# Internet and the flow of knowledge: Which ethical and political challenges will we face?

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## Introduction

The term "knowledge" is used more and more frequently for the diagnosis of societal change (as in "knowledge society"). According to Bell (1973), since the 1970s we have been experiencing the first phase of such a change towards a knowledge society, consisting of a rapid expansion of the academic system and a growth of investments in research and development in many countries. In this phase, as Castells (1996) points out, information technology has been rapidly changing the workplace as well as the composition of social organisations. In this first phase, the focus has been on scientific knowledge, its production and application in expert cultures. Since the Mid-1990s, however, this focus has been widening, such that one can speak of a second phase of the knowledge society (Drucker 1994a, 1994b; Stehr 1994; see also Knorr-Cetina 1998; Krohn 2001). Now it is no longer only scientific knowledge that is seen as driving the change, but also ordinary knowledge and practical knowledge, as know-how. The change is, as I would put it, autocatalytic, for typical of knowledge societies is "not the centrality of knowledge and information, but the application of such knowledge and information to knowledge generation and information processing/communication devices, in a cumulative feedback loop between innovation and the uses of innovation" (Castells 1996: 32). Science has also been changing to be part of this loop, as shown in the rise of applied sciences and in the acknowledgement of uncertainty and ignorance issues (cf. Heidenreich 2002: 4 ff.; see also Hubig 2000 and Böschen & Schulz-Schaeffer 2003). The most

significant change in this second phase however is the popularization of the Internet, that is seen as a key factor that governs societal change today.

So what exactly is this "knowledge" that is driving present knowledge societies? Can we rely on the philosophical analysis of the term to get some insight here? And, what are the ethical and political challenges that we had to face so far? The first section of this paper will be devoted to answering these questions. The second section looks at present transformations: Much is said about "Web 2.0" at the moment, the rise of a "social internet". In this section, we will therefore ask how knowledge is changing with these Web 2.0 developments, and which ethical and political challenges they are bringing about. In the third and final section, we will discuss how the internet, information and communication technologies in general might evolve, and try to sketch ethical and political challenges that we may have to face in the future.

In short, we will be looking at the flow of knowledge and how it may change as the internet continues to develop, and most importantly its resulting ethical and political challenges. Much of the following has been discussed in the past by other authors and much of it has also become common knowledge. The material here is presented in new frameworks. The first section redefines the concept of "knowledge" in an innovative way. The second section analyses the notion of "social" more closely than usual and combines the results with those of the first section. In the third part the analysis focuses on possible paths for evolution of the internet with respect to its effects on knowing-how, as opposed to conventional analysis which has focused on knowing-that (if it has focused on knowledge effects at all).

## 1. Knowledge

Philosophy has been trying to get a grasp of knowledge from its very beginning, and with immediate success. Has not Plato pointed out a definition of knowledge that remained valid ever since? According to this definition, knowledge is justified true belief. In fact, most contemporary philosophers seem to endorse this tripartite definition or a mild refinement of it as necessary and sufficient (see Steup 2006 for an overview). Some of these refinements state, following Gettier 1963, that at least one additional condition has to be met for knowledge. Others, following Sartwell 1992, want to drop the justification condition. This condition turned out to be most controversial; there is an ongoing debate about a notion of justification that is suitable for

the definition of knowledge (if any notion is).

Plato himself, however, did not subscribe to this definition (cf. the aporetic dialogue of *Theaitetos*, where he explores definitions of knowledge at great length). Through the centuries, there has always been criticism of this definition (cf. Ritter et al. 2004, 855-957). In the 20th century, a consensus was developing on the tripartite definition as aiming at knowledge only insofar as it can be expressed in the paradigmatic sentence: *S* knows that *p* (with *S* a subject and *p* a proposition).[2] The critics then argued that there is more to knowledge than just knowing-that, namely, that there is also knowing-how (S knows how to *f*, with *f* any action verb) and of knowing of objects (S knows *x*, with *x* any object) and that these forms of knowledge might be more fundamental.[3] It is also easy to see that we attribute knowledge not only to subjects but also to objects (*y* contains knowledge, with *y* any suitable object like a textbook or an electronic knowledge base). Both these criticisms are undermining the belief-condition. It was also in the 20th century that the value of the truth-condition became questionable: Following a coherence theory of truth, truth is grounded in justification, and thus not independent from it. Following a pragmatic theory of truth, it is grounded in knowing-how, undermining the tripartite definition that takes knowledge as knowing-that. So all in all, the tripartite definition is problematic: It seems to be too narrow to grasp all important aspects of knowledge.

Yet there is another philosophical tradition of defining knowledge established in the late 20th century, namely, defining knowledge as some kind of information (e.g. Dretske 1981). But it did not lead us to a clear, uncontroversial and inclusive definition, either. This can be seen from facts that properties that shall distinguish knowledge from (other) information vary from author to author, that properties ascribed to information vary from author to author as well (and some conceive information quite narrowly, like there being only true information, which then is highly contested, cf. note 2 of this paper for a possible reason for this), and finally, that some authors define knowledge in terms of information while others define information in terms of knowledge. So all in all, the use of "information" to define knowledge is problematic: It means simply to pass the buck to a more technical, less well known term that itself is in greater need of being explained than knowledge is (see Gottschalk-Mazouz 2006 for more on this topic).

Both the tripartite strategy and the information strategy of defining knowledge try to find out what knowledge "really is", but for our purpose it seems to be more interesting to find out what knowledge "is like", what it "can do", i.e. to look for features, not for (alleged) substances of knowledge. Given its shortcomings, it may well be that these substantialist definitions are failing

to grasp the most important aspects of the knowledge that is driving knowledge societies. While for inner-philosophical dispute it may have been productive to deliberately narrow the focus,[4] in an interdisciplinary discourse on knowledge societies, the same narrowing is unlikely to be productive. That is we should not simply stipulate philosophy's (or any other academic discipline's) definitions. We should rather at least try to meet the standard requirement of saving the phenomena (cf. Aristotle, *EN* 1145b2-7) with our definitions. To be able to do this, we have to show what the features of this knowledge are that makes it drive knowledge societies. One way of doing this is to look at contributions from key authors from Sociology, Economics, Psychology, Computer Science and Philosophy of Technology that led us to describe the current society as transforming into a knowledge society in the first place. More specifically, to look at those parts of their contributions to the knowledge society discourse where they try to define knowledge. Although these trials are far from convincing as definitions (as all of them are too loose, lopsided or in parts circular), they nevertheless underline important typical features of knowledge. In the following, seven typical features of such knowledge will be exposed.[5] These features are neither necessary nor sufficient for knowledge. But after browsing through 40-50 definitions, and seeing the features repeating themselves, I think that they are typical for the kind of knowledge that is at stake here.

'Knowledge' will thus be reconstructed as a complex concept (Komplexbegriff; see Gottschalk-Mazouz 2006: 25-27, similar to a so-called cluster concept in linguistics) that is comprised of these seven typical features. I see this as a prerequisite to the discussion of the aptness of any strict definition to sharpen the contours of the phenomenon "knowledge society" even further. So what does knowledge mean when we talk about "knowledge society" and related matters such as "knowledge management", "globalisation of knowledge" etc.? What are the typical features of such knowledge?

## F1 Knowledge has a practical aspect

Knowledge is valued because it helps to solve problems. This includes problems of orientation, evaluation and reflection. Thus, knowledge does not only consist in knowing objective facts. Moreover, due to its practical aspect, every chunk of knowledge is related to (practical) situations, not just one situation, but (typically) to situations of a similar kind, to (practically defined, broader or more specific) domains of knowledge.

## F2 Knowledge is person-bound or not

Knowledge comes in two forms; it is either person-bound (as naturally in psychology) or is not person-bound (though rather bound to or incorporated in objects). In other words, it is either personalised or (externally) represented. If knowledge is perceived as a good or a commodity, as it is in economics and elsewhere (see Toffler et al. 1994 for knowledge changing from being a public to being a private good), then this refers in large parts to represented knowledge (and to its practical use, of course, cf. F1). Representation is not constrained to knowledge of facts, but also to knowledge about possibilities, evaluations etc. To a certain extent, knowing-how can also be externally represented (e.g. in algorithms, recipes or in machines), and knowing of objects can be represented in paintings or novels. External representations can have the form of a text, picture or sound—anything that can be understood as carrying knowledge. The whole dynamics of knowledge production and use cannot be understood without incorporating both personalised and represented knowledge, and its interdependencies. The production of personalised knowledge requires represented knowledge (if it remained bound to person *x* then it would never reach person *y*), and production and use of represented knowledge requires personalised knowledge.

## F3 Knowledge has a normative structure

The normative fine structure of knowledge is at least two-fold: knowledge consists of recognised claims, i.e. claims that are not only recognised *as claims* ("knowledge candidates") but also as *successful* claims. With respect to F1, one can say that knowledge candidates are regarded as possible solutions to more or less given problems. The normative components of these claims can be further analysed, e.g. as consisting of normative commitments and entitlements which allows to reformulate some of the insights of the tripartite definition (see Brandom 1994, 200-203, for this).

## F4 Knowledge is internally networked

An entity taken as knowledge normally has an internal structure (i.e. its parts stand in certain relations to each other), and the whole entity stands

in certain relations to other (external) entities. I propose to conceive these relations as network-like. Learning also means integrating knowledge into already existing knowledge. This integration is happening in—explicit or implicit—processes of interpretation, justification, application and complementation (to name just a few). Thus, knowledge has an internal structure whose parts are typically regarded as knowledge themselves (but on a different level of knowledge formation). Knowledge typically does not consist of a single sentence or another single "atomic" representation. Typically, it has an internal structure that is not only syntactic or sentential, but it also has, for example, axiomatic, taxonomic or narrative structures. Metaphorically spoken knowledge is a net that allows to catch fish of a certain kind in a given environment (i.e. for cognition and problem solving in a certain domain).

## F5 Knowledge is externally networked

Knowledge has to be related to other knowledge if it is to count as knowledge. This has already been the case according to the tripartite definition; for a belief has to be justified by something else to count as knowledge. The justifier, however, is normally again justified or justifiable by something else, and all these justifications are very often possible in more than one way (quite rare there is "the" single reason for anything). So a holistic picture of the network character of knowledge appears: knowledge is networked with knowledge both internally (i.e. consisting of knowledge) and externally (i.e. supporting other knowledge as knowledge). The cut that singles out a chunk of knowledge seems somehow artificial then. It immediately follows that knowledge presupposes (other) knowledge in a way that we do not start with one single (and 100 percent certain) piece of knowledge and reconstruct our web of knowledge from there.

## F6 Knowledge is dynamic

Castells (1996) characterised knowledge as generating knowledge in a "cumulative feedback loop". In their best effort to reformulate the tripartite definition according to their needs, Nonaka and Takeuchi (1995) wrote that "knowledge is a dynamic human process of justifying personal belief toward the 'truth'." They explicitly added the notion of "dynamic" to such

definition while characterising it all in all as a process and not a state or a proposition. That knowledge is dynamic means that it is changing, and this change is not simply a growth, though be it a nonlinear one. Knowledge is acquired and disposed, is recognised, used/applied, sold and bought, written down, transferred, shared or kept secret, reformulated, etc. New knowledge can deflate old knowledge or make it more valuable. Knowledge can also be forgotten or disappear when unused for a long time. From time to time, there might also be larger conceptual changes (cf. Kuhn 1962 and Foucault 1966). Knowledge lives in time, so to say, but it also lives in space, as there are local cultures of knowledge on the one hand and a global circulation of (some) knowledge on the other hand, and interactions between these two.

## F7 Knowledge has institutional contexts

Institutions matter for knowledge generation, formation and distribution: This is evident from schools, universities, laboratories, libraries, archives etc. The acknowledgement of something as knowledge proceeds by "individual and institutional recognition", as Hubig (1997: 173) puts it: It is recognition by other institutions or, ultimately, individual recognition that lets a given institution be in charge or become obsolete. But nevertheless, knowing is no longer an individualistic enterprise (if it ever was). It is easy to see that in modern functionally differentiated societies, those who possess knowledge are no longer individuals or small groups, only. And that hardly any subject nowadays can acquire relevant knowledge alone. But vice versa, knowledge is also important for the maintenance of institutions, it fits to and supports certain institutions. Berger and Luckmann speak of knowledge as "sheltering canopies over the institutional order" 1966: 102). Therefore, knowledge is reigned by institutions but also stabilizes institutions (and the practices and power relations that come with them).

These seven features are the most important features of knowledge, at least of the kind of knowledge that drives (evolving) knowledge societies. Before we proceed, let us have a quick look at how the tripartite definition shows up in these features. The belief criterion is reflected in F2 ("person-bound") and in F7 (as individual recognition). The justification criterion is reflected in F5 (externally inferentially networked), and the truth criterion depending on your theory of truth in F1 (pragmatic), F5 (coherentist) or F2/F7 (constructivist). However, the components of the tripartite definitions are

clearly neither necessary nor sufficient conditions for knowledge, or at least not for the kind knowledge at stake here.

## 2. Present Internet challenges

From the very beginning of the knowledge society discourse, information technology has been seen as playing a major role as a catalyst of societal change. Nowadays, it is the internet in particular that is seen as playing this role. So what kind of knowledge is provided through the internet—and how might it be influenced by current and future technological change?

In the light of the features pointed out above, the kind of knowledge that is provided through the internet can be characterised as *representative* (because it is not person-bound) and consisting of *chunks* of knowledge *candidates* ("chunks" because it is typically scattered and comes in pieces that have to be compared and assembled, and "candidates" because it has to be recognised as knowledge on an individual basis as institutional recognition mechanisms are mostly absent). It is highly dynamic, pages are added and altered rather quickly and so are the page links, and thus the external networking structures change. To be able to understand, assess and productively use these representations, a significant level of skill and person-bound knowledge is necessary. The institutional and organisational background is also quite complex (you need at least a host, a published address, a provider, a phone/cable company and computer hardware, an operating system and a browser. All these things have to harmonize in a certain way if knowledge should be provided via "the internet".

We will now give an overview of ethical and political challenges of the kinds of knowledge flow that are made possible by the internet as it was known to us one or two years ago (Web 1.0), as we are experiencing it changing today (Web 2.0) and, in the next part of this paper, as we may experience it in the future (Web 3.0).

Challenges of Web 1.0 knowledge flow included a great deal of topics that have been already widely discussed elsewhere (cf. Langford 2000; Hamelink 2001), focusing on concerns over matters such as: Plurality of information sources, viewpoints, debunking; Access; Copyright; Privacy; Security; Free Speech/Censorship; Netiquette; Networking/Political organisation and action; Sabotage, "defacing"; Neutrality of net infrastructure (e.g. ICANN). With Web 2.0 (cf. O'Reilly 2005 for this term), however, the social dimension is becoming more important and flow patterns are changing according-

ly. We began to see a shift from single to common uses (Wiki, Blog, Rating), from static to fluid applications/Webservices instead of fix programs. While with Web 1.0 we typically had a one upload/multiple download pattern (left in Fig. 1), with Web 2.0 we are now experiencing live streaming, collaborative upload and automated partial download patterns (right in Fig. 1, top, middle and bottom, resp.).

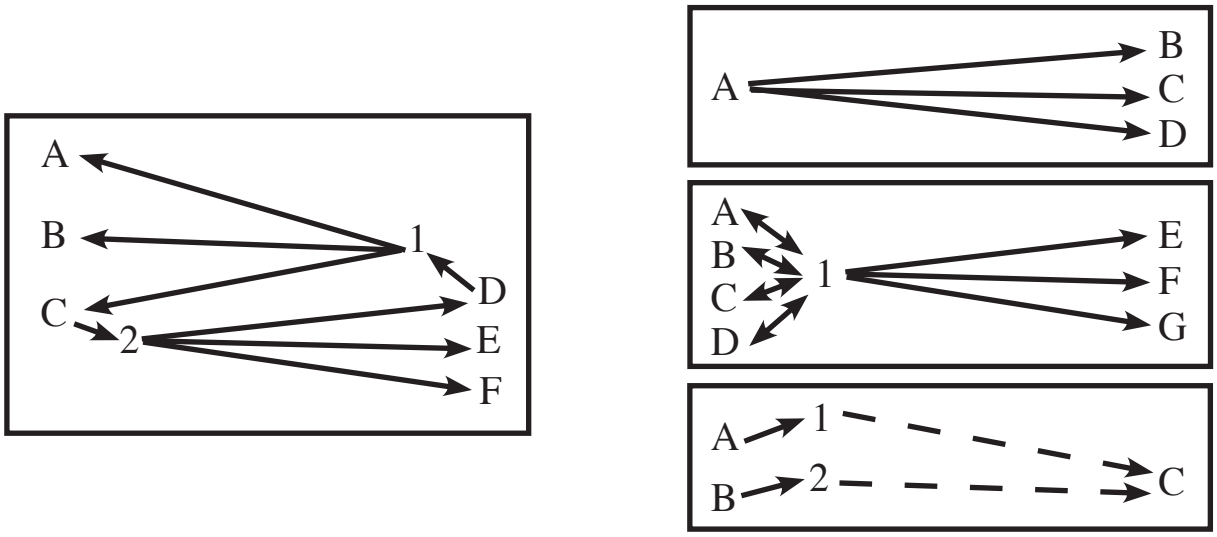


Fig.1: Knowledge flow patterns in Web 1.0 (left) and Web 2.0 (right). A, B, … are denoting users. 1, 2, … are denoting internet nodes. Explanations are given in the text.

For a closer analysis of these changes and their effects on knowledge flows, we need some terminology that allows us to characterise the commonalities and "the social" that is involved in Web 2.0. The concept of the social good can be used to accomplish this task. Two notions can be distinguished: (1) a social good that is affecting the social community, and (2) a social good that is affected by common action and/or affecting common action. Let us have a look at the latter where we find the *constitution*, *distribution* and *consumption* of these goods either as *substantial* or as *normative*. Persons constitute goods together either substantially (production) or normatively (evaluation), and if normatively than either driven by corresponding intentions (external goals; *poiesis*) or by mutual recognition (internal goals; *praxis*). Some goods can be constituted only together and only in a normative way (promenade, friendship, competition, contract, promise, we-intentions)—and dissoluted as well (contract, promise). Taylor calls these goods "irreducibly social goods" and argues that they "essentially incorporate common understandings of their value" (1997: 140). Sociality in the distribution of goods means

that persons distribute together—one gives while the other takes (1:1), also many-to-one, one-to-many and many-to-many (advanced peer-to-peer networks). Sociality in the consumption of goods is comprised of the substantial consumption (use and dissolution) as well as the normative dissolution (of valuations), again in two respects: poietic (e.g. "this brand isn't cool any longer") and practical (as a reciprocal cancellation of a contract, promise etc.). Of course there are also combinations, such as the identity gains by consumption (music, books, clothes, etc.) as an example for the normative constitution of a good by the substantial consumption/use of another.

These terminological distinctions can be combined with the aspects of knowledge as explained in part one in a topical (7x6) matrix:

| | | F1 practical aspect | F2 person-bound or not | F3 normative structure | F4 internally networked | F5 externally networked | F6 dynamic | F7 institutional contexts |
|---|---|---|---|---|---|---|---|---|
| substantial | constitution S1 | | | | | | | |
| | distribution S2 | | | | | | | |
| | consumption S3 | | | | | | | |
| normative | constitution S4 | | | | | | | |
| | distribution S5 | | | | | | | |
| | consumption S6 | | | | | | | |

Fig.2: Web 2.0 knowledge flow analysis matrix: Knowledge features F versus sociality dimensions S.

This matrix makes it possible to ask a bundle of precise questions that cover the field of Web 2.0 knowledge flows. These questions are of the following form: "How are changes in S*x* related to changes in F*y*?" Two examples may illustrate this. Take the matrix field (1,1) first, where we hence want to know "How are changes in the substantial constitution of knowledge relate to changes of the practical aspects of knowledge?" The answer is that there is a broader scope of (sometimes quite trivial) practices addressed (how-tos, recipes, after-buy experiences, "Lebensberatung", etc.), that many many persons are in a position to contribute, and that finally an explosion of pro-

duction of everyday-knowledge (loosely structured boards, more rigidly structured Wikis, …) results. The second example is (2,7): "How are changes in the substantial distribution of knowledge related to changes in the institutional/organisational contexts of knowledge?". The answer is that these changes are juridical (e.g. copyright- and patent-law), economic (changing user fees/flatrates), organisational (broadband, networked (home) servers), that distribution patterns change (circulation of source code, download and upload of audio/video content, filesharing, plagiarism), and that applications and content change incrementally, automatically and with open-end, leading to a "perpetual beta" of software (cf. O'Reilly 2005) *and knowledge*. The best illustration for this may be the Wikipedia. —Of course, these answers have to be figured out more in detail. By working through the whole bundle of matrix questions, however, the various aspects of the problem that are already addressed in the literature (c.f. Quigley 2007) can be organised and checked for blind spots.

Cross-cutting topics that attracted recent attention—ignorance/non-knowledge and social exclusion in particular—can also be addressed within the framework of the above matrix. The former can be understood as indicating "defects" of some feature of F*x* (e.g. F5: Missing justification) in the presence of other features that are attributable. The latter can, in general, be seen as multiple involuntary social uncoupling (education, work, health, politics). In a knowledge society, this consists in being not involved in many matrix field activities at once ("patterns of exclusion"; identifying these may help to develop strategies for inclusion as well).

## 3. Future internet challenges

When speculating about the future of the internet, two visions are constantly referred to: Semantic Web and Ubiquitous Computing. The former means to provide ontological metadata, such that men and machine can get rid of synonymies and use knowledge in a more productive fashion (see Herman 2007). The latter means an infrastructure that contains standardised IT elements with ad-hoc node updating, such that the virtual-real and online-offline distinctions vanish in a so-called "augmented reality" or better yet in "augmented actuality"[6]. To establish an augmented actuality by facilitating human action was *the* core objective of ubiquitous computing:

Inspired by the social scientists, philosophers, and anthropologists at PARC, we have

been trying to take a radical look at what computing and networking ought to be like. We believe that people live through their practices and tacit knowledge so that the most powerful things are those that are effectively invisible in use. This is a challenge that affects all of computer science. Our preliminary approach: Activate the world. Provide hundreds of wireless computing devices per person per office (…) This has required new work in operating systems, user interfaces, networks, wireless, displays, and many other areas. We call our work "ubiquitous computing". This is different from PDA's, dynabooks, or information at your fingertips. It is invisible, everywhere computing that does not live on a personal device of any sort, but is in the woodwork everywhere. (Weiser 1996).

In fact, this infrastructure seems to be about to develop. You find Linux driving a supercomputer, a laptop, a handy or a (wrist) watch. Your TV, fridge or car might also be running on Linux. What's more is that microprocessors and components are also becoming more and more standardized (Intel, ARM, PPC, MIPS etc.).

The impact of these two visions for the flow of knowledge are classically seen in the domain of symbolically represented, explicit knowing-that. For the Semantic Web, this seems to be evident because the whole idea is to attach explicit ontological categories to each entry. For Ubiquitous Computing, this is less evident, I think. Nevertheless, the focus has been on knowing-that effects (privacy etc.), and on identity effects (Heesen et al. 2005; IRIE 2007). But there is also a direct impact on action (knowing-how, implicit), and this is my main point here: The (social) constitution, distribution and consumption of *knowing-how* may become possible now, because in addition to software (and this means: algorithms) also firmware, training data, learned patterns, etc. can be shared, parts of the infrastructure can dynamically and cooperatively be updated, reprogrammed or deactivated. The rest of this text elaborates on what this means to us and ask for the corresponding ethical and political challenges.

The difference in focus can be explained with respect to the action cycle: 1. aiming, 2. executing, 3. evaluating (goal reached?), and then starting to aim again. We (and our things) are more and more relying on network assistance in (1, 2, 3), as the things get more responsive, in a broad sense of this word, and we get more responsive to them. We form men-machine-systems of cognition and action, then. According to the classical analysis, Web 3.0 affects (1) and (3): Things will let us know, provide us with knowledge about possible aims and suitable means; things will talk to each other but finally to us; we will live in information-enhanced environments; we will be able to search in real space (Google Maps/Earth). According to the complementary

analysis proposed here, maybe even greater challenges affect (2). Our means of action are directly at stake. As things talk to things (other people's things), they facilitate the surveillance of our actions, and as their talking changes the behaviour of the things, they facilitate the surveillance of our actions such that they might function otherwise or not any more (functions include, but are not limited to, data transfer).

The list of ethical and political challenges according to the classical analysis is long enough (see Heesen et al. 2005 or Greenfield 2006 for an overview). It comprises RFID tagging (attaching short range wireless unique identifier and data storage) allowing for the surveillance of trajectories of small things (and of their owners…), audiovisual recognition allowing for the logging and storing of data on real and virtual operations and moves, the storage of this data for an indefinite time, the combination of this huge amount of data (data mining) and the combination of this "flow data" with static data (registers, knowledge bases, harvested WWW information—a semantic web would be very useful for this). Thus, the main challenge according to the classical analysis is privacy, broadly construed ("it's all about knowing-that").

According to the complementary analysis proposed here, there are even more ethical/political challenges to be considered. Not only the *surveillance* of real and virtual moves, but also the *control* of these moves (functionings), leading to a direct control of action (not only by law or incentives). As soon as these functionings are compromised, we are deprived of knowing-how, we simply cannot do certain things anymore. Political/subversive action thus becomes important, and an example of this is hacking functions/firmware versus control and DRM ("digital restrictions management", as some cynics say). The struggle will be more about what you *can do*, not what you *know* or what you are *allowed* to do, and thus about power in the classical sense as conceivable as control over means (cf. Weber 1980: 28). It will be about an infrastructure design according to norms/values (where privacy is respected or disrespected by design, where control might be built in, where the infrastructure design itself might be intransparent and exclusive).

A shift in control over means might also induce conceptual changes by mediality effects (Hubig 2006: 183 ff.; 229 ff.): Our self-experience is mediated through our (more and more technically enhanced) grip on the world, and our self-understanding is more and more governed by technological analogies. These shifts may lead to a redefinition of the actor-means distinction and of concepts of identity and personhood. Many young people have no problem to publish even very personal things in the internet. Many customers willingly give away the data on customer behaviour for free or for

minor bonuses. This indicates that the concepts of personhood and privacy might be changing, that are central to western culture, but that are quite differently perceived in other cultures anyway (Nakada and Tamura 2005; see also Hongladarom and Ess 2006). It seems to me that for various reasons (security related, business related, cultural, etc.) mutual surveillance is becoming more and more accepted. Will mutual control become accepted as well? However it will be,[7] in the confusing struggles over control, personal or mutual trust will be more important than (unenforceable and inadequately simple) rules or oughts, such that virtue ethics might be an adequate framework if one wanted to analyse this point more in depth.

In summing up, the Web 3.0 scenario may ultimately look like this: We will be experiencing smarter, adaptive, responsive, but less robust and less versatile things (because they are programmed to a certain extent). We will have a Semantic web that makes smart things smarter (and the automatic surveillance and control or their use more effective). We will also encounter artificial agents: programs or machines that act in the name of an individual (or organisation) with legally binding consequences (but unclear accountability) and effects on competitive advantage (raising fairness issues). First signs of this are experienced today, such as when you are placing an eBay bid today, you are competing with humans directly, but also with eBay's bidding agents and with eBay snipers—but this is only software. We will experience the propagation of candidates of what is traditionally referred to as know-how, but in this case embodied in machines. It will to a certain extent be possible to share different firmware modules, training data etc. of our "smart things" that support our actions. It will depend on individual and institutional recognition whether what is provided by these machines and their algorithms counts as know-how, and whether it is regarded as useful, annoying or dangerous.

The trends in controlling *knowing-that* and *knowing-how* seem to follow a similar logic. In the name of anti-terror warfare, some people not only want to know what you are knowing but also what you are doing and plan to do. It may even be communicated to us all that they want to know all this. This may lead to large scale action reporting and surveillance. But, moreover, the same people also want to be able to intercept your actions and to force other actions. This may lead to large scale action that will result in further control. The technical infrastructure that we are about to establish will in principal allow for all this to happen.

These options are very attractive to both the "good guys" and the "bad guys": Federal agencies, police etc. on the one hand and organized crime, terrorists etc. on the other. The most successful strategies, however, will not

necessarily be high-tech. As soon as one side is relying on the new digital options, the other side might try to establish analogue counter-cultures. In the long run however, these options may very well become more radical over time, for mainstream technologies may converge towards NBIC (Nano-Bio-Information-Cognitive Technology). This would lead to opportunities for fine-scale surveillance and control of even more (biophysical) processes: An analysis of the formation of a "biopower" (cf. Foucault 1974) and that of a "technopower" sketched above may have to be combined accordingly then if one still wants to be able to analyse the political and ethical challenges of knowledge flows in the internet age.

## Endnotes

[1] The first part of this paper draws on work that was presented in Munich, Berlin and Bayreuth. It has been published in an extended version in German elsewhere (Gottschalk-Mazouz 2007). The second part was also presented in Bayreuth and was previously unpublished. Some ideas of the third part were presented in Stuttgart, where I have learned a lot about Ubiquitous Computing while I participated in preparing the Stuttgart Collaborative Research Centre SFB 627 in 2003, and also thereafter from the people working in this centre and their publications (see http://www.nexus.uni-stuttgart.de). I am currently elaborating this part for a German anthology on electronic surveillance (Gottschalk-Mazouz, to be published). I want to thank the various audiences as well as the Kirchberg audience for their helpful remarks. My special thanks go to Nadia Mazouz for intense discussions on how a philosopher should deal with an interdisciplinary subject like this. The views expressed here and any remaining errors and flaws should nevertheless be attributed to myself.

[2] For "information", there is no such model sentence. This may be one reason why ordinary language intuitions apparently do not converge on, say, the question of a truth presupposition of information.

[3] See Ryle (1949) and Russell (1929) for these types of knowing, while for the priority of knowing-how to knowing-that credits are frequently given to Wittgenstein and his remarks on Rule-Following (see *PI* 185-243).

[4] Personally, I do not think so, so I followed the analytic discussion to some of their dead ends and tried to reconstruct a broader, process view of knowledge from the writings of Plato, Aristotle and Brandom in my Habilitation (Gottschalk-Mazouz 2006).

[5] They were extracted from the literature elsewhere (Gottschalk-Mazouz 2006). The quotes used there stem either from key writings frequently given reference to, from textbooks or from leaders in their disciplinary scientific field (be it on a national or international scale).

[6] I prefer "virtual actuality" here because there will be changes in the domain of action as well.The term is borrowed from Hubig 2007 who uses it to distinguish reality (all that is the case) from actuality ("Wirklichkeit" as all that we experience) reintroducing the latin realitas/actualitas distinction to the virtuality debate.

[7] In Gottschalk-Mazouz (to be published) it is argued for a positive answer.

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