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# New instruments based upon formalisation of social /legal norms for investigating the architecture of organisations by analysis and simulation.

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***Abstract***:
In 1970, a 1m shelf of legislation specified how the Department of Health and Social Security should function. To behave in an organised manner, people must share the necessary social norms – perceptual, cognitive, behavioural and evaluative. We hypothesised that legislation supplements the available social norms and it displays essentially the same logical structures. On the basis of these observations, we aimed to devise a formalism to express any such norms as an instrument for investigating, specifying and developing organisational systems[2]. We have achieved this with by-products: a) to assist in the drafting of legal norms; b) to assist in organisational design; c) an organisational architectonics d) tools for simulating the specified organisation e) a concept of ontological dependency leading to f) a canonical semantic schema for the organisations domain of discourse g) methods for developing computer applications of improved quality, completeness, stability and at much reduced costs. These methods apply to corporate entities, government operations and much else.

One lays the foundation for an organisational specification with the semantic schema. This uses Gibson's Theory of Affordances as the basis for a presentist ontology, a version of actualism that recognises things only exist here-and-now, with signs providing knowledge of the rest. This compels detailed clarity about all the social constructs and the communication acts that form and change them. The canonical semantic structures allow us to build reusable, stable, 'atomic' components, each of which has a finite period of existence that starts and finishes under an explicit authority (agent or norm) where most responsibilities and powers reside that may determine the dynamics of the organisation. By expressing the norms in the precise legally oriented formalism, the organisation to be simulated. The norms appear to serve as a genotype, within which we can identify a minimal 'signature' for the organisation.

***Keywords*** organisation, semiotics, invariants, semantic normal form, organisational kernel, scientific method, refutationism, collaboration, laboratory, data sources

As this is my first contribution to WINIR, I shall introduce the discipline that I represent: organisational[3] semiotics. In 1998 I convened a workshop with that title and it was followed by annual conferences, the 16th having taken place recently in Toulouse. I felt enthusiasm about WINIR because it is obviously a close cousin to organisational semiotics, so much so that, at a future date, we might consider occasionally linking our meetings in some way. Interestingly both WINIR and OS will hold their next meetings in Brazil.

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[1] He led this research for 20 years at the London School of Economics and then, as Chair of the Information Management Department, at the University of Twente, in the Netherlands.

[2] This research was funded by EPSRC and ESRC in the UK, by the NWO in the Netherlands and by IBM and Digital.

[3] For the moment, I shall treat "organization" and "institution" as synonyms.

To provide a concrete example of work in the field of organisational semiotics, I shall present some key results of my own research programme

## Organisational Semiotics

A metaphor can indicate the object of this new discipline: as biology combines with chemistry to form biochemistry, a new science that now yields many significant advances in fields such as medicine, we may combine organisational studies with semiotics (the doctrine of signs[4]), to create a new science that may yield valuable insights into the functioning of organisations that will enable us to improve them. The description of the gross anatomy and physiology of living things had quite limited explanatory power before the detailed level of their chemistry began to be explored. Currently, organisational studies provide a similar, gross account of the parts and functions of institutions, while semiotics has the potential to explain their mechanisms in detail.

As medicine motivates much of the work in biochemistry, so we should be motivated by the pathology of our institutions to seek a new understanding, the better to repair and design them. The financial debacle of 2008 is a motivating case of obvious inadequacies in the established disciplines. Had the astronomical community failed to warn us of a catastrophe because they did not direct their telescopes toward the asteroids, we would question their scientific standing. Either we lack instruments for observing our institutions or we chose to point them in the wrong direction: both possibilities indicate how important WINIR might become. Below, I shall illustrate how the OS 'telescope' can examine the money system.

## History of a Multidisciplinary Study

Reflecting on the history of another multidisciplinary study early in the life of WINIR may be helpful. It is a story of obstacles that arise from concepts, institutions, politics, reputation . . . Perhaps it counts as a case-study in institutional functioning although it lies where many institutions interact.

I worked on organisational problems in hospital administration and the steel industry, where I was recruited by Ashore Hill, their staff college. The dire shortage of systems analysts and designers in the 1960s led to my being asked to create a programme to train them.

At that time all courses for the analysis of business problems and the design of information systems to help solve them were run by computer manufacturers, who aimed to insert a hidden sales force onto the staff of their customers. For them "information system" = "computer application with humans in attendance". I designed a course about ***organisations as information systems*** that might,

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[4] John Locke, *An Essay Concerning Human Understanding*, 1689,

optionally, employ computers. These courses directed attention to the human use of information and, therefore, the introduction of ideas from semiotics.

***Obstacles*** in the shape of ***powerful companies*** with an agenda were accompanied by the traditional methods they employed, which embodied concepts that were hard to recognise as obstacles, let alone to shift. These date back to scientific management at the turn of the 29th century: work study in the office that focused on time and motion compels one to think in terms of ***the flow of information and the sequencing of operations on or access to data***. Even today, the dominant methods fall under ***this paradigm,*** which guides most software engineers and remains a major obstacle to even the consideration of our new ideas***.***

In the 1960s computerisation projects, even technically good ones, often failed to deliver much of organisational benefit. The cause was fairly obviously the pooor understanding of the human and social aspects of the organisation. it is difficult to specify the required information system. Recently, I trawled the Internet to discover the current situation. Poor requirements analysis remains the problem and, roughly, only 25% of projects succeed, 50% fail because they do not meet the budget or the time constraints or fulfil the required functions, and 25% are totally written off. This disgraceful performance for an engineering discipline motivated the course design and my subsequent research.

My new courses received wide approval and, with the formation of a Ministry of Science and Technology became the basis for the NCC-BCS[5] national programme of training in systems analysis and design. Under the influence of those institutions they reverted to the technical bias favoured by the computer manufacturers.

The new Ministry also gave funds to establish information systems as a discipline in two universities. Imperial College bought a computer and hired a lecturer; the London School of Economics hired a team, among whom I was a member. Obstacles in the academic world were many. A senior professor at LSE, who thought we were computer scientists, remarked that "typewriters had profound social and economic effects but we don't need a department of typewriter science." At the London University Computer Centre, when I went there to give my first lecture, a computer scientist greeted me saying "I see no need to teach systems analysis. If a manager wants a computer system, all he need do is tell me precisely what he wants and I'll write the software." Opposition from ***established academic disciplines*** was a serious obstacle. In those days, the technically minded saw everyday human activity as trivially simple, compared with the wonders of computing.

Of course, I wanted to know what other disciplines had to say about information, so I asked my new colleagues in economics. Things have changed but then (1970) they all told me that ***price was the only information relevant for economics*** and no cajoling would elicit any other response from them. On the

[5] National Computing Centre and British Computer Society

point of finishing a book on the subject, that disappointed me. Another paradigmatic barrier!

**Organisations as Information Systems – Research Programme and Method**

Before looking for a way to study organisations as information systems, I decided there was no way forward if we continued with our vague, imprecise way of talking about some mystical fluids. From *data*, as the feedstock, we can distil *information*, which, subject to further distillation, yields *knowledge*, before finally arriving at the single malt: *wisdom*. (This chemical engineering metaphor, sadly, is still in use.)

By insisting on an ostensive definition of "information", I was taken to see small physical objects or events that stand for other things. My interest in these *signs* led to my writing a book[6] on semiotics in business and administration and to my using these ideas as the basis for a research programme. (It amazes me, in a so-called "information age" that the huge, fascinating literature on semiotics is overlooked. Research on institutions, especially if it is inter-disciplinary, needs to take great care to establish precise meanings for its terminology.)

I was then lucky to engage with the early computerisation of the Department of Health and Social Services, and realised that this monstrously large institution performed the tasks specified in the Acts of Parliament and Statutory Instruments occupying a metre of shelving. The routine activities were probably defined in about 20% of these laws of which perhaps 10% lent themselves to automation. Hence a 2cm thick book of legal norms in effect specified the software needed to drive the supporting computer applications. These rough figures were sufficient to suggest a suitable research problem.

Reading Sir Karl Popper, then a towering figure at the LSE, I appreciated the need to formulate the problem in hypotheses that would lend themselves to falsification. Hence:

H1: Any pattern of organised human behaviour can be specified by a system of social norms (including legal norms); and

H2: in so far as these norms can be expressed with formal precision, a supporting computer application can be generated from them automatically.

These were operationalized by two experimental procedures:

ExH1: Specify a formal, LEGally Oriented Language (LEGOL) intended to express *any* social or legal norm. Then apply it to a piece of legislation, where the norms are already explicit, or an aspect of an organisation, where the norms must be discovered. If the language cannot accommodate those norms, the hypothesis is refuted.

ExH2: At least in so far as the formalism serves to express at least a part of the chosen norms, devise a program to interpret their formal expression as a system to support the norm-subjects in their activities.

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[6] *Information in Business and Administration*, now out of print; a revised edition has been delayed by recent years of caring for a partner with Alzheimer's

To begin with, falsification usually resulted. But each failure was a moment of discovery, leading to a refined hypothesis or formalism.

Moreover, by repeating the analytical processes, we learned about the best methods to adopt. These proved to be valuable and now constitute a so-called 'soft systems method' called Problem Articulation that we have tested with success on a bewildering diversity of problems.

**Results**

Today we have from
H1: an excellent formalism that, of scientific necessity, is still subject to continual attempts at refutation; and
H2: software that will automatically generate a supporting computer application; work on improving this continues.

The ultimate *practical test* is to apply the results to problems of substantial size in organisations that will depend on the solutions for their everyday functions over a lengthy period. This is difficult but we have done it and with marked success on one fairly large system. This stage of the work continues to encounter more obstacles, a topic I return to later in this paper.

The analysis methods have been tested on a diverse range of problems. They turn out to be valuable wherever innovation starts from even a vaguely formulated goal (from a piece of legislation to a mechanical artefact), especially when they support a 'multidisciplinary team' gradually to articulate and elaborate the idea until they have a solution capable of implementation. These methods of 'Problem Articulation' are a component of the full set of MEASUR methods, discussed briefly below.

But there are more results of deeper scientific significance. They may be seen as a response to Herbert A Simon's dictum in 1990:

***"The fundamental goal of science is to find invariants"***

These invariants may be relevant to other research on institutions, for example, by our colleagues in WINIR. I shall now explain some aspects of the research programme, with emphasis on the invariants we found and the obstacles we encountered.

**The Multidisciplinary Road Leading to Some Useful Invariants**

Apparently similar research efforts can hide huge differences: At Imperial College, Kowalski and his team worked on another problem in the field of computers and law: they were applying first order predicate logic, implemented as the computer language PROLOG, to the representation of legal norms, in particular the British Nationality Act 1981[7]. They appeared to have a ready-made solution to our problem but vast differences separated us. In particular,

[7] Sergot *et al*, 1986

while they had a tool in search of a problem, we were searching for a tool by 'listening to' the problem's advice on where to look. Their excellent work was primarily a contribution to the use of PROLOG. That tool embodies the expressive power of declarative statements, whereas norms, our starting point, require language of quite a different kind, involving among other things notions of power, responsibility and action, even though they may not be explicit.

For example, they were happy to deal with meaning with a perfectly satisfactory mathematical strategy: when you know precisely in what possible worlds a proposition is true, you know its meaning. A truth function such as that is useless in practical human affairs. Instead, using the law and guided by its treatment of evidence and the interpretation of language and other signs, we saw that meaning must involve agents as witnesses or interpreters of normal usage etc. From the start, it was clear that our legally oriented language would always involve the relevant human agents, who would be responsible in some sense or other. Semantic functions that map states of possible worlds onto truth-values would not serve us. Instead we needed operationalize the 'stands for' relationships that link signs to things in the real world (whatever that is) and preferably as an approximation to someone taking us by the hand to see the object denoted, or to meet someone who has done that.

The proximity of the LSE's helpful Law Department and the regular presence of academic visitors[8] with legal backgrounds supported us in that style of thinking.

***Norms***

The members of any institution must have a shared understanding of the domain of activity they deal with. They must, *to a sufficient degree*, recognise the same things in their shared physical and social world (perceptual norms), know how it fits together and functions (cognitive norms), react to situations similarly (behavioural norms) and have shared values (evaluative norms). The categories were established in social psychology, another relevant discipline, which is clear that norms exist in the minds of people.

Rules are not norms but signs that stand for norms while modelling them approximately. Where we hope to automate an activity in an organisation we need to use rules. But for building real systems we need to invoke the actual norms through the agency of appropriate persons; our formalism must facilitate that function.

Norms have the structure:

when **agent** knows **condition, agent** adopts **attitude** toward **something**

Perceptual norms result in ontological attitudes, cognitive norms in epistemic attitudes, behavioral norms in deontic attitudes and evaluative norms in axiological attitudes.

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[8] These visitors representing various disciplines, especially law, came from Austria, Czechoslovakia, Finland, Germany, Holland, Italy, Norway, Poland, Sweden, USA and USSR.

(As an aside, because space does not permit a satisfactory explanation, this structure leads to quite a rich taxonomy of norms, with unequivocally partitioned categories based on the kinds of conditions, attitudes, conditions and the things that are the subjects of the attitudes. These categories are associated with different kinds of organisations and sharply delineable architectonic features within them, which may provide the basis for hypotheses precise enough to lend themselves to falsification and also as a source of significant invariants.

If organisations can be fully specified (so we conjecture) by the norms their members share, then the gross properties of those norms should be the site of interesting invariants. People behave in different ways in different circumstances (institutions?) – in the home, in the factory, in the office, in the sports club, in a court, and so on – each of them governed by its own set of consistent norms but possibly in conflict where they overlap.

It seems appropriate to define a system of consistent norms as an *information field*, an ***invariant*** or nearly invariant component of an organisation that may be close to what we mean by "an institution". The notion of consistency can be given a strict, logical definition. It is worth introducing the notion of *near invariance* because it is probably the introduction of inconsistencies, for a variety of reasons, that induces change and the gradual evolution of institutions / organisations. (The norms are probably as close to organisational DNA as we can get.)

**Semantics**

For reasons of space, let us concentrate just on the norms associated with the meanings of signs, especially linguistic ones.

There are many meanings of "meaning" suitable for different tasks: lexicography, mathematics, computing, etc. But we need a "real world" meaning that connects signs to the things in the real world that they stand for, such as materials in a factory, plans for an exhibition, disabled people requiring welfare assistance, rather than dictionary definitions or computer operations. A semantics or theory of meaning suitable for this kind problem begs the question: What is real? That question immediately raises difficult philosophical issues. Fortunately, we had a philosopher[9] in our team. (Other research into institutions must, surely, face similar problems.)

However, although philosophy helped to clear the decks for action, it did not supply a satisfactory solution. Instead we adopted a kind of engineering solution that in philosophical terminology might be a kind of *actualism*: ***the only things that exist are those that may be perceived directly, here and now.*** They are

[9] Sandra Cook, who is currently Vice President at the American University of Afghanistan.

the ones consistent with the maxim "take me by the hand and show me one". This enforces the severe constraint of ***presentism***.

This appears to be foolishly restrictive but, far from limiting our vision, it makes us see more clearly a major subject of our enquiry: the signs or more loosely, the information that tells us about the things that are not in the here-and-now, while forcing us to admit that we need to have some degree of belief in the existence of everything else on the basis of signs that are, here and now, available for inspection.

But that still does not solve our problem because we are relying on the idea of perception. So what are these things we perceive? Yet another discipline came to the rescue: the psychology of perception, in the shape of James Gibson and his theory of affordances. Gibson[10] pointed to the infinite regress implied by the classical explanation of perception: the focusing of sense data into images that must then be perceived in a similar way by an incubus, who then needs the help of another incubus who perceives the first one's images . . . and so on. No explanation at all!

Instead Gibson postulated that every creature, bombarded by signals on all sides and from within, makes sense of the cacophonous environment by detecting invariants within it: patterns of available behaviour that do not change. These stable behaviour-patterns depend on the abilities of the creature itself in combination with the environment. Thus a cup does not present itself to a toddler as a ready-made object to be perceived on opening its eyes; instead, the child holds it, bangs it on the highchair, finds it can hold milk, and also be used to pour the milk over mummy, and a whole repertoire of exciting behaviours that this thing affords. To the family dog or goldfish, the cup would be quite a different thing, if noticed at all!

(Similarly, as perception by an individual depends upon discovering the invariants that Gibson called "affordances", so does perception by scientists depend on their collectively discovering invariants in the domain they are exploring, as Herb Simon pointed out. No individual can perceive a tectonic plate or a Higgs Boson, for example. From our own field, you will find examples below.)

Now for the leap forward that had eluded us! Gibson's theory translates into a structure, an outline for the syntax of our legally oriented language. Everything an agent knows depends upon its performing a variety of activities within which it discovers what behaviours the world affords. Hence, every statement should mention the agent, A, because there is, to all intents and purposes, no reality without an agent. And the only things perceived in that world are affordances, x, y, . . , or the invariant repertoires of behaviour that the ,agent enjoys.

Ax Ay etc.

Sometimes, two affordances must be realised at the same time

A(x while y)

[10] Gibson 1968 and 1979

to make another affordance possible

A(x while y)z

The existence of z depends on the coexistence of x and y. So x and y are the ontological antecedents of z. If either x or y should cease to exist, then y must go out of existence also.

From our point of view, Gibson's theory has an interesting impiication: if the agent gets it wrong, there may be painful or even fatal consequence of misperceiving an affordance, so, at a very basis, biological level, A is responsible for these constructs. The physical and the social world are constructed. We need, for our work, the notion of responsibility and it appears to belong quite naturally in this model.

These ontological dependency schemas can grow very large. Figure 1 illustrates this and it introduces a number of conventions that we use in the graphical notation.

If the knowing agent is one isolated human being, then the known world will be very limited indeed. To make sense of the vast reality we take for granted, we must acknowledge that its perception is a social endeavour; hence we treat Society as the root agent.

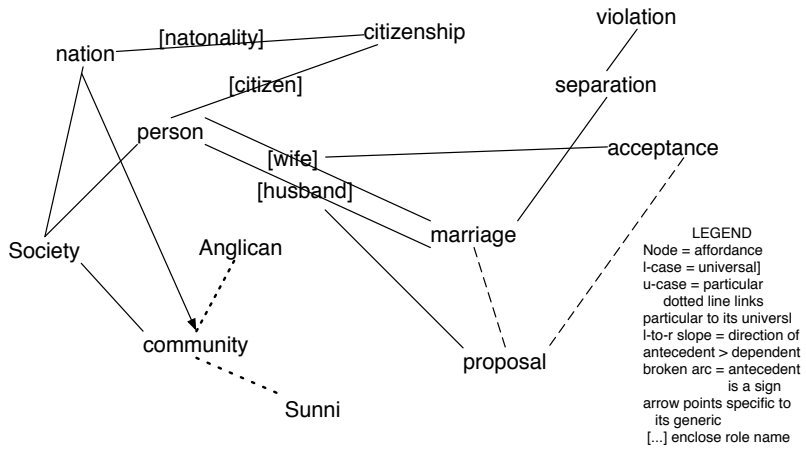



Figure-1: An SNF-Compliant Ontological Dependency Schema

Notions of marriage, separation, proposals and acceptances, even personhood would be meaningless, otherwise.

Notice that the schema represents a reality confined to the present time and to the proximity of the agents involved. Notice that this approach make no assumptions about space and time, which the agents involved must construct – a topic that space does not allow us to discuss.

However, notice that we escape the constraints of time and space by using signs. By performing speech acts, attitudes of various actors can be changed and knowledge obtained of distant events.

**Surrogates, Time, Responsibility and Authority**

The ontological dependency schema has, associated with every node, a surrogate table containing details of a few *necessary* attributes, ones that are intrinsic to its existence. Figure 2 illustrates this for the marriage relationship.

You may find it helpful to imagine these surrogates in a relational database. Every relation, you may notice, has exactly the same form, a simplification with significant consequences for the efficiency and robustness of systems based on this design.

Every node, whether for a universal at the schema level (person, for example) or for a particular (John, for example) has a unique identifier, a code that the user will never see. The natural language label 'person' appears as the value of a determiner in the English English language community (which has its own node) and appropriately for any other language required. Similarly, the particular person, John, may have several names in different communities, not only as in his national population register.

Surrogate Table

| ATTRIBUTE | VALUE |
|---|---|
| identifier | 04809275 |
| universal | marriage |
| antecedent-1 | John |
| [antecedent-2] | Mary |
| start + | 22 May 1966 |
| finish - | 15 June 2006 |
| start authority @ | Vicar of Dibley |
| finish authority & | High court |

(All values are surrogate identifiers; also, in principal, so are the dates.)

Fjgure-2: The Ontologically Necessary Attributes of Each Affordance

Every node has a start and finish to its existence. Those instants are the basis for our knowledge of time; clocks and chronometers are not. The values of these attributes will be identifiers of surrogates during which the events took place (when both are in the past). We cannot visit the start and finish to experience them or show them to other people; we can only talk about them as the boundary events in the existence of things that may be visited. Nevertheless, we can supply the named states of suitable timepieces as the start and finish values, just as users of first order predicate logic would introduce time as another variable. But notice the total difference between these two views of time.

Every node has an authority associated with its start and finish. It may be a norm: for example, when a work is published the law brings a copyright into existence and assigns its ownership. Norms that start and finish things may devolve responsibility upon several people. The authority may be a particular individual or the occupant of a particular role. In some cases the attribute value may just be a pointer to the responsible person, as when it gives the reference to the relevant document. The ontologically important fact is that ***without knowing the agents responsible for the entity's start and finish, we do not know precisely enough what we are referring to.*** This principle led to my choice of the money system for the case I introduce later to illustrate the diagnosis of institutional deficiencies, using basic semiotic ideas.

I have no doubt that the issues I have just touched upon will provoke philosophical discussions. Among the interesting topics are: the treatment of time that arises naturally from this treatment of knowledge; the nature of responsibility in the social construction of reality; the notion of ontological

dependency; and issues around language and identity. That is why I consider philosophy of major importance in any interdisciplinary research into institutions.

## An Invariant: the Semantic Normal Form

The *presentist* property of the actualist ontology imposes strict constraints on the structure of these semantic schemas. Between the root agent (normally Society) and any other node, there stands a lattice of nodes, every one of which must exist for the selected affordance to exist. We call this the *stem* of that affordance; its ontological dependents form its *branch*.

Can we add further constraints to enforce uniqueness of the schema for a given problem? If so, this invariant may have singularly valuable properties.

One constraint is given by the hypothesis, H3 that no affordance has more than two direct antecedents. So far, we have found no counter-example. In every challenging case, analysis reveals antecedent affordances that have been overlooked, each having a separate existence and none of them being a dummy to accommodate the hypothesis.

Two further constraints are that the stem of an affordance must contain all and only its necessary ontological antecedents. If anything ceasing to exist will finish the existence of the affordance then it should be included in the stem. Anything in the stem that does not entail the affordance ceasing to exist should be removed.

We hypothesise (H4) that any schema that conforms to these constraints will be an invariant, so that any two analysts will arrive at the same schema, in the Semantic Normal Form (SNF). If this does not appear to be so, it should be apparent that one or other or both have made mistakes or, they are actually specifying different domains using the same terms. So far, H4 has not been falsified.

## The Practical Value of the Semantic Normal Form

For any domain, an SNF-compliant schema is a powerful instrument for disambiguating its terminology. *I recommend it, therefore, to my colleagues working on institutional research.*

When developing many distinct computer-based applications for organisations, the resulting systems most often do not dovetail and cause problems when, with the passage of time and the gradual extension of their boundaries, the once appropriately separate systems need to inter-operate. This is expensive to achieve. By basing all the designs on SNF-compliant schemas, these separate components should dovetail or at least have a better chance to do so.

(Note that, although the sub-systems encroaching upon each other may have actual semantic differences, they will usually be accommodated by the start and

finish authorities. The canonical semantic schemas remain invariant over a wide range of cultural boundaries: for example for marriage over (nearly?) all religions.

We have not had the opportunity to work on a problem of inter-operability but we have built a system that had to contend with continually evolving organisational requirements. This succeeded. The so-called 'maintenance' costs (more accurately 'adaptation' costs) are usually very heavy because they entail changing the underlying schemas with impacts on most of the software. We were able to compare our system with a very similar one built using the very best of mature, orthodox methods and this revealed that the stability of the SNF-compliant schema cut the costs by at least 50%.

[An aside: an institutional problem worthy of research. We have approached the various agencies in the UK government, which has, along with other organisations, a deplorable record for its computer application costs, to take an interest in our research results. The Department of Business, Innovation and Skills, the Government Procurement Agency, the Cabinet Office unit charged with improving the efficiency of government, the Research Council that granted most of our funds, the National Computing Centre, etc. either suggested it was the concern of some other agency or the ignored our letters. There are several likely explanations but the one given to me by a person well acquainted with this kind of problem is that the companies subcontracted by government are better able to milk the system by building computer applications that require a lifetime of expensive adaptations than by adopting new techniques that would eliminate much of that desirable, perpetual stream of work. Are these kinds of issues of interest to my WINIR colleagues?]

**Another Invariant: the Organisational Kernel**

In our zeal to refute our hypotheses, we analysed many cases drawn from legislation, contracts and actual organisations. And, as Gibson might have predicted, all this activity within a complex, messy environment, began to display some invariant repertoires of behaviour that we perceived as organisational invariants.

For example: It was important to find the core of the problem each time and we found a simple method that illustrates the use of the classification of norms that I mentioned earlier.

We differentiate between the ***substantive norms*** concerned only with the eventual outcome of the activity, the ***communication norms*** that explicitly direct the use of signs /information of any kind and the ***control norms*** concerned with checking compliance with other norms. An institution succeeds when it achieves what the substantive norms require, however it operates. For a single set of substantive norms, a hundred different procedural solutions may serve, along with all kinds of control activities. A close-knit, experienced team of people with all the relevant skills, when given a job, should be able to do it quite

well without introducing any bureaucratic procedures and expensive technical rigmarole. (That is why the network of small teams can be so efficient.)
So we make two assumptions:

1) ***Total openness:*** every team member has access to all the information they need, in particular relating to the conditions in the norms to which they are subject.
2) ***Total trust:*** every team member can be trusted by all the others to perform according to the norms governing their activity.

These assumptions help us to select only the substantive norms, which form the organisational kernel.

A typical piece of legislation starts with a key substantive norm, such as
" The Minister shall pay to every family with two or more children the sum of £x …etc."
The rest of the Act introduces pages of communication and control norms that define the bureaucratic work.

The system can be built up gradually by saying who should send what information to whom and who should check on the performance of substantive norms. Then one adds controls to communication, communications about controls, communications about communications and control of controls and so on, indefinitely until, eventually, one is forced to say "from this point on we must assume the relevant people have all the information they need and everyone involved can be trusted.

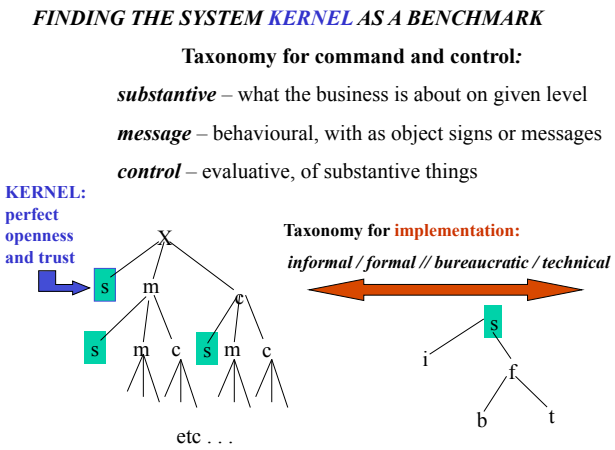



Figure-3: The Organisational Kernel

Eventually, we have no alternative but to rely on the informal culture.

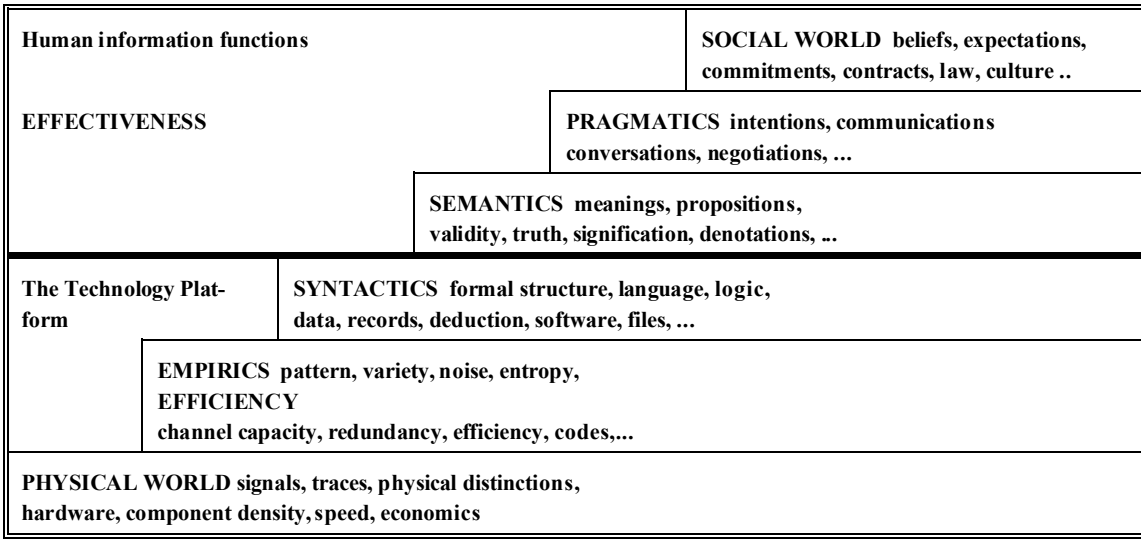
The design process also involves allocating some functions to the informal system, which calls for 'engineering' a cultural change, and dividing the rest between the formal/bureaucratic sub-system and the technical devices, such as computers. (Illustrated in the bottom right of Fig-3.)

## The Semiotic Framework and More Invariance

As a simple checklist, the Semiotic Framework draws attention to the necessity to ensure an organisation will function correctly on six different semiotic levels. This was essentially the plan of the book on the nature of information that I published in 1973. Signs are always physical things made to play the role of standing for other things. Essentially that is the domain of the hardware used for handling information, from its earliest 'technologies' of gesture and speech, through writing and printing to our latest uses of the electromagnetic spectrum

and optical networks. I almost totally avoided that huge but familiar topic while adopting the established[11] framework (syntactics, semantics and pragmatics). and extending it with the addition of empirics and the social level.

Each level deals with a different and, to quite a large extent, separate set of properties of signs. Its key use as a check-list is to draw attention to the need to make sure that the information system (including organisation or institution) functions correctly on every level. Here it is:




For the economist, this might look like a map of the social capital. Although it may appear that the norms I have been talking about are concentrated in the top, social layer, they occupy all the other levels as the various skills and practices that they depend on.

The framework has the virtues of decomposing a huge pile of problems into relatively distinct, separable ones. As I pointed out in the section on the organisational kernel, the set of substantive norms can remain invariant on the social level, where it established the human purpose of the enterprise, while the organisation is changed on first on the pragmatic level, by adjusting the communication and control norms. In principle, the pragmatic layer may remain invariant while adjustments are made at the semantic level. For example, if you want to go somewhere in London, you may call a cab. Pragmatically, you would do in the 21st century just what you would do in the middle of the 18th century: form a contract with the driver by asking him (him or her, today) to be taken from A to B. The driver will seal the contract with an "OK" or whatever it was 150 years ago and the job will be done with more or less the same words that now concern a black diesel driven automobile and then would have related to a horse-drawn carriage, both called a "Hackney Carriage". Keeping essentially the same semantics, you could play the whole scenario in a different language (the syntactic level); next, you can imagine adjusting the empirics level by introducing a law to oblige everyone to repeat all they say in order to reduce

[11] Established especially by CS Peirce and Charles Morris (q.v.)

communication errors. Finally, taking advantage of the latest physical device we could use our mobile phones to make contracts and speak with the driver via an intercom to avoid transmitting any infection to him or her.

In general, invariance brings the benefit of simplifying complex problems. As the social world is so amazingly complex, we should be highly motivated to find invariants.

**Finally, an Application of Semiotics to the Institution of Money**

With any information system we can use the semiotic framework as a diagnostic aid and apply it to organisations or institutions that have problems?

The money system is a key institution that recently caused a tsunami that did huge damage to, probably, millions of individuals and numerous firms. Perhaps a semiotic perspective on the money system might have signalled impending problems?

***Pragmatics:*** I have already mentioned that I sought the wisdom of my new economist colleagues at the LSE concerning the concept of information. Their unanimity that the only relevant information is provided by price and that the rest was irrelevant ensured that I would take a semiological view of money at some point. It happened when our method of semantic analysis drew attention to an important aspect of the money system.

A semantic schema includes the ontological dependencies plus the data in the surrogate for each affordance. In other words, you don't really know what you are talking about until you know when each affordance starts and finishes its existence and under what authority. Banks were described as taking deposits from savers and lending them on to borrowers to buy property, expand their business etc. etc. It requires persistence to discover that coins and banknotes were manufactured under the authority of the Bank of England but 97% of the money was circulating as records of indebtedness (also called "credit"). When the high street banks lend money they are obliged to have only some of it in their vaults; the rest they create by recording a debt in a ledger. Thus, they manufacture new money by striking a few computer keys. Then they use it as a sign to perform the speech acts needed to offer a loan contract, which then turns the ledger entry into money when the borrower, in another speech act, accepts the bank's proposal. The bank's intentions are complex: they impose many obligations on the borrower including interest payment and, perhaps a penalty for paying off the loan too soon, etc. It is fatuous to pretend that, from an economic point of view, bank-created money is just like coins or notes that circulate with no baggage attached to them. The loan contract retains its economic function until the loan is paid off, when that bank-made money ceases to exist. Using bank-created money to express economic intentions in day-to-day transactions looks, to the individual, just like using banknotes but, unlike banknotes, its associated loan contract continues to express intentions of persistent relevance for the macro economy.

***Semantics*:** I had known about fractional reserve banking – textbooks mention it - but I had not realised its full implications and, now I did, I felt enraged by the injustice of the system. Our analysis method forces into the open the overlooked aspect of the power/authority associated with a thing that a sign stands for. In a social or organisational system this is a vital part of knowing any meaning.

In political discussions running up to an election, as now in the UK, if the electorate do not know the *full*, as opposed to the *apparent* meaning of a key term such as "money" their individual and crowd decision-making will be distorted. For an individual's transaction in a shop, using a card or cheque to pay for goods is virtually the same as paying with state-made cash (so-called sovereign money) but in the national accounts the picture is totally different. Even a BBC's economics editor said that only central banks can create money (I complained), serving to confirm the misunderstanding. Only a small minority of politicians understand the system and they encourage the misunderstanding by using the housekeeping metaphor for managing government funds.

**Physical:** Who controls the channels and sign-tokens related to the money system? Earlier I mentioned that messages from institutions best placed to disseminate the truth about the banking system do not reach the public who need to know. The fact that private banks create money, from nothing, and collect interest on 97% of it (in UK, that is), is generally not mentioned by the press or other media. Such a significant fact was, at last, promulgated in the Bank of England's first Quarterly Bulletin in 2014 but not taken up by the national press, TV or radio despite its importance. In December 2014 the subject was debated for the first time since 1844 by the British parliament but, in the two minutes devoted to it in the BBC programme, Today in Parliament, they only mentioned the irrelevant Bit-Coin. In 2013 the International Monetary Fund's research department reported their simulation study that confirmed that 100% reserve banking (= sovereign money only) would have only beneficial results. This other highly significant fact was not reported, as far as this attentive reader and listener was could discover.

The physical communication channels serving the financial sector are amazingly broad and fast. Everyone dealing in money faces multiple screens delivering any relevant news flash. That is not for the mere citizen; Henry Ford, long ago, was happy about that:

> "It is well enough that people of the nation do not understand our banking and monetary system, for if they did, I believe there would be a revolution before tomorrow morning."

When an organisation's communications prevent information reaching those who can register and respond to failures in its information system, the possibility of improvement is impaired.

**Empirics:** It could be that physical channels are open but too narrow or too noisy. But there is another empiric aspect of information systems: control and influence. The extent to which a device can exercise control or influence over another depends upon the channel capacity of the closed circuit connecting them

and also, as Ross Ashby showed, upon the variety of responses each can exhibit. The party with the richer variety will win.

Compare the flows of information *from* the population to the financial sector and the channels for regulatory / control signals *back* to the agents in their market: that circuit is wide and fast, whereas the flow of information about the financial sector to the people is very narrow and slow while the channel for controlling them is even narrower and slower. In addition, the rich variety of control strategies and tools available for financial firms is stupendous (including the lawyers and consultants they can afford to employ) compared with the small, relatively ill equipped individuals in the population, who can be picked off one at a time.

**Syntactics:** Here the concern is with the complex sign structures employed by banks. The most noteworthy of these are the derivatives that were the most likely cause of the 2008 banking crisis. Banks create (and pocket the interest on) money they lent, having manufactured it by depressing a few computer keys, so it is worth looking where they lend those funds. A tiny proportion goes to productive enterprise because it is relatively risky; the majority goes for purchasing assets, usually property, which serves as collateral and cuts down the risk; the rest is mostly played on the global financial casino. The derivatives are legal instruments constructed in legal gobbledygook whose design and interpretation the banks generally control while individuals must rely on a little advice from consumer societies, government regulators and trade associations.

Syntactic complexity is their 'atomic' weapon. While supposedly democratising home ownership, many American banks gave mortgages to families who had no hope of repaying them. Batches of these mortgages were then made the assets of mini corporations they called "collateralised debt obligations" (CDO), which were then traded to spread the risk. Furthermore, they chopped up batches of CDOs and bundled the pieces into even more complex financial instruments known as $CDO^2$. To know what you were buying if trading in these derivatives you would have to read and understand hundreds of thousands of pages of legal gobbledygook[12]. Rating agencies could do that no more easily than others so they were persuaded to give them AAA ratings and they were sold globally and, being so 'officially' trusted, they served as liquid assets in the role of near-money. Finally they exploded.

**Social:** Signs, when they are interpreted, give rise to attitudes but some create norms, which also generate attitudes but only when triggered by the norm's conditions. Governing the money system are the norms that permit the kinds of activities mentioned above. Changing those norms falls to the management of the banks who can do most to influence the informal norms of their internal cultures. Judging by the monthly reports of fines imposed for illegal and corrupt behaviour that does not appear to be working well. Parliament can change the legal norms but a recent survey in the UK of MP's revealed that two thirds of them had little relevant knowledge of the money system. Lobbying power

[12] Haldane, Andrew, 2008

deployed in support of a system that allows banks to create money from thin air and the collect the interest on it, is unlikely to be spent in favour of reform.

This case suggests that macroeconomics might gain from work on organisational semiotics. For institutional economics, I suggest it is vital.

**Interdisciplinary Collaboration**

I hope that colleagues in the other disciplines represented in WINIR will consider collaborating with members of the Organisational Semiotics community. In particular, and personally, I will gladly engage in projects such as those sketched below.

In March, at the most recent Organisational Semiotics conference I urged my colleagues to sharpen up our work in a number of ways and, because of the close affinity between the aims of OS and WINIR, those thoughts may be relevant here.

***Terminology****:* In the information systems field, generally, the sloppy terminology has held up progress. "Information" is wonderfully multi-semic but you would not guess so from the literature in that field. There are totally different but precise meaning of "information", "meaning" and other fuzzy terms on each of the levels in the semiological framework, for example. It is possible to disambiguate a terminology using the methods of ontological dependency analysis outlined above[13]. In an interdisciplinary field, where the same terms may be expected to vary in meaning across disciplines, this issue may be a critical barrier to progress.

***Explicit scientific method***: Semiotics caught a severe chill from its use by the post-modernist writers who were eventually satirized and hoaxed by Sokal and Bricmont (1997), so I urged my colleagues to espouse a tough scientific method to eliminate all risk of this infection. I recommended, where possible, we should adopt Popper's Refutationism, as I outlined above when describing the Legol / Measur programme, but that calls, in addition, for hypotheses capable of being operationalized and for access to suitable empirical material.

***Data***: What data suitable for attempted refutation of hypotheses is available and readily abundant?

***1) Explicit norms or rules*****:** Legislation and institutional rules are abundant. A strict formalism for their analysis can help. I would be interesting to examine the treaties relevant to the Euro currency.

An experience in India persuaded me of this: Refused permission to interview the people involved in a new statutory institution for public health engineering work, I asked for a copy of the relevant statutes. Before long, as a result of my analysis, I was able to ask the permanent secretary about the industrial relations problems they must be encountering. Alarm arose because

[13] For example as applied to "sign", see Stamper 1996.

they thought I had been going behind all official backs to the trade unions, whereas the symptoms were clearly written into the new laws.

***2)Actual institutions*:** After gaining permission to access the people involved performing their usual tasks, the research would call for the essential skills in ethnomethodology. It may be appropriate to elaborate upon such formalisms, such as the one I have sketched, to make sure that no essential features are overlooked. The formality can then help the investigators to search thoroughly, as Newtonian mechanics can help astronomers find a missing body, when prompted by an observational anomaly.

***3) Official enquiries*** should serve us well, as the examinations of disease and failed treatment serve the medical scientists. Organisational malfunctioning has potential as empirical material for the detailed examination of the use of signs on all the six semiotic levels. If my superficial, semiotic examination of the money institution can yield a harvest of obvious deficiencies, then a thorough examination of accidents, failed investments, suspected corruption etc. should uncover the details of institutional mechanisms that, of necessity, will be semiological.

***4) Simulation and laboratory work*:** No, I am not proposing computer simulations but computer-supported gaming. I first employed this method in the National Health Service when asked to find ways of improving the blood transfusion service. Although Oxford University in the late 1950s had acquired a Ferranti Mercury (??), it was not yet practical for the Oxford Regional Hospital Board to use it. Fortunately, therefore, I used a version on paper, with the actual decision-makers playing their roles against the simulated demand for blood of the various groups (surprisingly different). The benefits resulted from the observations of running the service at the hugely accelerated pace made possible in the game.

Later, for courses in systems analysis and design, I created a game (Fluted and Square) to teach about organisations as information systems[14]. Computers were not available so the students played their roles in separate offices, using the telephone system in the building, each team observed in detail by an umpire who presented analysed results and led an examination of the use of information by the team. Today, using computers, this laboratory method could be greatly extended but I would advise against doing so without using the methods I have outlined in this paper. The laboratory would need continually to adapt and extend the system, which would quickly become sclerotic and expensive to maintain; without using the methods of semantic analysis and norm analysis, the result would be a bowl of software spaghetti obscuring the interesting organisational aspects of the work.

My colleagues and I would be very happy to collaborate with WINIR participants in developing this kind of institutional laboratory. The possibilities

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[14] At Ashorne Hill, the staff college of the British Steel Industry, at that time one of the UK's three leading management colleges.

– from modelling parts of actual institutions and experimenting with them, experimenting with new technologies, or new organisational structures or collaborative techniques and arrangements – with detailed monitoring and observation, seem limitless, not to mention the adaptation of the laboratory to teaching what we discover about the functioning of institutions.

**Acknowledgements**

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ODDS AND SODS

They will continue our project by subjecting our theses to further attempts at falsification; they will test some potential