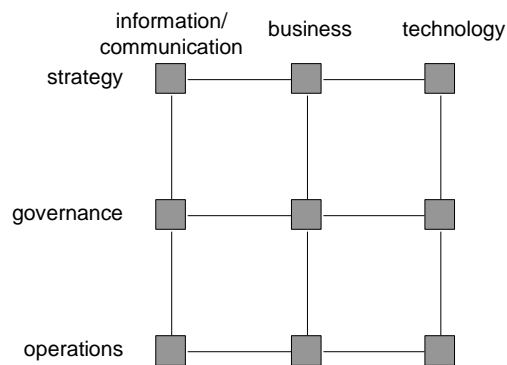

Figure 9.

Reordering columns in Maes's framework.

I am fully aware such reordering of columns goes against orthodoxy in business economics, management science, etcetera.[11, 12] In fact, later on I go even further by removing the label of business altogether. It is replaced by system which is a more general concept, still. For contrary to what Maes remarks with respect to his "generic framework," I don't view information management as only a "management subdiscipline." Information/communication involves much more than business life. Accordingly, the framework for information management should be as comprehensive as we can design it. Please note that system connotes cybernetics.

12. Avoiding trouble

It looks my proposal to 'improve' his framework will no doubt get me in trouble with Maes. He warns:

> *Changing the position of the rows and/or columns of the framework would lead to "pathological" patterns in terms of managerial relationships.*

Well, changing columns is exactly what I did. By moving business to the intermediary position and subsequently renaming it system, I feel it does better what Maes claims for his original middle column.

> *[It] represents the organizational choices made regarding the indifferent technological facilities*
> *and is therefore a mediating column.*

Arguing for information/communication as the intermediary concept along his horizontal dimension, Maes remarks it "play[s] a pivotal role in information management." Further on, he writes about "governing variables." I find the latter expression well chosen. It avoids the confusion of "pivotal" with intermediary. And it makes it clear that information/communication deserves a place at a level of more complexity than business in the sense of business organization, i.e., of system in general.

Another argument in favor of modifying the conceptual order along the horizontal dimension is also already present with Maes himself. He sees the linguistic distinctions of syntax, semantics and pragmatics reflected in his concepts. I agree that semantics, that is, meaning by convention, should occupy the middle column. Business/system seems to me precisely where convention rules. Individual behavior is, at least by my definition (Wisse, 2002), unique and therefore needs to be associated with pragmatics.

13. Mapping frameworks

I have already made mapping the frameworks much simpler. For Maes's concepts along his horizontal dimension have been reordered to correspond to the disciplinary types in the framework of multiple axiomatization. Profiting from my advantage as the author, here I take my own framework as the basis and try to map the framework of Maes — please note, as changed by me! — onto it. My first operation is to rotate it ninety degree to the left, as shown in figure 10. This rotation reflects what I see as the motivational turn (pun intended) in information management.
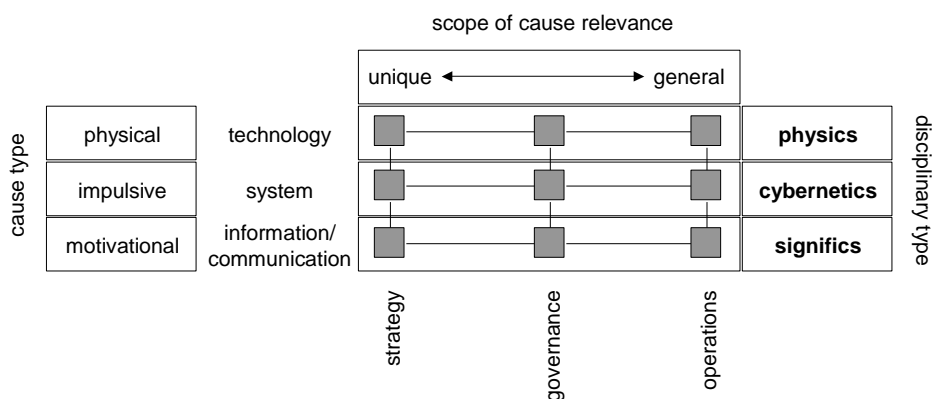

Figure 10.

A mapping operation.

As I am already quite satisfied with this result, I will refrain from additional mapping operations. A major difference remaining, though, is that Maes sees the concepts along both dimensions as discrete which combined also yield all discrete elements — or cells, as he calls them — in his matrix. I prefer to keep the possibilities for moving from particulars to universals, vice versa, more flexible. But then still the question remains to what extent the range between strategy and operations actually corresponds to the range between unique (particulars) and universal phenomena (general). Frankly, I doubt the correspondence holds. I tend toward Maes where he writes that differences between strategy and operations are neither clear-cut, nor valid. So, why not take the next step and eliminate them from the framework?

Questions such as these certainly need to be taken up. I believe design of frameworks for information management, comparing and discussing them, deserve ample attention from researchers. For it is only on the basis of an explicit framework that researchers in the dynamic field of information management can optimally make and coordinate their necessarily diverse contributions. Perhaps most of all it also helps them to clarify disagreements and when it is fruitless to resolve them. Then, at least, confusion arising from implicit assumptions may be avoided as much as possible. For all such purposes, Maes has made an important contribution with his "generic framework." I hope to have added some fundamental considerations to the ongoing discussion.

14. On significs

In this final paragraph I will explain my choice of significs as the label for the disciplinary type corresponding to the cause type of motivation. Is it a new term? Not at all. It was coined by V. Welby around 1890. Undeservedly, she is currently only known, if at all, as the English Lady corresponding (1977) in the early years of the twentieth century with the American polymath C.S. Peirce. It is undeserved, for she already pursued communication-oriented studies of signs (1903, 1911). She did so, in fact, to a far larger extent than Peirce who also read her books but, probably being preoccupied — as his letters show — with his own work in logic, he didn't discuss her ideas in any detail. In the first half of the twentieth century, G. Mannoury (1925, 1947-1949) in the Netherlands theorized on significs.

The work on significs has been saved from being ignored, and subsequently hopefully from ignorance, largely through the efforts of H.W. Schmitz (1985a, 1985b). Anyway, significs didn't catch on as the denominator of a science of signs. Peirce's terminology of semiotics did.

Of course, I thought about semiotics as a label. I decided against it because the irreducibility required for a productive concept of semiosis (Peirce, 1897) has lost against demands for scientific 'objectivity.' As I argue in Wisse (2002), motives are essentially subjective[13] and so is the experience of information and communication. A reconstruction of significs[14] as conceptualized by Welby and especially

Mannoury will confirm that explaining why-inquiries at the motivational level requires axiomatic status of the unique, individual person. This concept of the motivated individual determines the order in the framework for multiple axiomatization in information management.

Notes

1. The importance of Schopenhauer's dissertation **Über die vierfache Wurzel des Satzes vom zureichenden Grunde** is still largely overlooked. He submitted it in 1813 and published a second edition in 1847. My emphasis here is on his, say, driefache Wurzel des Satzes vom zureichenden Ursache or, in English, threefold root of the principle of sufficient causality.

2. The English-language quotations are taken from the translation by E.F.J. Payne.

3. W.F. Roest (1988) exhibits a refreshing emphasis on the teleological perspective, configuring it into an overall framework for information systems development. Our frameworks certainly show similarieties.

4. Compare De Saussure's (1916) distinction between diachronic and synchronic analysis. The 'structure' or system of synchronicity corresponds to causal modeling.

5. I have documented several found under semiotics (U. Eco), philosophy of language (J.L. Austin and J.R. Searle) and sociology (G.H. Mead and J. Habermas) in Wisse (2002).

6. Please read as a sex-neutral indication. A researcher is female or male.

7. In Wisse (2002, see § 13.7), I have included an example of a disciplinary configuration for business information modeling.

8. I find that other fields of study can also be productively reconfigured along these lines. However, a general proposal lies beyond the scope of the 'program' of information management, and therefore beyond the scope of this working paper, too.

9. See Wisse (2002) for a critique.

10. The term Maes applies is "cell."

11. I suppose orthodox sociologists to have raised objections much earlier, that is, against my relative ordering of cybernetics and significs.

12. In fact, the concept of business becomes even more encompassing as it is considered as emerging from irreducible dynamics such as the framework suggests.

13. And situational, hence subjective situationism (Wisse, 2002).

14. The work by Schmitz (especially 1985b) is an excellent staring point. He is ready to illuminate the poverty of current communication theories when compared with concepts from significs.

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