



History Mining¹

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1. Introduction

This memo presents a summary of the discussions in the March 6 meeting of the Lincoln Seminars, and aims to identify possible future work in the Brown Group as part of the Systems and the Information Society Network (SISN). The work in the SISN project follows the Syntegrity model, under the guidance of Raul Espejo and Alfonso Reyes.

In the first step of this model the aim of the project was formulated in a General Statement: “We want to explore the forms, which emerge from the co-evolution of information and communication technologies (ICTs) and social processes in order to clarify the resources and values that people can use to affect/effect changes of a desirable nature.”

Next Aggregated Statements were allocated to groups. For the Brown Group² it was: “The social construction of new technologies reconstructs the natural world as an unintended outcome of the interaction. The new definition of "nature" then emerges as part of the interactive culture, while the old one denotes a previous state of the retention mechanism.”

The task of each group is to develop its Statement for further work. The Brown Group decided to reformulate its task as a question: “whether ICT leads or has led to a reconstruction of our understanding of the ‘nature of nature’.” It aims to search for what, besides being an answer, also satisfies a side-condition of the general statement, to ‘affect/effect changes of a desirable nature’.

The lack of a clear, initial understanding of what the terms in the question refer to was deplored. This holds especially as the definitions that most directly come to mind lead to answers that seem mainly trivial. If we think of ICT as the use of computers, there is little doubt that our social and natural world has changed in terms of such use (see App. 1).

¹ The notion of *history mining* is used as an analogue to the notion of ‘data mining’. It refers to the activity of searching in history for patterns that explain experiences in the present, such that they contribute (and add value) to activities in the future. See also Proust, Benjamin, Ranke, etc.

² Participants were Roger Harnden, Loet Leydesdorff, Consuelo Davila, Bob Malcolm and Gerard de Zeeuw. Critics were Ian Perry, Chris Atkinson, Tony Gill, Clive Holtham and John Mingers



On a less trivial level we may compare the influence of ICT to that of new technologies such as refrigerators (less trivial as it enabled a new food industry, and new patterns of eating), airplanes and ships (which connected far off continents), trains (which quickly changed our understanding of time and time-tabling), or medical tools.

There may be another, even less trivial level. It would be most surprising if it were possible, indeed, to demonstrate that the relation between ICT and how at present we organise our social world, allows for something to emerge that is as important as the forms of knowing that developed in the 17th century following the introduction of the tele- and microscope (App. 2).

2. Mobility and other changes

The text of a paper by Kakihara and Sørensen (2002)³ was reviewed in order to explore and gauge the extent and depth of this problem of definition. It conceptualises recent social and organisational changes as made possible by, or as coming about in the wake of, the development of ICT – or, in terms of the General Statement, as co-evolving with the latter.

The focus of this conceptualisation is the concept of *mobility*. Changes in mobility are interpreted as changes on three dimensions – the spatial, temporal and contextual. Temporal changes, for example, refer to accelerations in interaction like the e-mailing of textual messages, contextual changes to the way working environments are designed, etc.

The paper can be read as suggesting that mobility should be the *object* of study, and that the temporal, spatial and contextual dimensions refer to the variety within that object. Unfortunately, this approach will be successful only if the description is (nearly) exhaustive. It is not: mobility also refers to other relevant changes, e.g. the cognitions people use to solve problems.

The authors also attempt a second interpretation, viz. that the object of study is the *fluidity* of a society or social system. This interpretation is based on a metaphor, the gradual coagulation of people and institutions into recognisable entities such as regions, networks and fluids. This new description does not seem more successful (exhaustive) than the old one.

Another suggestion in the paper is that, while ICT developments do relate to mobility, this is mainly in the form of a removal of technical, or physical *constraints* – for example those on the co-ordination of actions. This appears close to a tautology, however, as (loosening) constraints seems semantically very similar to (increasing) mobility.

³ Kakihara, S. and Sørensen, C. (2002), Mobility: an extended perspective. Proceedings Hawaii Int. Conf. System Sciences.



3. Analytic definitions

3.1 Concerning ICT

The authors define ICT as strongly linked to hardware – such as computers, technology to speed up the functioning of organisations and chips to enable mobile phones. This definition restricts ICT to processes of executing operations on input such that errors are (mainly) avoided (by continuously checking and ensuring that results stay within a formal calculus).

In this interpretation the contribution of ICT is easily identified. Computers contribute by performing operations quickly, by being effective in checking the quality of results, dependable in storing and recalling statements and able to do (calculus-controlled) tasks that add value to human activities – for example prediction – at a relatively low cost.

Unfortunately, this definition leaves out a central characteristic. This is especially clear when one realises the large impact even of slow, early computers: they have to be programmed. Programming requires that one rethinks and redesigns tasks, to make them *independent* of each other, and also *efficient* and *simple* in terms of users' needs (e.g. by using a 'mouse').

Looked at this way, definitions of ICT should not focus on aspects such as speed and reliability. These are shared with most other technologies. More important is that ICT appears to *push* towards higher level programming methods that *increasingly* help to add value to people's actions, while *minimising* cost (time, energy, as well as administrative alertness).

This interpretation seems supported by the fact that access to computers was accelerated famously by the advent of higher level programming languages and by the implementation of the *desktop metaphor*. Both made it possible as well as easy to 'engage' users and include in the system precisely those user activities that benefit by the constraints of the calculus involved.

Additional and even more striking support may be found in changes in the design of software – using *structures* with ever more influence on action. Increasingly sophisticated buttons, graphical forms and sounds are used, enabling users to concentrate on what they want to achieve. Bad software requires many control actions and slows down revision.

Further support may be found in the strong feelings of change as expressed in the paper (but differently interpreted). People *are* not (interactively, spatially) closer, but *experience* getting closer to each other – the less demanding their interactions, the more easily sustainable in daily life and the higher the level of the languages by which they are co-ordinated.



In short, defining ICT only by how 0s and 1s fit into a calculus, and thereby create what is (operationally) closed seems to be the wrong tack. What may be non or at least less trivial is to consider how a calculus may help identify resources (energy, administrative programs), as well as provide a basis for adding value to the actions of their users.

3.2 Concerning the domain of (social) experience

The major difficulty that appears to face the authors of the paper is how to delineate their *domain of validation*. They include temporal, spatial and contextual changes. They also include the extreme of reaching final freedom, when activities may fragment into ‘ad-hoc events’, and even a ‘collapse of traditional households and communities’ is to be anticipated.

The example of the trucking system implies a second, paradoxical, extreme. Although the ‘fluid platform for the co-ordination of the [...] interaction’ imputes *increased freedom* only to that system and its users – its members appear *pinned down* by localities, timescales, and clients’ demands. Including both extremes in the domain makes it all- (and hence too-) inclusive.

Fortunately, there is a sensible way to limit the domain. The examples suggest that the observed large increases in mobility serve a purpose, minimally an economic purpose. Living as a spatial, temporal and contextual nomad has to be *paid for*. Payment is in the increased creativity freedom brings – which, remarkably, the truckers no longer enjoy.

These comments are not meant to detract from the authors’ contributions, which are very insightful. They point to a problem beyond their aim. It is that it is not easy to find in history descriptions that ‘clarify the resources and values that people can use to affect/effect changes of a desirable nature’. As experience shows, generals tend to fight the previous war.

What appears needed is not a static historical description, but some construction (or system) that maintains, adapts and updates precisely what people need to be able to change in the desired direction. It should help detect what supports its existence such that it is able to help people, or in more general terms, add value to their actions.

To be able to answer Brown’s question it is proposed to define the domain of validation by the class of such systems. This guarantees that the two extremes mentioned above are not included: elements in the domain must be coherent and supportive. At the same time the main claim of the Statements is still captured: continued access to resources.

3.3 Concerning ‘nature’

What remains missing is some idea of *what* to validate instances of the domain of validation against. As argued already, notions such as mobility, fluidity and lack of



constrains are too non-exhaustive to serve as substantial candidates for validation against the domain. A more general notion is required if the domain of validation is to serve as referent.

A suitable candidate is the notion of ‘nature’ as that which the elements in the domain refer to and itself is delimited by the domain. We may start exploration of this notion by looking at daily use. The reference then is what is not human, the ‘natural world’. More constructive and suggestive of further usage seems to interpret ‘nature’ as in the ‘nature’ of a windmill.

In this case ‘nature’ appears to function as the criterion or set of criteria that something has to satisfy in order to function, for example to produce flour and add value to (other) actions such as eating. This restricts ‘nature’ to what supports social processes. The ‘nature’ of a tree thus will be its function, for example in helping to construct bookshelves⁴.

It is the idea of ‘nature’ as a *criterion* that promises a non-trivial answer to the Brown question. The ‘nature’ of the ‘resources and values’ to be designed will refer to the (‘retained’) criterion with which to decide what, as the ‘unintended outcome’ of interactions, adds ‘desirable’ value to actions as part of the ‘co-evolution of [...] ICTs and social processes’.

In the discussions in the seminar it was suggested to concentrate on definitions that help identify *dramatic* levels of value added to actions. A good example would be the criterion of ‘scopic nature’, which developed in the 17th century and served to create natural science as a new set of organised social processes (App. 3).

This example suggests that definitions of ‘nature’ are linked. Taking the tree as an example again, it may be hypothesised that the number of actions to which it adds value be extended beyond bounds (infinity). This would result in an extreme – in an understanding of the tree in all its functions, and hence in an understanding of (part of) the ‘natural world’.

This link may have induced the (false) idea that the domain of validation includes some form of ‘reality’. It may have started the interpretation of science as *representational*. However, the most that can be claimed is that *natural science* was first in *separating* ‘nature’ as a criterion from ‘nature’ as either reality or natural world.

⁴ Another interesting example is how we describe the ‘nature’ of the human brain: it appears to search for resources to achieve competent action – for example as designed in the decision making mode.



4. Further exploration

4.1 Combinatorial nature

The definitions of the (social) domain and of ICT may be combined as both emphasise the design of constructions that add value to the actions of their users, and are stable enough to detect changes in their environment that can be used for their own continuation. The definition of ‘nature’ suggests that there is a way to select from the combined domain, or set of such systems.

A suitable label for the definition of such a new element in the class of ‘nature of nature’ appears to be *combinatorial nature*. It refers to ‘desirable’ interactions between ICT and the domain of validation. The combinations that satisfy the criterion will be said to contribute to the acquisition of *situated knowledge* – knowledge that allows only for partial transfer (App. 4).

The criterion may be specified further to facilitate selection from the domain. all windmills bring together bricks, cloth, wood and people – to ensure that they are stable and fulfil their function. Each should help *identify* and *channel* wind energy, and *produce* flour – in large and uniform quantity, fast, with high precision, low waste and cost.

These criteria specify the direction of what is added. Similar criteria may be specified when producing a bicycle, a house, a social system. Each implies constraints to the actions of users, within which they are to act. What each adds, therefore, is *competence*. It refers to the ability of preventing outcomes other than desired ones (App. 5).

A second specification is concerned with how windmill are to function. Over time it should optimise its search for and discovery of the (wind) energy that makes it work and allows it to add value to actions. We also expect it to be stable (invariant under disturbances) in that it withstands storms, prevents extreme speeds by a proper repositioning of its sails.

Stabilisation will be ensured in terms of how the windmill is constructed, as part of its (pre-designed) ‘nature’. Additional effort usually is needed. This will be *debited* as costs to the value added. Usually it is tried to minimise debiting. This is referred to as *automation* (usually linked to the use of ICT), or simplification, to facilitate the task of users⁵.

A third specification concerns the users. The minimal level of ‘adding value’ is of course that the windmill produces flour for one person – but it obviously would be more advantageous if value is added for many users – to (nearly) any baker, small or

⁵ Early examples of automation (in particular reduction of the number of people necessary for maintenance) include canal locks.



large, far or near. The bakers in their turn may, similarly, be *invariant under* visits by any kind of customer.

4.2 Comments

The definition of ‘combinatorial nature’ as a criterion helps to characterise what constructions may be considered ‘bad’ – for example windmills that do not seek to optimise input of energy, that are sensitive to high winds, that produce flour that does not lead to tasty bread, etc. Being able to identify defects makes it possible to strive for high quality.

The criterion allows for many and varied constructions in the proposed domain. Windmills are only one example⁶. Others include ‘harnessing’ cows to produce milk (fast, efficient, inexpensive) that can be used to anybody’s advantage. One may also think of collective efforts to socially support activities such as social security, (reproductive) health care (App. 6).

Such constructions share a number of aspects, the dominant one being that of high *redundancy* (App. 7). Cows do many things that are not required to satisfy ‘combinatorial nature’, although indispensable for milk production – like producing dung⁷. In the design of social systems similarly some leeway (or space) is created to adapt to clients, to stabilise the value added (App. 8).

The knowledge embodied in such constructions clearly is linked to the particular situation they are in, hence the adjective ‘situated’. This raises the question how this differs from the use of the criterion of ‘scopic nature’, which co-evolved with ‘scopic’ technology. It is used to construct what may be called a *stable observer*.

Such an observer identifies and channels observations, to generate high quality observations or *knowledge*, to be used by any actor. One may speculate that this observer constitutes a special case of the use of the criterion of ‘combinatorial nature’. It is preferred, however, to think of this case as an extreme, as no mechanism for maintenance is in place (App. 9).

5. Conclusion

The aim of the seminar was to explore how the Brown group may answer its question least trivially: “whether ICT leads or has led to a reconstruction of our understanding of the ‘nature of nature’.” The method used was to define and combine two terms in

⁶ The notion of ‘technosphere’ was introduced to single out instances in the domain. It should be kept in mind that the criterion identifies a direction – to add value to actions.

⁷ Redundancy may take the form of unpredictability (formalised, for example, in the notion of chaos). Compare also the way one ensures that two flanges are connected stably (on flange- or systems-level): both have one hole that is positioned precisely; the others are elliptic.



the question (ICT and ‘social processes’ or ‘interaction’) and relate them to a (suitable definition of a) third term, ‘nature’.

These terms were focussed upon for two reasons. They are part of the General and Aggregated Statements produced in the Syntegrity process, and they refer to a domain where people appear able as well as motivated to intervene and ‘affect/effect changes of a desirable nature.’ The notion of ‘nature’ is seen as fundamental to the ability to design such changes.

There are standard definitions – for example ‘ICT’ as the hardware that allows for communication and information transfer; social processes as our interactions with others using tools such as mobile phones, computers, mass-transport; ‘nature’ as an interpretation of daily life, of that which we consider reality.

These definitions support a fully positive answer to the Brown question, as demonstrated by the argument in a paper by Kakihare and Sørensen (2002). The authors suggest that our daily life has indeed been reconstructed by the use of ICT, and that we may understand the changes in terms of variables that indicate an increasing loss of personal space, slowness and context.

It was tried to search for definitions of the terms that would lead to a less trivial answer (less trivial in that ways would be sought to influence such changes). It was noted, first, that ICT has little to do with computers. The way it influences social processes is via clever ideas implemented in software and in higher level programming languages.

Second, it was observed that social processes tend to depend increasingly on the availability of support systems, or systems that are maintained or maintain themselves with the aim of adding value to people’s actions. Not all are well structured – but there are many of them: networks, partnerships, private and public organisations, chat groups, etc. (App. 10).

Third, it was argued that the notion of ‘nature’ is linked to many notions in daily life, but was separated from them in a fundamental way in the 17th century, and in particular seems to have assisted in the birth of systematic knowledge acquisition or inquiry. This suggested making ‘nature’ part of a research program to design social processes using ICT (App. 8).

According to this proposal the answer to the Brown question no longer is generally positive. Only a particular aspect of ICT is to be used in the definition of ‘nature’; only a certain development of social processes is to be sought to increase people’s ability in designing new forms of interaction, thereby to achieve competence and strengthened actorship (App. 11).

Assuming that the answer is, indeed, no longer generally positive, a research program appears to be in place. It will involve identifying ‘higher level languages’ that can be used in the ‘self-maintained co-ordination’ of constructions that add value to the



actions of their users. Of interest are especially ICT languages and applications that allow for complete collectives.

Projects that may be assumed to implement such a research program include the development of ICT supported youth groups (see the work of the White Group) and of support systems for the elderly (already started). The main research design facilitates identification of ICT co-ordination structures, those maintained *by the very actions to which they add value*.

6. Appendices

Some additional comments seem useful to further clarify the way Brown's task was approached in the seminar on March 6, 2002. The problem that was faced is that of understanding social processes in relation to technological developments – a quite daunting task as *anything* (in history) may strike one as relevant: the technology itself, its use, the way people talk about it⁸.

6.1 Appendix 1: Trivial answers

The notions of trivial and non-trivial in the summary should not be understood in any derogatory sense. Trivial refers to anything the relevance of which can be ascertained by direct inspection 'from now on'. Non-trivial refers to what requires an explicit use of historical thought figures, for example those of natural science, those of technology, those of the crafts.

6.2 Appendix 2: Support Enhancement

The approach chosen in the seminar was to identify a *framework* that would help to circumscribe variety in both the social and technological developments at the same time, and hence allow highlighting their relation. The framework chosen was that of looking for what adds value or quality to action in a systematic way, a *Support Enhancing Framework* (SEF).

6.3 Appendix 3: 'Dramatic' changes and technology

There have been many changes in technology that seem to have made little difference to existing views on 'nature'. They appear to have added 'more of the same'. In some cases the effects were quite dramatic. We may think of the 17th century definition of the criterion of *scopic nature*, in recognition of the technology used (tele- and microscope).

⁸ See Proust, Benjamin, Ranke, etc.



6.4 Appendix 4: Transfer

The strict separation, as maintained in the text, between ‘nature’ as a criterion and as a (high quality) observation of ‘reality’ is not always adhered to. This seems to have led to confusion concerning ‘transfer’. It is not results that are transferred, but their invariance under use in ‘reality’. Such invariance is guaranteed by the use of the criterion, not by comparison with reality.

6.5 Appendix 5: Characterisations of value added action

If particular forms of ‘nature’ are to add value to particular activities, it should be possible to characterise the latter by that ‘particularity’. This most clearly holds for the (longest and best known) criterion of ‘scopic nature’. It separates action from observation (actorship from observership), to produce high quality observations (of ‘states of ‘nature’’) as resources for prediction.

If prediction is possible, it can be used to identify (future) deviations from intended effects, and hence to control, regulate or steer towards achieving those effects. Those actions that are supported in this way can be characterised as forms of control or regulation. The notion that managers, doctors and other professions function as *regulators* is quite popular.

Characterising actions that are supported by constructions that satisfy the criterion of ‘combinatorial nature’ appears less straightforward. There is prediction, but only as long as the constructions allowed for by the criterion are maintained. There is regulation, but it is restricted to the actions that the constructions are intended to support.

In other words, ‘combinatorial nature’ admits to constructions that *qualify* actions, and only allow for variation within the constraints that are implemented thereby. The actions so designated may be characterised as *competence-enhanced*: the *power* of their deviation-detection and redress is the result of a construction and should be maintained or enlarged.

Constructions that qualify actions address and engage users, and turn them into agents (or P-individuals; see App. 7). These may combine into further constructions that add value. It may be surmised that there is a limit to their combined ‘power’, and that one cannot increase competence beyond that limit (without leading to fragmentation).

6.6 Appendix 6: Projects

The SaRA project was presented in the seminar of the White Group, on February 20. It involved the construction of groups or clubs of adolescents and enabling them to show and tell each other about local experiences (through videos), thereby to create observable constraints on competence. These proved transferable even to individual life beyond the clubs (App. 4).



One of the topics discussed in the Brown Group was how the history of our knowledge of Fe might exemplify a reconstruction of the 'natural world'. It was suggested that Mendeleev's periodic table exemplified a construction that added value by helping to search for substances and anticipate their properties. Maintenance of the table depends on the search action.

6.7 Appendix 7: Redundancy

Constructions that satisfy the criterion of 'combinatorial nature' show a number of properties that partly derive from the need for redundancy. For example, redundancy seems to be increased when resources to maintain the constructions are partly derived from the actions they support. This suggests that there is 'value' in self-production, self-checking and self-organisation.

To satisfy the criterion constructions have to be able to detect 'differences' in their environment (sources of variation, of energy, of distinctions, of non-equilibrium). These include the presence of (other) individuals, but only as agents or P-individuals (resources, or selected or restricted variations and differences; Pask's term).

Each construction may (be made to) expand, contract or remain stable. If the latter, it is called complete. The constraints on interactions within a complete construction (or collectives) may be treated as (formally restricted) languages. These are taken to constitute the knowledge part of the situated knowledge embodied in the constructions.

(Transferable) languages refer to constraints on interaction in new construction such that the interactions serve as communications, the Shannon-type information over which is maximised, while the entropy of the constructions is minimised. This combination ensures that participating individuals collapse into stable P-individuals or agents.

There may be a limit to the number of P-individuals given the variation each biological or M-individual is able to generate. We may say that this number embodies the M-individual, but not that this individual embodies that number. In other words, biological systems do not belong to the combined domain of social processes and ICT.

6.8 Appendix 8: Knowing to change values

The General Statement of SISN refers to 'resources and values' for people to use. The notion of *resources* is (relatively) clear: anything that is sufficiently stable for people to notice and use in support. As to *values* at least two types may be distinguished in this context: values used to define what is 'desirable' and values used in the process of creating resources.

The latter are especially interesting as they are the least 'free'. Membership of constructions, collectives and other forms of organisation requires that values be restricted (combined and recombined; hence changed) to ensure stability and support



to users (honesty, not having ulterior motives, trust). ‘Combinatorial nature’ aims to identify relevant restrictions.

6.9 Appendix 9: Criteria as theory

Anything that is defined as a criterion may be used as a (potential) descriptor as well. This obviously is a type of misuse. Still, it is fully acceptable as a form of exploration. The danger is that, as there is no criterion anymore, some other criterion is chosen, usually (a variant on) representational sufficiency.

This criterion is a direct derivative of the criterion of ‘scopic nature’. It is in this sense that one may say that using a criterion as a descriptor is a trap. It allows any effort to deal with ‘non-scopic’ developments to return to or be attracted by designs on the basis of ‘scopic nature’. The danger of this trap is that it prevents all forms of knowledge transfer.

6.10 Appendix 10: Policies

The constructions that arise using the criterion of ‘combinatorial nature’ appear to constitute only a small part of what may arise when adding value to actions. There may be many other definitions of ‘nature’. Both may support anarchist or terrorist activities, as might a windmill. This raises the question of policy: how would one avoid this?

It may be surmised that the way to do so is to continue constructing, as each new result will impose some discipline on its members, and help them move to constructions that do not support activities that damage others. This suggests not to try and control any individual construction (as managers might tend to do), but to manage by creating new combinations.

6.11 Appendix 11: Alternative terminologies

The problem dealt with in the seminar has been treated in the literature under a number of names, although each time it appears basically the same. One such terminology refers to the (problem of) context, rather than to that of adding value to actions. This terminology – used in various forms of decision making – reverses the emphasis from forward to backward design.

Another terminology tends to emphasise the process of designing stable collectives without reference to the value added to the actions of users, or to the detection of resources for maintenance. This would be exemplified by methods for 3rd phase science, where only general attention is paid to the need to identify specific resources for maintenance.