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Gendered Views on the Ethics of Computer Professionals

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Abstract:

The paper discusses moral problems created by information technology and its producers. It furthermore deals with ethical issues used within the computer professions to deal with these problems. The title refers to both problematical gendered views within the computer professions (including their discussions of responsibility and computer ethics) and possible ethical views of gender studies onto computing. While the paper criticises common attitudes within the computer professions and the working cultures in which they develop, altered perspectives for responsible technological action may be derived from (feminist) situational, welfare-based, close-range ethics or micro-ethics.

Within a field like IT, where technology assessment and projections into the future are difficult, where the consequences of artefacts can mostly only be validated ex post, which is notorious for its ambivalences, complexity is obscuring and responsibility is distributed, it is necessary to find ethical attitudes within professional epistemology, habitus and working cultures. These strongly influence the processes of decision making, early research and developmental phases. I will therefore focus on frequent attitudes of computer professionals and the working cultures in which these are developed, in order to lead to different views via micro-ethics. Thereby it seems to be necessary to redirect our view from considering ethical questions from the "after" of the usage of existing technologies to the "in advance" of and "during" the development of IT artefacts.

Feminist ethics claim to be able to see and treat issues of power and the welfare of those affected more effectively, due to the epistemic privilege of being excluded from the mainstream. They relativize universalistic ethical claims in favour of situational, subjective, contingent moral points of view in view of the complexity of the artefacts created by software, and they are concerned with everyday ethical issues – in addition to or instead of great moral questions. Feminist moral arguments (see e.g. Gilligan, Ben Habib) are focused more on personal closeness to others, are more affective and define themselves via responsibility for women's personal spheres, leading to an ethics of care. This is opposed to and asks for addition to ethics of universal moral principles and concepts of rights and fairness, which claim to treat all individuals equally by postulating generally applicable rules and universally valid obligations.

Feminist ethics attempt to avoid hierarchizing ideologies in general (gender is one example, along with others such as culture, ethnicity, social class, age, etc.), operating on both an analytical and a constructive level. Gender studies in science and technology explain why and how situated knowledge (Haraway), the views of

individuals “doing science and technology” influence the projection of societal prejudices and relations onto technology. In technical artefacts thereby co-constructed social orders (Faulkner) are mediated and consolidated inducing a reifying and self-strengthening effect. Consequently, the quality of technology research and development can be measured from a gender perspective in terms of which values are represented within it, whether these values are self-reflected and self-critically oriented, making its own presuppositions, models and reductions of complexity in the technological product transparent or not.
Concerning the IT developments feminist ethics calls for research and development which concentrates on the desirable and useful instead of on the “feasible”, in a world in which the majority of humankind is refused the most elementary basic needs.

1. Morally problematic attitudes within the Computer Professions

Trying to find approaches to a morally more sensitive IT-development, it is necessary to observe the influences inducing problematic properties of IT, like e.g.: software-supported organisational and working processes are partly emptied from ethical concerns by the delegation of decisions to software; the language and metaphors used in IT are levelling the differentiation between the human and the machine, and lending machines the status of subjects, while simultaneously making humans into objects; user interfaces, in spite of scientific knowledge about usability, are poorly designed; safety and security of software, contrary to better knowledge, is not respected. In the following it is tried to pin down some of the causes:
In cases when the attitudes described in this paper are common within computer culture, the Open Source community and the working cultures of information technology, they can influence the quality of the products of information technology, prompting ethical problems. These attitudes and positions, which are not to be understood as general attributions but rather as existing standpoints, include:

- The moral assumption of the neutrality of science and information technology, not recognising the active redistribution of resources, re-evaluations and alterations set in train by technological development itself.
- A determinist view of one’s own work originating from the “one best way” thinking of engineers. In mechanical engineering, for example, this may appear to be based on good reasons due to the constraints of material and task. However, this view is entirely out of place in information technology, with its diversified tasks using uniform material and universal means of formalisation. The metaphor of technical evolution favours the idea that the development of the discipline and the technology itself is deterministic, pre-ordained and beyond influence. This leads to the absurd situation in which the very individuals who are currently changing the world in an active and extremely far-reaching way believe that they themselves have no influence on these changes. These individuals’ attitude fails to appreciate their own creative power, which can be infinitely variable in software development in particular, as there are many decisions behind every model, every draft design, every program line of code and therefore many possibilities of doing things differently, even if developers are frequently unaware of them. Once a decision has been made, all alternative possibilities are ruled out and the technology cements later usability within the software.

- A purely formalistic view of the skills required in the computer professions, neglecting the fact established by TA studies that 3/4 of computer scientists' work consists of communication within the team and with clients and customers and translating between formal and non-formal language.
- An unbalanced (economic) liberal and business-oriented attitude, which is all the more problematic in that technological creation and development does not take place within a democratic process and rarely has social-ecological objectives in mind, but pursues profit, market and power-based interests[1]. In the academic world, this corresponds to a feasibility-centred attitude which asks only what can be automated and not whether this is also socially/ecologically/ethically desirable.
- A position which makes it more difficult for women to participate in technical skills, or more precisely in technical skills displayed via habitus, without denying them their femininity.

Such attitudes towards work influence the professionalization of computer science, the definitions of professionalism and professional deficits, and all this is closely linked with moral-ethical attitudes. These positions neglect inequalities of power such as the effects of the "digital divide", the power of the new elites (computer specialists) or shifts of power within information-supported organisations and working institutions such as have been shown in the hospital sector, for example (Wagner 1989). They also neglect the increasingly far-reaching areas of de-ethicisation of software-supported organisational and working processes, when decisions are delegated to software, transferring ethical issues to the behaviour of the software developers. Software developers often are less morally sensitised than the users themselves and are often unable to estimate and influence the moral reach of their work due to the distribution of development tasks.

Among the e**thical issues to be dealt with** are:
The de-ethicisation and transformation of knowledge and information is significant not least as new knowledge orders (Spinner 1994) are established in the net, and ontologies and automated knowledge management prescribe contingent selection and viewing of knowledge.
The redistribution of power in favour of increasingly autonomous technology and the more difficult assignation of responsibility by this technology are generally demonstrated by the reduction of options for choice, the very opposite of which Heinz v. Förster morally demanded: "Always increase the number of choices!".
Conversely, for computer scientists the dilemma arises that they must assume responsibility from the very start, which calls for increased prospective skills, and that this responsibility is more difficult to assign individually or to bear in divided form, due to the extreme division of labour. This paper deals with the ways in which subjects can find ethical orientation, with the aid of a combination of maxims of similar working attitudes (implying to an equal extent the intentionality of actions and the, albeit limited, foresight of consequences), willingness for discussion and situational answers (recognising the absolutely limited nature of human freedom and autonomy), despite these problems of the profession which obscure clear moral answers.

[1] Even the Open Source movement, which does not pursue market interests, works on the basis of a business model rather than on a democratic model, for example.

In the following some morally relevant empirical findings are discussed, influencing working cultures and habitus: the forms of exclusion of women and of certain subjects, like "computer and society" from the profession.

2. Findings: Inclusions vs. Exclusions

Professionalisation

The exclusions (e.g. of women and certain ethnicities) made by the professionalisation of computer science are morally and ethically relevant. Max Weber described "profession" as a rational, purposeful and targeted activity based on justified rules, which also contains an ethical obligation ("professional ethics"). Professionalisation is regarded as a strategy for social exclusion (Weber 1904) defining itself via skills and abilities gained through specific (academic) training and providing access to the relevant opportunities for paid employment, responsibilities, precision and solution of tasks and social positions. Professions are in competition with one another (Abbott 1988) and differentiate between their responsibilities, contending with one another for the monopolisation of labour. The development of knowledge plays a central role in this process, as an exclusive basis of knowledge forms the foundation of professional power. This knowledge consists of two elements; firstly, academically gained knowledge (knowledge of problem solution and interpretation), which must, however, be generated with regard to practical use in order to achieve recognition. The second element is professional or experience-based knowledge, including cognitive and normative rules for practising the profession (Daheim 1992). If we consider the classical features of professions – professional ethics, specialised knowledge, monopoly, autonomy and self-regulation – these can only be applied to computer science to a limited extent. A professional ethos for computer science does exist in written form in the ethical guidelines of the GI[2] or in the "Codes of Ethics" devised by the ACM, however these appear not to be very well known among those active in professional practice[3]. This does not, of course, imply that there is no extensively shared working ethos or a diversified ethos according to the individual working or company culture ("moral order") in computer science or software development. The monopolisation of knowledge produced by the profession itself is a particular problem for computer science. Although specialised knowledge of computer science does exist, appropriate training in computer science is by no means a prerequisite in all areas, for example for jobs in software development. The high number of individuals entering the profession from different educational backgrounds shows that even and especially theoretical computer science is not regarded as necessary as a candidate for stabilising the discipline in practice, because labour market pressure forces companies to take on non-professional staff. Neither does a mutual specialised language exist. Firstly, the anthropomorphising and acronym-rich language of "computer culture" is used, which certainly has an excluding effect for non-computer fans. Secondly, computer science as an academic discipline has developed its own language, which is inaccessible to a certain extent for non-professionals, but is not a standardised language and nomenclature with well founded and clearly defined terms (Schinzel/Knecht 1998).

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[2] Vgl. www.gi-ev.de

[3] In a survey carried out for our project "New Professional Potentials for Women in Software Development", none of the software developers questioned was aware of the GI's ethical guidelines.

Due to the large percentage of individuals entering the profession from different educational backgrounds, it is also impossible to refer to a monopoly of services by computer scientists. Differences do exist between the various working areas of computer specialists in this area. The more complex and abstract a task area is, the higher the percentage of trained computer scientists active within it (Hartmann 1995). However, the majority of computer specialists is still employed in applications with a low percentage of trained computer scientists (IESE/ISI 2000). Skills deficits in these areas on the part of computer scientists and deficits in their ability to acquire sufficient knowledge of the applications mean that employers frequently prefer to provide their own staff with additional training in programming skills. This development means that we cannot refer to an independent professional field for computer scientists. In the late 1990s, only approx. 20% of computer specialists had appropriate training (Dostal 1996). This limited professional autonomy necessitates computer science to reflect on how it sees itself and how to adapt in part to the upcoming problems, for example web development and data integration, and how to react to demands for practical orientation in computer science education and training.

As part of the project "Professionalization of Informatics" PROFI in Germany (sponsored by the Deutsche Forschungsgemeinschaft), we carried out interviews surveying the professionalization of the experts who influence computer science in various subjects and directions. In the course of this research, we observed a strong divergence between scientific development, particularly at universities and to a lesser extent at technical colleges, and the demands in the working world. It is the choice of intellectual and economic investments in research and teaching which is ethically relevant in this context. The research sector is constantly opening up new intellectual and technological fields, for which the socio-economical significance, public demand and projections into the future sometimes range from unclear to questionable, but refuses to a certain extent to invest scientific effort and funds in acute problems arising from current developments. On the other hand, software development is increasingly transforming into a service profession with broadly extended requirements. However, service is customer-oriented, consisting not only of reacting to technical demands or deficits but also of linguistic translation abilities into formal language and mediating formal content, presentation and communicative and emotional work, without which formal skills, although naturally very important for reasons of quality, are worthless.

Computer Science and Society

The majority of experts we interviewed sees the societal perspective – which they do take seriously – for the inclusion of a societal and ethical orientation within the academic subject of computer science in particular in the consequences of the use of information technologies in society, consequences they regard as unforeseeable and unpredictable. The experts in the engineering subjects describe the responsibilities for consequences as unassignable and therefore also not accessible for the application of ethics. However, they see the responsibility of large corporations for future developments as distinct from this aspect. One expert with a critical attitude to society regards it as imperative to reflect on technical feasibility and to integrate technology assessment concerning the acceptance of technological products into the subject. According to Coy (1996), such integration should be undertaken particularly within the discipline of "Computer Science and Society". Coy regards discussion of the interaction of computer science and its various fields of application as key, and considers this could continue to "lead to the integration

of societal questions and interaction into technological development, particularly in the early phases of this development as a practical example of integrated technology assessment and evaluation". The varied components of this subject with an ethical element can prepare students more effectively for the current demands of the professions and help them to find their own identity within these professions. However, most of the experts we interviewed regard computer science and/or software production as an actor from a more unidirectional perspective. Society is seen as a field of application rather than as a participating actor or as a diversified unity of actors.

Integration of Women

The PROFI project posed itself the question: which lines of development of German computer science would make the integration of a larger proportion of women more likely? Theses drawn from literature (Erb 1996) could argue for a mathematical-theoretical or in contrast for a "sense"-oriented, i.e. societally reflected and/or application-related location of women. Women are, after all, over-proportionately represented in critical professional organisations such as FIfF, and in older studies (Schinzel 1991) women's interest in theory was stronger than that of men. Mengel-Belabbes (1998), however, observes that female labour is not formed on the basis of content aspects in computer science as elsewhere, but is derived from the gender hierarchy, i.e. women are forced into less influential, respected and well paid niches or locate themselves there. The above orientations such as the business aversion of theory could certainly be interpreted in this way, and the increased localisation of women in software development in Germany in the unproductive areas (e.g. quality management) also argues in favour of this view. According to the companies we spoke to, all doors are open to women in software development and in fact, many women do work for large companies, in particular, those which run programmes for managing diversity or childcare. However, they are frequently employed in the unpopular, although increasingly important areas of project management (Berndes 2002) and quality management (Conrad 1998), which is necessary for certification in accordance with ISO 9000. The reasons for this allocation of women to such specific areas are linked with the differing organisational cultures of the software companies, but they are also related to the attitudes, interests, stereotypes and role models produced and reproduced in everyday interaction between the members of the software companies (see Wetterer 2002). For example, in our interviews related to the professional motivation of software developers we observed that the software developers' interests were more on the level of conceptional and "technical" development, in the "translation" of customers' problems into perfect software solutions, which some experienced as fascinating and others as an obligation. The implementation of the implicit pre-understanding and analytical and systematic procedures are seen as the "core of success" in practice. The women we interviewed find performing this "translation work" in such a way as the customers really get what they want a decisive factor, i.e. it is perfectly normal to consult them; it is less a case of implementing their own ideas than of developing suitable software jointly with the customer.

Regarding the approach to work and the professional self-image of software developers, we established that both male and female software developers see men as the "doers", as more career-oriented and with a playful approach, while women are seen as working in a more structured and methodical way. The men's and women's self-perceptions and those of each other all agree on this point. These

self-images and "outside perceptions" also correspond to the expectations of the personnel managers, who refer to women as "more structured, more organised and more methodical" and as "more socially competent", making them "particularly suited" for tasks in project management (cf. also Endres 2003), an area linked with moderating, administrative and management activities.

Such gendering of activities is also interesting in the context of the industry's self-image as part of the service sector. As B. Stiegler (1994) observes, it is characteristic of the use of social skills in the service sector that these skills go unrewarded. They "are still considered to be achieved in the process of socialisation or through family and housework, are regarded as a component of the 'female labour ability' and therefore do not need to be produced, supported or further developed by targeted, structured learning processes"[4]. Instead of being regarded as objectivizable and thus learnable abilities, they are pushed into the area of individuality. This emphasises the importance of the individual (personality and character) and his/her individual characteristics for the influence on the software team that he/she is to manage.

The stereotypical process of classification men = technical, women = social, corresponds with the division between or the unilateral views of product and/or process orientation in software development. For the latter orientation, coordination and cooperation aspects play the most significant role (Floyd and Züllighoven 1997). As mentioned above, this division also influences ethical orientations; whether these are only posed in retrospect as great moral questions of the use of finished products, on which developers' own influence is seen as marginal, or whether moral questions are posed throughout the process, whether this may be influenced by working cultures and attitudes, and which moral-ethical space opens up for the agents of the development.

Unfortunately, the correspondence between gender-specific stereotyping, division of product and process orientation in software development and also, linked with this factor, macro-ethical and micro-ethical orientation is manifested by the participants taking these aspects on in their habitus. Such manifestation of stereotypes in habitus simplifies their naturalisation (Bourdieu 1997); socio-communicative skills are then seen as "naturally" feminine and correspondingly, female employees can be found in activities where they can make use of their alleged "natural resources". Moreover, according to Kanter (1978), individuals with minority status (tokens) are stereotyped more easily, because they are ascribed an exceptional role due to the lack of group affiliation, i.e. women in the minority situation as software developers easily become "objects of stereotyping" or the target of gender-stereotyped ideas within the group[5]. For these tokens on the other hand, it is much more likely that they will adapt to existing stereotypes and behave "as expected", as this is the simplest way to avoid conflicts.
The existing ambivalences in habitus for women (Janshen-Rudolph 1987) are also clearly shown in our interview subjects. In a clearly derogatory undertone, one of our interviewed personnel managers describes women working in areas ascribed to men as "masculine" and "unfeminine". However, the female software developers

[4] Stiegler Barbara (1994): „Berufe brauchen kein Geschlecht : zur Aufwertung sozialer Kompetenzen in Dienstleistungsberufen" - [Electronic ed.]. - Bonn, 1994. Electronic ed.: Bonn: FES Library, 1999; http://www.fes.de/fulltext/asfo/00545004.htm#LOCE9E5

[5] On the possibility of a balanced group structure, Janshen and Rudolph comment: *"people (...)anchored in a proportional group of at least 15% (develop) 'normal' group behaviour displaying solidarity towards each other."*(Janshen/Rudolph, 1987).

interviewed also incorporated these ambivalences with regards to technology, each in a similar way. Supported by a confused concept of technology (Erb 1996) and related unclear ideas of what is "technical" and what not, the female computer scientists we interviewed distance their own activities from technical activities and express discrepancies between their self-definition and the outside perception approximately as follows: "…I find my profession relatively non-technical …If I had to explain my profession, I would talk about technology fairly much." Earlier studies have shown that women have to cope with ambivalent self-convictions when they are employed in male-dominated professions, as the dominating image in such professions cannot be harmonised with the traditional image of women or the gender-specific role expectations in these contexts (Janshen and Rudolph 1987, Kosuch 1994). Demands on the feminine and professional roles are contradictory and can therefore only be coped with in a permanent balancing act, or appear from the outside as double non-fulfilment within a framework of "habitus ambivalence", against which women in such situations develop differing strategies (Janshen & Rudolph 1987; Teubner 1989; Berg-Peer 1981, Kanter 1977).
The personnel managers see the lack of female job applicants as the cause for the low presence of women in the companies we examined. At a second glance, women have to contend against societal prejudice, have to be persistent and focus on their career, regardless of any family plans they might have. Family works as the greatest handicap for women in making real career progress in software development. Parental leave or part time work, often favoured by women, and the resulting lack of time for further training, go against the professional culture of software development. The symbolic importance of the time-consuming and intensive profession (cf. Pongratz & Voß 2003) thus takes direct effect in this context, as a differentiating element for distinguishing suitability or non-suitability in favour of men. In the context of the "new basic forms of working" accepted as the norm, which require staff to adapt to constantly changing demands, to be available around the clock and practise self-exploitation as their individual fates (cf. Baukrowitz and Boes 2000), the current credo of flexibility in the IT industry, particularly in small software companies, reveals itself as a mask for differentiation and exclusion processes developing with regard to employees' gender, age, skills and life situation (Schinzel & Ruiz Ben 2004). Acker (2002) comes to the conclusion: "with the new economy, which allows a number of women to enter its ranks, a new hegemonic image of masculinity is developed overall, just as male dominance effectively exists in the areas of information technologies, computers and finance".

3. Gender Studies in Technology and Feminist Ethics

Gender studies in science and technology has revealed the backgrounds of the ideal of objectivity, the separation of subject and object as an instrument for defining hierarchies between nature an culture, body and mind, female and male, etc (e.g. Harding 1996). They attempt to avoid hierarchising ideologies in general (gender is one example, along with others such as ethnicity, social class, age, etc.) in these disciplines, operating on both an analytical and a constructive level. For example, in the field of construction processes for research in science and technology, gender research has shown that such presuppositions present during the choice of subject and formulation of the research / development question are worked into the practical aspects of data collection and processing, as well as into argumentations, conclusions and hypotheses, into scientific knowledge and technical artefacts. Studies have established that these research procedures appear simultaneously uninfluenced by personal interests and views circulating within society (e.g. Palm 2004). In the natural sciences, this process reifies and naturalises

societal relations, as has been shown by many examples from the field of biology, for example. In technical artefacts, the co-constructed social orders (Faulkner 2004) are consolidated and have a reifying and self-strengthening effect when mediated in this form. Gender studies in general attempt to confront dichotomous gender orders by de-essentialising differentiations of behaviour, skills and achievements, i.e. by questioning and deconstructing such assumptions[6]. The same principle is applied to scientific and technical research findings, as the former harbour the risk of naturalising habitual sex/gender differences and the latter mould them into a concrete technical form. Gender research examines empirically confirmed sex/gender differences in the sectors of cognition and habitus for signs of contingent production, for example for differing conditions of socialisation. Using the framework of 'constructive realism', Berszinski et al. (2002) understand 'Geschlecht' (sex/gender) as a socio-cultural construction that is reified and reproduced in social interaction with historical references. Although constructed, it becomes real in our processes of self-reflection, in reality, and also in and through artefacts. Empirical examinations on the relation of technology and 'Geschlecht' have to struggle with the epistemological dilemma that, although they find empirical differences between women and men, there are however no reasons to attribute these differences to a consistent invariant concept of 'Geschlecht'. While the inequality of Geschlechter continues and feminist researchers aim to change and overcome the reality of social, cultural and political power relations based on the opposition of women and men, thereby referring to a more or less universal term of Geschlecht, the danger arises of fixing totalitarian constructions again, of reinforcing essentialism, biologism or an approach of female deficiency. So at the same time it is necessary to deconstruct all these naturalisations and uniformisations. With the concept of 'constructive realism' (see Berszinski et al. 2002) the authors attempt to overcome this paradox and relate it to the power debate, the body-nature debate and the debate on inequalities in the IT sector.

According to Judy Wajcman, neither Geschlecht nor technology are fixed, uniform categories; in fact they contain many different possibilities and are constructed in relation to one another. "Technologies and new forms of gender relations and cultures arise in this way simultaneously" (Wajcman 2002). Thus, gender and technology are not part of separate worlds, but have always mutually constituted each other. Genders are not fixed dimensions but parts of a dynamic reality. Individuals act within a process of gendering, and technology is always gendered and has a gendering effect on society in turn (Schinzel 1999). From this point of view, technical artefacts and their superimpositions have far-reaching influences on individuals' self-images, on political decision-making and social relations – in fact, these self-images and social experiences are also embodied - and the more

[6] Since Foucault and Derrida, essentialism has been the greatest possible sin in the humanities, and its therapy has been deconstruction. Traditionally, essence is understood as an inner nature of something in difference to its accidental phenomenality; as a final (Aristotelian-scholastic) consequence this inner nature can only be grasped intellectually without recourse to the outer appearance. These esoteric essences have no place in the modern humanities (whereas in science they tend to be intensified). With the early modern scientific revolution, the difference between essence and appearance has become the difference between primary and secondary properties, i.e. the difference between object and subject with an unambiguous causal relation. The philosophical consequences from this conceptual transformation lead to the (constructivist) insight that to identify something that has variable attributes means to *assume* an entity that is this something (in its essence) in spite of the actual and possible changes. If this entity again has variable attributes, the game starts again. This dialectic does not stop until there is an unchanging basic property (though it does not necessarily have to stop).

ethically relevant, as modern neurology has shown in the area of plasticity research. Anne Fausto-Sterling takes up this subject in her Embodiment Theory, which rejects the dualistic differentiation between nature/culture, sex/gender, real/constructed, i.e. between a physiological body on one hand and a societal body on the other, as well as a basic difference between natural-physiological and cultural-societal processes (Fausto-Sterling 2002).

Gender theories explain why and how the views of individuals "doing science" influence the projection of societal prejudices and relations onto technology. Standpoint Theory (cf. Haraway 1995; Harding 1994) argues that subordinate groups have an epistemic privilege over the dominant groups that determine technological development, as they are more easily able to detect the creative decisions falsely declared as universal and value-free and their own ignored experiences and preferences (cf. Palm, 2004). The necessary perspectivity itself suspends all possibilities of value neutrality from a perspective beyond societal contexts. However, this perspective does not exist in technology from the very beginning, as the field is concerned with developments which supplement or correct nature, as required by whatever instances and in whatever way. The current theories of multiple, situated standpoints, referred to as "situated knowledges" (Haraway 1995), are applied in technology research to the selection, representation and organisation of knowledge, functionality and use, because we must always consider the complex social and cultural dependence and restrictedness of all knowledge, i.e. its situatedness and partiality. Consequently, the quality of technology research and development can be measured from a gender perspective in terms of which values are represented within it, whether these values are self-reflected and self-critically oriented, making its own presuppositions, models and reductions of complexity in the technological product transparent or not. Every one of us is enmeshed in numerous meaning-producing systems of power, which we should not deny but rather recognise, reflect and disclose. For technological development processes, we can guarantee a plurality of partial perspectives by involving as many societal groups as possible in a self-reflective process and keeping use open for as many contexts, objectives, backgrounds of subjective experience and conversions as possible. From a gender research point of view, concepts which should therefore enter into technological creation include for example the diversity approach for technically mediated interaction and use (cf. e.g. Messmer & Schmitz 2004, Schinzel 2003, Van Oost 2004). Only in this way is there a possibility of using the utopian potential detected by feminist researchers in the Internet and the new media for communication and interactive space free from authority and beyond the binary gender hierarchies (e.g. Haraway 1995), rather than simply reproducing the stereotypes of gender-specific representation or narrowing the social and societal conditions of access to and use of these technologies.

4. **Feminist Critique**

Understandably, the demands of gender research on technological development, design and superimposition are of a moral nature. From the point of view of feminist computer science and computer science gender studies, observable moral attitudes within the computer science community therefore become problematic. In particular, these are the (economic) liberal and business-oriented attitude on one hand and the deterministic-universalistic attitude on the other. The former is all the more of a problem in that technological development does not take place

within a democratic process but pursues profit, market and power-related interests[7]. The latter favours the moral assumption of the neutrality of science and information technology, without recognising the active redistribution of resources, re-evaluations and alterations which technological development itself sets in train. This attitude also neglects inequalities of power (cf. Adam 2002) such as the effects of the "digital divide", the power of the new elites (computer specialists), or shifts of power within information-supported organisations, or the de-ethicisation of software-supported organisational and working processes when decisions are delegated to software. Moreover the de-ethicisation of knowledge and information as new knowledge orders[8] are established in the net through ontologies and automated knowledge management proscribes contingent selection and viewing of knowledge.
Feminists further criticise the misuse of computing language (but also the language of the cognition sciences, AI and Bruno Latour's actor-network theory, which, according to Wajcman (2002) exposes the error of "understanding technology and society as separate, mutually influential spheres, which are made of the same substance – networks which represent a link between humans and non-human entities"). This language levels the differentiation between the human, or social, and the machine, or computer network, thus exchanging humans with artificial "agents" and lending machines the status of subjects, while simultaneously making humans into objects, like for example the most recent search engines. Finally, feminist critique objects to a form of research and development which concentrates on the "feasible" rather than what is desirable and useful, in a world in which the majority of humankind is refused the most elementary basic needs. The ethical codices of the computing professions themselves are also criticised for various reasons, including because they are only defined as a result of the interests of the professionals themselves, condemning users and those affected by the profession to silence.

Feminist and gender ethics claim to be able to see and treat issues of power and the welfare of those affected more effectively, due to the epistemic privilege of being excluded from the mainstream. They relativise universalistic claims in favour of situational, subjective, contingent moral points of view in view of the complexity of the artefacts created by software, the permanently increasing complexity of the social world, initiated not least by IT, and they are concerned with everyday ethical issues and with the moral effect of working cultures within the framework of micro-ethical approaches – in addition to or instead of the great moral questions.
In her book "A Different Voice", (Gilligan, C. 1982, Herring, S. 1996) Carol Gilligan describes a female view of morality, which she claims to have discovered on the basis of empirical studies, in contrast to the male view. According to Gilligan, female moral arguments are focused more on personal closeness to others, are more affective and define themselves via responsibility for women's personal spheres, leading to an ethics of care. Her teacher, Lawrence Kohlberg, classifies this morality as level 3 of psychological development, while he describes levels 4-6 as spanning orientation towards law and order, justice and fairness up to universal moral principles which claim to treat all individuals equally by postulating generally applicable rules and universally valid obligations.

[7] Even the Open Source movement, which does not pursue market interests, works on the basis of a business model rather than on a democratic model, for example.
[8] Helmut F. Spinner, Die Wissensordnung: ein Leitkonzept für die Grundordnung des Informationszeitalters Opladen: Leske und Budrich, 1994

Gilligan studies have been relativized by showing that men also favour context-dependent welfare arguments and women, in turn, favour justice arguments in other contexts. This de-essentialised the moral positions which had been attached to the two genders, denaturalising them in relation to gender. At the same time, however, inflexible universalist essentialist ethics and others were thus also countered by feminist, situation-based ethics and close-range ethics ("Nahethik"), as the deconstruction of gender studies has also de-essentialised the naturalisation of morality, initially in relation to gender, but then also in relation to culture, history, age, social class or ethnicity.

5. Suggestions for Changing Ethical Behaviour in Computer Science Focusing on Process, Habitus and Working Cultures

Structural problems such as societal distribution struggles, legal changes, etc. require collective approaches which may be located in civil rights movements, negotiations with trade unions or in wider discussions or discourses within society. However, when the issue is painstaking everyday work in the process of software development, accepted behaviour in everyday practice or implicit assumptions and strategies in working and corporate cultures, ethical methods and theories can be applied which can address subjects, professional groups, and their detailed work in the form of micro-ethics. This approach focuses on prevention of crises by relocating the ethical task to the development process, rather than dealing with crises after they arise.

According to Lynch & Kline (2000), very few ethical conflicts take the form of either/or decisions, but are the result of long term accumulating processes or minor decisions in the course of the development process. They are strongly influenced by working cultures, as these channel and limit the room for manoeuvre. The direction of the changes in working and corporate cultures necessary from an ethical point of view appears clear. Firstly, we must open up our view of possible alternative routes of action, i.e. despite time pressure and economical restrictions, we must always take a step back into the distance to become aware of the accepted assumptions, to reassure ourselves of our actual objectives and clear view, even of poorly structured problem situations, and to identify and evaluate alternative possibilities. We must constantly bear in mind the effects of our coming actions on functionality, proneness to error, risks or use, on the surroundings, organisation and embedding, in spite of any given specification. We must always incorporate a comprehensive evaluation of the objectives, concepts, models and concretisations of our own tasks, which requires interdisciplinary abilities to a certain extent. Process orientation calls for an open, friendly way of dealing with others, a communicative atmosphere, avoidance of knowledge retention for establishing monopolies, working attitudes directed towards use and usability and the welfare of those affected, and the active will to positively influence the form of the working culture and the habitus existing within it.

The PROFI project has shown how strongly the habitus of computing culture focuses on purely formal-technical skills, keeping social, communicative, moderating or linguistic translation skills out of the professional habitus, despite recognising their necessity[9].

Changes of habitus are very difficult in closed circles such as computer culture, as they are typified by hardly conscious role models and value concepts and

[9] and thereby taking poor usability and everyday suitability for granted or interpreting problems with these aspects as user errors, simultaneously dismissing users as DAUs.

simultaneously imply the unconscious emulation of the body performance, behaviour and language of the group in question. Habitus can be broken down most simply by accepting diverse groups such as women, other specialised cultures, ethnicities, etc. into the group. However, these groups need to achieve a minimal participation level of approx. 15% so as to avoid being stereotyped as tokens and culturally excluded, and a participation of 25% so as to exercise an active influence on the groups. It should therefore be the moral-ethical objective of computer science not to seal itself off against the humanities and cultural studies, women, African participation, etc., which can all provide models for alternative orientations and demonstrate supplementary skills, to be integrated into the habitus of computer science.
Along with habitus there is also the need to gain a different attitude towards non computer professionals and towards users. Concepts which should therefore enter into technological creation include the diversity approach, e.g. for technically mediated interaction and use. Another concept, linked to the former is the claim to close the dichotomy between developer and user (Crutzen 2000), i.e. not only to accept that every developer is also a user of software, but also to enable the user to develop her own application interface.

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