Media-Technology and the Structural Change of Knowledge Societies *

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Abstract

The paper takes the media-technology as an example to investigate the role of technology in so-called societal transformation-situations. That means highly complex historical situations in wich a society is partly changing its character so dramatically that observers later on will state that is no longer the same society that it used to be. Such structural changes of societies are very complex events, which are never attributed to single causes. Beside technology changes of many singular facts have preceded such structural caesuras as an effect to special circumstances, like poverty, lacks of democracy, requirements of the world market, economic growth or crisis, ownership structures etc.. In my paper I want to discuss the relevance of media technology for such societal breaks. My hypothesis is that any structural change of society with caesuras of political and economical power are obliged to social structure of knowledge and the way in which knowledge is handled. Or, inversely expressed: caesuras of the mode of knowledge will force a more or less significant overthrow of economic and political dominance. Insofar all societies are "knowledge societies" in the sense that any society has to emerge forms and techniques to proceed important decisions regulating its knowledge: Which knowledge should be kept, which can be deleted. And in which form this could be done? In a sociological discourse context – and anymore from a sociocybernetics point of view – it is not need to emphasise that society's decisions on storing and communication of knowledge are not made by society's own will. It emerges based on media-technology which is available, the current societal structure, and a lot of other variables which have to be described. The interdependency of these factors expresses the concrete complexity of a knowledge society.

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1 Introduction

This paper discusses the relation between complexity and technology using the example of the so-called *knowledge society.* Right from its onset, the debate over the knowledge society has been strongly shaped by technological aspects. In the USA, there was talk of a "Global Information Infrastructure", in Germany, of a "Data Highway" and the EU Commission partly took the number of Internet connections as an important indicator of progress made in the Knowledge Society. Only recently, and above all in the context of the so-called *Web 2.0* , i.e. the watering down of the traditional role patterns of producer and consumer of media contents[1] have the social aspects of Internet communication started to become increasingly dominant.[2] In this paper, I would like to take up a comment made by André Gorz at a Heinrich Böll Foundation conference in Berlin in 2001, when he said that referring to a Knowledge Society would only make sense if one were able to demonstrate that relevant radical changes in society somehow related to changes in the handling of knowledge in society (Gorz, 2002). Such a demonstration is the object of this paper.

Fifty years ago, Harold Innis made a similar attempt when he examined the proposition that *communication systems* might be responsible for the rise and fall of certain cultural peculiarities (Innis, 1951). Innis suspected that the (material and organisational) development of the media destroys the hegemony of knowledge reached in a respective historical situation, thus bringing about radical changes in society.[3]

Innis' propositions imply a certain handling of societal complexity that has been widely criticised. In particular, he was accused of maintaining a technology-centred view. However, regarding communication technology as a sort of driving force of radical change in society is by no means unusual. For example, letterpress printing is is often attributed an important role in the schism of the 16th century, with all its further consequences in terms of the development of European states. It can be assumed that the reformation prompted by Luther would not have been so successful without the possibility of a mass distribution of printed matter. However, a cause-and-effect relation can hardly be demonstrated. Letterpress printing had already been introduced in China and Korea several centuries earlier without triggering such revolutionary changes.[4] Today, we are involved in a similar debate

[1] which can be observed in the shape of the many music exchange websites, Youtube, Indymedia or, generally of the use of Wikis and Weblogs

[2] this is also manifest in the terminology referring to Web 2.0 as a "Social Web"

[3] Owing to specific properties, certain communication media are more suitable for certain forms of disseminating knowledge than others. For example, Innis distinguishes between temporal and spatial knowledge dissemination and claims that the development of papyrus as a storage medium destroyed the hitherto existing education monopoly held by the Pharaoh, resulting in a fundamental shift of power.

[4] Ultimately, letterpress printing did not assert itself in China owing to the complex

regarding the assessment of the Internet's role. What seems clear is that since the introduction of the mass use of the Internet, we have been able to observe fundamental changes in the way that knowledge is handled and that the implications of this change are equalled with the significance of letterpress printing, even though we cannot formulate an approximate assessment of them. This time, however, the changes are affecting global society as a whole.

Societal transformation processes that I am mentioning in this paper refer to highly complex historical situations in which a society is partly changing its character so dramatically that observers later on will state that it is no longer the same society that it used to be. In such radical transformation processes, changes in the way that knowledge is handled in society no doubt represent only one aspect. However, this aspect will be at the centre of my argumentation in the following, i.e. I will be looking at the manner in which a society handles its knowledge as a complex area of interaction of different factors and is, of course, vice versa influenced by these factors itself (e.g. by technology). I refer to this complex entity as the "Knowledge Society" or, for its historical variations, as the "Form of Knowledge Society".

It would be a mistake to define the different forms of knowledge society via the communication technology they are based on. Incidentally, Harold Innis did not attempt to do this either. He too describes the communication system using technical and social (organisational) aspects. The paper at hand differs from Innis in two respects. First – as will be shown below – the concept of the *form of knowledge society* is more comprehensive than that of the *communication system,* and second, as opposed to Innis, effects are not attributed to their causes. In other words, we are opting for a systemic, socio-cybernetic observation.

2 The complexity of knowledge society

The following argumentation is based on two premises. The first one is that all societies are knowledge societies in the sense that they have to develop special social mechanisms to handle their knowledge. All societies have this basic necessity in common. So I believe that it makes little sense to refer to one or several specific forms of society as a *knowledge society* and not to do so with others. However, what distinguishes the societies is the manner in which this is done. The theoretical concept that expresses this relation between variable, changeable but definite insubstantiality and fundamental

multitude of characters. However, this was not the case in Korea, where a reform of writing carried out in the 14th century enabled the productive application of letterpress printing. Here too, technology-centred interpretation has to be ruled out, for the question why the consequences in China were different from Korea obviously points to non-technical factors (Giesecke, 1986).

and indefinite substantiality is the *concept of the form.* We are familiar with the concept of the form as one of the most important metaphysical concepts in scholastics, although it probably experienced its most famous application in Marx's Critique of Political Economy. Analysing the value-form enables Marx to solve a problem that even Aristoteles had already foundered on, that of how it can be possible for commodities to be compared in economics if what is common to them, the labour congealed in them cannot be expressed in their outer form, their natural form. As readers will be familiar with, the value-form solves this problem by the commodity, as an object, representing the invisible relation to another object encompassing the same relation via the distinction between use-value and value (Marx, 1868).

A further prominent example of applying a form analysis is the "Theory of Social Systems" by Niklas Luhmann. However, Luhmann separates the form analysis from its economic relation to the object examined, generalising it in that the two sides of the distinction may reappear on both sides of the distinction, i.e. that they represent form and content and the content could be examined regarding its form (cf. Baecker, 2007).

I would like to take up this tradition with the concept of the "Form of Knowledge Society", using it for a special, historically variable for in which societies handle knowledge, in which they decide which knowledge is to be preserved, which to be forgotten or which to even be completely destroyed, and in what manner this is done.[5]

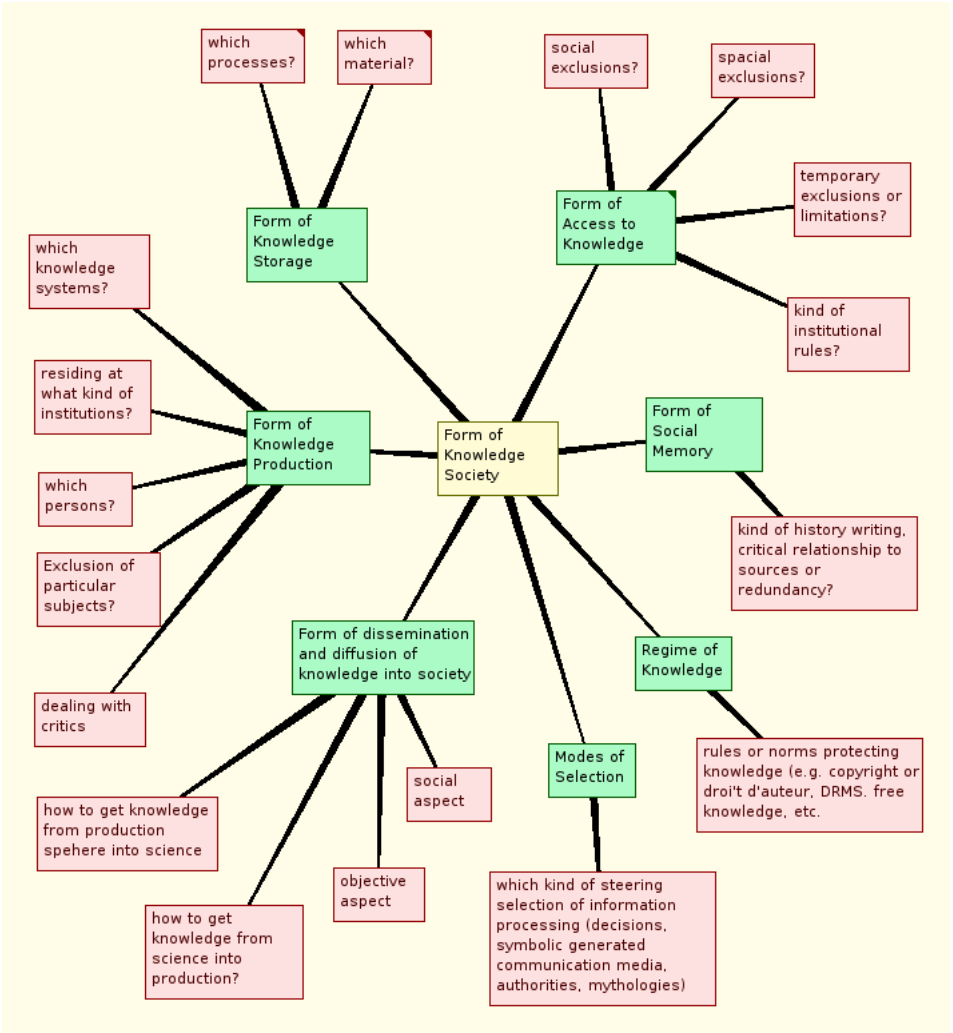
It is obvious that such selections never occur freely[6] but are always linked with socio-structural contexts. These selections are shaped by certain social structures that are historically variable. Such patterns need not be of a cultural nature but can also be political and economical. A further premise is that while these social patterns depend on the societal structure, they are determined by the communication media a society has at its disposal in the respective epoch. Here, one has to consider that these two central dimensions are mutually dependent, i.e. I am maintaining neither a socio-structural nor a technological determinism but view the form of knowledge society as the result of interaction between the social structure and technological development. This means that on the one hand, the communication media are the result of demands made by the structural development of society (e.g. changes in writing owing to the development of the markets, the administrative system, developments in science, etc.), and on the other, society's structure itself is subject to change owing to the development of the media in a non-negligible way (e.g. the influence of letterpress printing on the development of bourgeois society).

[5]Using the concept of the form suggests itself for the problem to be addressed here because it offers a certain handling of the concept of complexity. I will take this up later on.

[6]Even if decision-making processes are at issue.

3 The form of knowledge society

Using the concept of the form is to enable us to handle the issue of complexity in a certain theoretical manner. Since a system's complexity is determined by the number of possible relations between its elements, identifying forms serves the purpose of mapping a network of relations without wishing to perform a categorical structuring of the world in an ontological sense,[7] and in the following, it merely presents a rough outline of the different dimensions.

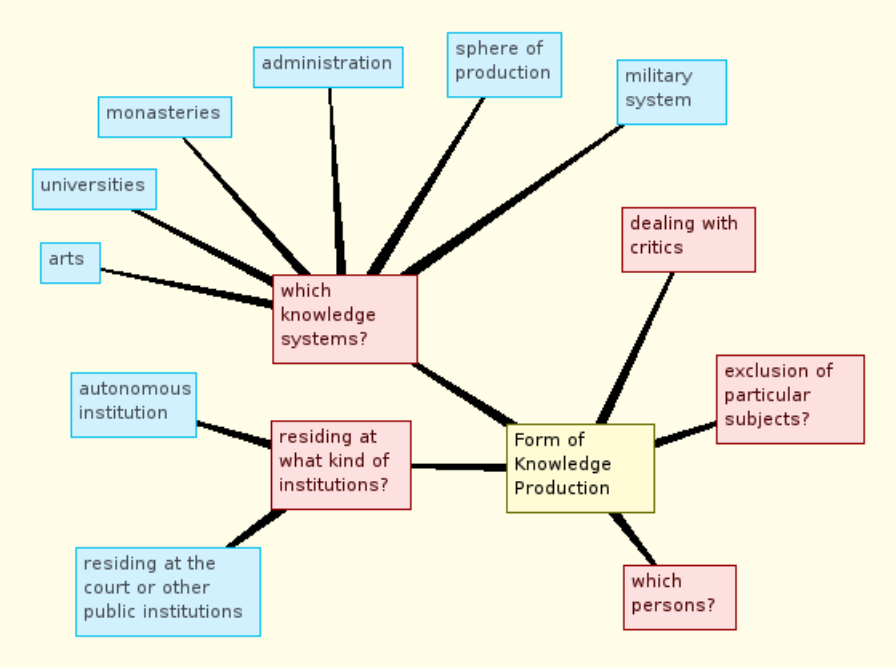


[7] This already becomes apparent with the dimensions referred to further down being classified by *processes* of knowledge handling and not by ontological categories. Furthermore they not always being selective in terms of their operational variables. Many indicators occur in different forms. Not all forms can be described in detail in this context. However, I would like to refer to papers by Burke and Stichweh, in which similar considerations have been treated (Stichweh, 1991; Burke, 2001)

Form of knowledge production

Here, questions arise regarding a society's knowledge systems. Where, at which institutions and in which locations is knowledge produced (e.g. monasteries, universities, enterprises, workshops)? Which persons produce this knowledge (people specially trained and employed for this purpose or in connection with the production of goods and services)? Are there taboos, i.e. bans on researching or thinking about certain issues? Is knowledge produced via critique or is existing knowledge merely maintained, refined and passed on (problem of dogmatism)? We know, that during the historical transformation from a stratificational to a functional differenciated society in Europe Universities were primarily institutions to *impart* knowledge, not so much to *produce* it. Scientific knowledge production in the sense of theoretical or empirical research processes began not until the the renaissance humanism and took place firstly beside the universitary institutions. Burke is speaking of "alternative institutional networks" (Burke, 2001, p. 53).

But also the inverse process must be of interest. In what way the knowledge of the practical world, e.g. from farming, from guilds, from seafaring etc. found the way into scientific treatment? I would like to remind the example of Galileo's telescope. It was the invention of an gaffer from the Netherlands which motivated Galileo to reproduce it and to use it for scientific observations. There were simular effects from other areas like windmill technology or military inventions.



Form of knowledge storage

Here, the focus is on the material used (i.e. material aspects of storage, such as stone monuments, clay slabs, magnetic tapes) and the organisational processes (e.g. temples, libraries, data banks).

Form of access to knowledge

Here, the question is who has access to knowledge. Is knowledge freely accessible, or are there exclusions? If so, in what form? a) social exclusion (e.g. excluding certain people or groups of people), b) local exclusions (e.g. no Internet or TV reception in certain regions), c) temporal exclusions (e.g. learning only occurs in certain phases of life). What are such restrictions based on? (e.g. fees charged for access or norms on not making knowledge accessible outside a certain group). What institutional rules are there for this? (e.g. in the medieval guilds, strict regulations governed the passing on of professional knowledge). The indicators of such forms of access are the existence of certain institutions such as libraries and museums as well as the existence of characters. What other forms of access to knowledge are there (e.g. tales, participating in rituals, etc.)?

Form of dissemination and diffusion of knowledge into society

How do the societies examined organise the transfer of innovative knowledge processes into the sphere of production? How does new knowledge enter everyday life in society? The indicators here are, for example, the speed of knowledge transfer, progress made in industrial productivity, the linking up of the knowledge system and the economic system, dissemination in publications and accessibility for the population.

Here, the emphasis is also on general aspects of the relation between science and societal practice (e.g to what degree practical problems of agriculture, handicraft, trade or administration are addressed as a scientific topic in the first place). The Middle Ages will yield a different answer to this question from that of Antiquity). Or the reverse problem: How is knowledge incorporated in material production[8]? Or how strongly do certain disciplines delimit themselves from one another, such as, in Arab Spain, law (including theology) from medicine (including philosophy)(Hottinger, 1997). Another aspect is of a social nature: Who disseminates knowledge? What types of school are there? Are the population informed by town-criers? Is there a monopoly on interpretation (e.g. by priests) in explaining written documents and iconic representations?

[8]examples: the iron plough in Gallium, which did *not* dispread into the italian Rome, Windmill technology which came from central Asia over Arab Spain and dissimninated very fast and succesful in western Europe.

Form of social memory

Here, above all, the relation between continuity and variance is at the forefront. Is what is already known memorised by constant repetition (e.g. what was written by earlier historians in Arab Spain) or do new contents tend to come more to the fore? Indicators can be found in the way that history is recorded, the existence of a critical or uncritical relationship to sources and how ignorance is dealt with (cf. Esposito, 2002).

Regime of knowledge

The issue here is whether and how knowledge is protected (through what norms, laws, habits, etc.). The indicators are certain legal norms such as copyright (z.B. Copyright vs. Droit d'Auteur; common knowledge) (cf. Grassmuck, 2002; cf. Spinner, 1994)

Modes of selection

What is the form that steers and orients the ability of information processing to select (decision? Symbolically generalised communication media? Authorities? Guardians of knowledge? Mythologies?)?

4 Between social determinism and technological determinism

Thus we can see that knowledge societies may be described as complex networks in which all nodal points consist of technical and social factors. How can this relationship be determined from a sociological angle? Technology as the environment of the social dimension (Luhmann), as a social process (Weingart), as actants on a par (Latour) or as a material element in the form of which the social context again encounters itself (Marx)?

4.1 Technology as a "working simplification"

To Marx, technology reveals humankind's entire active behaviour towards nature (cf. Marx, 1970, p. 393). Luhmann regards it as an area of operations in which fixed but repeatable links are established, which can however only work because the interference of external factors has been largely eliminated.[9] To Luhmann, it is astonishing that such "working simplifications" should work in the first place (Luhmann, 1991). Just like social systems, technical systems reduce our complicated environment by determining relatively limited options for action, thus delimiting themselves from their envi-

[9] While it is precisely the advantages of (loose) links that nature makes use of

ronment. The formation of systems, irrespective of what kind, reduces the complexity of the environment.

The environment of a system may be more or less complex; this depends on the density of the networks linking up a system's elements. The greater the number of relations between the different nodal points in a network, the denser the network and the higher its complexity. Here, the rule applies that no system is capable of establishing a complexity of its own that would come even anywhere near its environment's complexity. Neither is this required, for many interactions in the environment are of no significance for the system's survival. Systems only concentrate on those events in the world that are meaningful to them and not on their entire environment simultaneously.

Technology contributes to such a reduction of complexity with a fixed linking up of options (via rules, programming of causal relations, which amounts to a simplification of causal links (Luhmann, 1991; Halfmann, 1996; Japp, 1998). In contrast, owing to the contingency of social communication in general, social systems have to reduce complexity via other mechanisms. To this end, they create symbolically generalised communication media which, unlike technical systems, always operate on the basis of meaningfully constituted communication.

So far, Luhmann's definition of technology has not managed to assert itself in the sociology of technology (Rammert, 1998a). This no doubt somehow relates to its being based on a concept of technology that gives little consideration to the modern computer-supported information and communication technologies. However, it is these technologies in particular that give rise to new aspects to be explored, such as the question of to what degree technical artifacts (like, for example, autonomous robots, agent systems, etc.) can be regarded as agents of social action, in addition to the older issue of what influence technology has on the social context (impact research, technology assessment) or, vice versa, the social context of shaping technologies (Technikgenese). These new issues show that while sociology has dealt with technological problems for almost two centuries, how technology and the social context relate to one another is by no means settled.

4.2 Technology as a "social process"

There seems to be general agreement in sociology that a technology- determinist view has to be rejected. And who would doubt that the causal attribution of (social) impacts to certain (technical) causes, for one thing, represents too much of a simplification of the true context to allow complex socio-technological interaction to be described via this approach? Second, over the last few years, doubts have arisen whether in rejecting technical determinism, sociology has not succumbed to the reverse simplification of social determinism the fascination of which is suggested by the very subject itself. Given its basic postulate, formulated by Durkheim, of "explaining the

social only by the social", how could sociology fall behind Heidegger's statement that "the essence of technology is nothing technological" (Heidegger, 1991)? And thus, in the second half of the last century, positions asserted themselves that increasingly eliminated the artefact, the material character of technology via sociology'.[10] Technology is examined with a view to its "social nature", and it is found in the "social relation" (Borries, 1980) mediated via technical construction or application or in the influence of the social context on the development of technology, whether it be cultural or social aspects, power, paradigmatic revolutions in science or models (Mambrey/Paetau/Tepper, 1995). Technology itself has been declared a "social process" (Weingart, 1989).

4.3 Actants

This is why deterministic approaches, whether they be technology or socially deterministic, are accused of attaining no adequate relation to complexity because they prioritise one side of the complex relationship between technology and society in a reductionist manner. And this is the point at which criticism in the nineties of the last century is levelled that calls for an appropriate consideration of the *materiality* of technology, arguing that technology is something omnipresent for society, a condition of sociality and the form that social processes assume. Given the much described and sociologically analysed fact that technology faces the human being as a power alien and incomprehensible to him, bearing the potential to control him instead of being controlled by him, (Weizenbaum, 1978), the artefact character of technology is once again given attention by sociology.

Bruno Latour's proposal to replace the distinction between technology and society with a concept providing for the integration of technical artifacts into a socio-technological web of actors and networks has not managed to rise beyond the status of an interesting albeit ultimately not convincing provocation. In his "Actor-Network" theory, human subjects are no longer faced by a non-human nature. Instead, everything happening in this network is based on action by *hybrid beings* that may either be human beings or machines.[11] Action collectives - Latour prefers to use this term rather than that of society – are defined by a web of so-called *actants*. Ultimately, however, the network concept for the description of concrete constellations between technical and social processes is overtaxed in a manner that no longer allows for the use of a concept of technology that can be used operationally (Belliger, 2006; Schulz-Schaeffer, 2000).

[10] Technology sociologist Rammert even fears that sociology could forget technology ("Technikvergessenheit") (Rammert, 1998b).

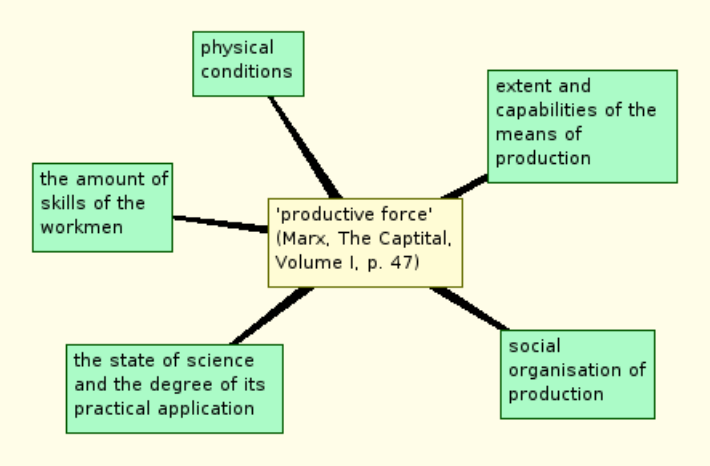
[11] Latour maintains that the entire macro-social order can be traced back to the integration of non-human actants – i.e. that it is mediated by technology. (cf. Latour, 1998, p. 62)

4.4 "Dead" labour dominating "living" labour

Marx regards technology or the machine system, as he usually puts it, as a *method* that may become manifest in different forms: in means of production and labour processes. A definition that is quite common nowadays and that, as it were, has assumed its modern terms in the distinction between hardware and software. However, the real point in Marx's concept of technology is not revealed before a further step of analysis is taken in which the property of technology is stressed that it is not only a means of change but in itself a result of labour processes. Only at this point is the sociological content of the Marxian concept of technology assumed.

In interaction with the other element of the production process, labour, technology is the element that introduces already crystallised (or dead) labour back into the living production process. It accomplishes this in the shape of material tools as well as organisational rules with which the complex interaction of the various elements of the production process is controlled. Marx summarises the multitude of these factors with the term "productive force". It is the productive forces – their level of development, availability, etc. – that determine the productiveness of labour.

> " This productiveness [of labour] is determined by various circumstances, amongst others, by the average amount of skill of the workmen, the state of science, and the degree of its practical application, the social organisation of production, the extent and capabilities of the means of production, and by physical conditions" (Marx, 1868, p. 47)



So the key distinction with which a sociological analysis of productive forces is performed by Marx is not so much the difference between material and non-material but processing (live) and sedimented (dead). This distinction is so crucial because it simultaneously contains a value-theoretical

implication. The theory of value, with the aid of which Marx seeks to provide the economic basis for his guiding criterion of distinction, that between *wage labour* and *capital*, which is crucial to his analysis of the social structure. Thus his aim is to demonstrate the mastery of *past labour* sedimented in money and capital over *living labour* that perpetually has to enter the production process anew and be valorised.

> "With the machine - and the mechanical atelier based on it, the mastery of past labour over living labour assumes not only social truth – expressed in the relationship between the capitalist and the worker – but also, as it were, technological truth"[12]

The way in which Marx now attempts to capture the complexity of the capitalist production process step by step via several levels of abstraction cannot be described in sufficient detail here.[13] However, what ought to be pointed out is that in conjunction with the value form, the Marxian concept of technology expresses a relational view of reality that can be attributed a remarkable degree of modernity. Rather than developing a static system of categories, his analysis circles around the relation between *use-value* and *value*. In this manner, he is able to regard technology as a sociological element without ignoring its artefactual character or eliminating the latter via sociology.

4.5 Cybernetics

Right from its inception in the middle of the past century, cybernetics has never left any doubt that the relation between society and technology, as well as that between society and nature, are central causes. The cybernetic view of things should by no means be related solely to technical but to all systems, including living and social systems (Wiener 1948). This highly tense relationship between nature, society and technology is already expressed in the titles of several classic cybernetic works[14] and is clearly reflected in the membership of the cybernetic Scientific Community. Right from the onset, overcoming the traditional division of scientific disciplines into the arts and natural sciences with the aid of a – highly abstract and therefore very precise – common language was simultaneously one of its self-declared goals and – what cannot be overlooked – its Achilles heel. Focusing its application on

[12](MEGA II,Vol. 3.6, as quoted in: Kurrer, 1990, p. 544, translation by the author)

[13]cf. the excellent account of the method applied by Marx in Zelený (1962)

[14]For example in Gregory Bateson "Mind and Nature. A Necassary Unity" (1979) or "Steps to an Ecology of Mind" (1972), Norbert Wiener "The Human Use of Human Beings [Cybernetics and Society]" (1954), or in Karl Steinbuch, who added the subtitle "Auf dem Weg zu einer kybernetischen Anthropologie" (steps towards a cybernetic anthropoly) to the fourth edition of his publication "Automat und Mensch", which was important for cybernetics in Germany.

control aspects could be the reason why technical application areas were predominant in its pioneering years and cybernetics earned a reputation of being a technical discipline. As a result, applying its principles to social phenomena was often misunderstood as a transfer of technical principles to non-technical concepts. However, what cannot be denied either is that this sign of weakness in its early years has to be put down to theory-immanent shortcomings that have only been tackled in the course of the neo-cybernetic debate (focusing in particular on second order cybernetics).

However, in my opinion, it cannot be denied that despite the claim outlined above, a sociologically satisfactory explanation of the relation between technology and society that could evade the snares set by the sociology of technology referred to above has not been given so far. Given the more recent development of "intelligent" information systems, this is a challenge that we yet have to take up.

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