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Working within the Varying Interests between Academic and Industrial ICTs Research: Ethical Dilemmas and Individual Researchers' Accountabilities

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Abstract: Ethical principles permeate and infuse all those aspects of scientific work that are regarded as the core phases of research. A great deal of information and communication technologies (ICTs) research is controversial and raises ethical issues which need to be addressed seriously. Controversial tensions often arise from the nature of ethical dilemmas but also from the diverse demands and conditions set to ICTs research, on the one hand, by the fundamental principles of science, and on the other hand, by the nature of industrial production of ICTs. In this paper we discuss the contemporary practice of ICTs research involving both academic and industrial requirements. The aim of this paper is to highlight the emergent ethical tensions within university-industry research collaboration.

Keywords*:* ethics, information and communication technologies, research, principles of science, industrial production, UI collaboration

Introduction

At present, the commercialisation of technology-based innovation in terms of progressing viable business opportunities through the global market is set as a goal for information and communication technologies (ICTs) research not only in successful ICT companies but increasingly also in universities. More often, the emphasis of research work is on close collaboration between private companies and universities in proprietary research and development (R&D) projects (Motohashi, 2004). In Europe, the political agenda of many countries discloses that cooperation between universities and industry need to be intensified and university-inventions geared more into innovations. The 'Framework Programmes' orchestrated by European Union, from which funding is attainable virtually only by distributing the goals of a project between universities and industry partners, serve as good examples of the development

toward closer university-industry (UI) collaboration. It seems to be a growing trend to include more than one university and one industrial partner within the same project, instead, projects of two or three universities, couple of firms and a partner from the public sector aren't rare anymore. Also a survey indicating the beliefs of 1000 faculty members in US suggests that US academics had more positive thoughts about closer university-industry collaboration in 1990s than during the previous decade (Lee, 1996). In addition, faculties in applied disciplines are much more supportive to the possibilities to transfer knowledge, technology, know-how, and people from universities to industry than the faculty members of basic or social sciences (Ibid.)

It is often argued that basic research is too often separate from its potential business applications resulting in companies' willingness to invest in applied rather than fundamental research. Furthermore, discussions on the 'European Paradox', which refer to the high quality of European academic research but the poor abilities to convert the results into innovations that generate wealth, have taken place (Dosi, Llerena & Sylos Labini, 2006). However, the share of contract-based research is increasing, and universities are moving from fundamental research towards commercially profitable R&D, which changes the scope of academic research (Rapinoja & Soininen, 2005). This UI collaboration has been supported for many reasons. For example according to Balconi & Laboranti (2006), collaboration benefits academics by supporting academic freedom with public funding and offering possibilities to interact with a more technical culture, which facilitates problem solving. In addition, collaboration with industry improves proficiency in science. The industry, for its part, gains better problem-solving capabilities for their researchers and better possibilities to recruit proficient people through the connections with universities. (Balconi & Laboranti, 2006.)

Consequently of the UI collaboration ICTs researchers encounter ethical tensions arising from the different demands set to their work. On the one hand, research has its fundamental scientific principles that academics are obliged to faithfully follow. On the other hand, there is a growing interest in stimulating national innovation systems through leveraging the knowledge and resources of universities. In addition, different kind of cultures of operations between universities collaborating in the same project, multinational challenges, as well as multiple interest groups bring their own tensions to the cooperation. The diverse demands set the working conditions for researchers, teachers, and especially doctoral students often with puzzling situations. Individual researchers encounter diverse ethical issues and execute related decisions within the different phases of their work.

Common concerns for faculty researchers include the possible corrosive influence of cooperation on academic science and integrity, issues related to contracts that constrict the researcher's possibilities to publish achieved results, as well as the use of students as cheap labour for industry (Lee, 1996). Ethical issues as such are diverse by nature and often incorporate ambivalences. For example, Pietarinen & Launis (2002) differentiate between four types of ethical dilemmas. The first type concerns disputes on certain activity's moral acceptability. For instance, is it morally acceptable for a ICTs professional to develop the usability of a software that will be used for military purposes? Second, dilemmas regarding decision making arise when a person cannot decide what would be morally the best way to act in a certain situation. Thirdly, there are issues that are ethically problematical in that people cannot state justification for their moral insights but firmly believe that this insight is well-grounded. As an example, we take it for

granted that humans should not suffer from medical experiments but accept that animals can be used in those experiments without explicit justification what is the morally significant feature that separates human suffering from animals' suffering. Fourth, ethical dilemmas of signification emerge when a certain situation is difficult to describe with morally relevant concepts. Often, for instance, the prospects offered by new technologies are difficult to ethically evaluate if there are no possibilities to conceptualise the factual consequences of their use. These dilemmas indicate that, in their diversity, ethical issues are often embedded in a profession related cultural conceptualisation, and require explicit description and consideration.

Faculty researchers may position themselves in many ways in relation to the industry partner. Such groups termed 'Academics', 'Pioneers' and 'Janus' are suggested by Shinn & Lamy (2006) and offer interesting views into UI collaboration. Academics are researchers who tend to use enterprises as instruments for scientific purposes, while Pioneers adapt scientist objectives to entrepreneurial aims. Janus group consists of researchers who have alternate agenda between academia and industry. While UI interactions appear usually highly complex, each group is also characterised by altering levels of UI tension. "[A] *maximum of synergy and minimum of tension between the scientific field and enterprise occurs in a configuration where the relative autonomy of the scientific field is elevated—the case of the cohorts labelled Academic and Janus*" (Ibid., p. 1475). Similarly, the systems developer's role in organisations is considered Janus-faced. Systems developers are struggling between the different motivations of the end-user of a system and the sponsors of the system (Howcroft & Wilson, 2003). Paradoxes introduced by Howcroft & Wilson are transferable to and familiar from the UI collaboration as well. Different expectations towards the end-user participation in any development process may cause problems regarding the issues presented by Howcroft & Wilson, such as the rhetoric of empowerment, which proposes a change as empowerment although it is primarily undertaken for economic reasons. Also the lack of skills and power of end-users may cause hiccups to the seemingly democratic collaboration, while lack of commitment can be caused by dissent, and the benefits offered to employees and managers may be inconsistent in practice. Finally, the uneven apportionment of power may result as inappropriate system. (Ibid.) From the academy side more matters arise when students get involved in the collaboration. In a project presented by Jarzabek & Petterson (2006) students took part in various forms of collaboration with an industry partner. A clear malaise in such a way to collaborate in which students accompany shared knowledge creation is that students learn the epistemological values integral to research work from the industry, not from the academy.

In this paper we discuss ethical dilemmas that arise in the situations of contemporary ICTs research in which both academic and industrial activities take place. In our view, all actions may be characterized as involving consciousness, as opposed to being mere behaviour. Actions also cover choices, since it is – in principle – always possible to choose another line of action. Whatever choice is followed, then, includes a preference, which in turn means that something is valued over something else. Thus, all actions are morally relevant. However, it is impossible to give precise rules to account any possible situation, and yet every decision regarding an action involves a moral aspect. The quality of ethically responsible research in the ambivalent situations of ICTs research is highly dependent on individual researchers' choices, accountabilities and possibilities. The different views to moral justifications are introduced under the title "Intellectual aids for solving ethical dilemmas". We suggest that the ethically sustainable view

could be pondered from four different angles: Consequentialism (teleological approach), Kantian approach, Ethics as reflective skills, and Ethics as virtues.

Secondly, we delineate the frames of reference from which the ethical dilemmas involving contemporary ICTs research arise by depicting the fundamental principles of science and the nature of industrial production of ICTs. The ethically responsible research also concerns what researchers consider as ethical dilemmas and how they turn their considerations into ethically sustainable practices. Ethical dilemmas that we have come across in our work as researchers and which have been pondered together as part of a ICTs doctoral seminar will be discussed after the different views to moral justifications. In our view, the approaches for moral justification serve as intellectual aids for reflective skills, where ethics is viewed not as a definite set of rules but rather as ability to deal with ethical aspect of actions.

Intellectual aids for solving ethical dilemmas[1]

Considering ethical and moral problems is a constant challenge. Researchers and industrial developers confront ethical dilemmas daily and solving those dilemmas is not always simple. At first glance, it may seem easiest to have a set of rules could be gathered, which clearly define what a researcher can do and what she or he absolutely cannot do. However, this would most likely appear to be unpractical. Ethical and moral rules and policies should be universal. It is not feasible to define specific rules or lists of dos and don'ts since they expire and become unusable over time. Ethics is not casuistry.

When talking about ethics, values, and research, it is important to understand that there are many kinds of values. An important difference is between ethical and epistemic values. The former refer to desired or good in general, whereas the latter refer to aspects related to knowledge. Even though a conceptual line may be drawn between them, they are inseparable in real life. This is because all decisions involve both knowledge as well as moral values. The dilemmas introduced in this paper cover both ethical and epistemic values.

When confronted with a genuine dilemma involving values, where choosing one line of action that is in accordance of one value would necessarily result in not meeting another value, there seems to be only one way out. One value should be prioritized over another. This is the case, for example, when an institution, whose goal is to maximize profit, gets to control another institution, whose goal is to find the truth. Aiming for profit may conflict with scientific practices. Despite that in some cases there may not be such tensions; it would be a fallacy of wishful thinking to believe that the tensions are always solvable. In some cases the choice must be made: Is scientific knowledge more important than profit (or some other value such as efficiency) or the other way around? Obviously the relation between scientific community and companies is more complex than this rough simplification, but it does show the bottom line. One could speculate, for example, on the question whether scientific truth in the end is more profitable than a hasty generalisation or a hunch of the world, but this line of thought is not further discussed here.

[1] For a quick reference on Ethics, see Sterba, 1998

It is impossible to give precise rules to account any possible situation. Attempting to do so would be casuistry. Every decision regarding an action involves a moral aspect. This places a responsibility to be able to make morally justified decisions on everyone. The question then is, what does moral justification mean? Then we, on the one hand, could look at the types of justifications for actions. If one justifies an action by referring to, for instance, one's personal gain or pain, we would probably see this as ethically immature or egoistic view as opposed to reasons referring to, for example, to the well being of humanity or human rights, which would highlight a more universalistic view. On the other hand, we could differentiate between emotional and deontological reasons. The first would concern reasons like *"I just feel like it"* and the latter "*it is one's duty to do it*" types of reasons. These differences in moral justifications disclose a metaethical view emphasising the maturity of ethical reasoning (cf., e.g., Kohlberg, 1981). To our view, the responsibility of being able to make morally justified decisions includes loyalty to one's own growth potential regarding ethical reasoning. In this way the quality of choices in ICTs research could be improved in terms of explicit justification in regards to the morally significant features that we actually base our decisions on.

Ethics as a philosophical discipline could be characterized as the attempt to form a well-justified theory to answer the question "How should we live our lives?" A number of approaches has been put forward, all of which are subject to debate within philosophy. However, despite of their shortcomings, most of them seem useful when trying to solve moral problems.

Consequentialism[2]

One of the prevailing theories could be labelled *consequentialism*. Within that branch, the core answer to the moral question is to choose the act with the best consequents. This basic idea seems to be defendable in the sense that most people do praise or condemn acts based on their outcomes. However, this approach needs to be revised, since it faces a number of critical questions, such as:

- Should one be responsible of unintended consequents?
- How far into the future should we look for the consequents?
- What if there are both desirable as well as undesirable outcomes?
- What is a morally desirable outcome?
- How are we to measure good or bad?
- Whose conception on good or bad are we to follow, and whose benefit should be taken into account?

A more sophisticated version of consequentialism may be formed to meet at least some these problems: *one should choose acts that as a rule have such consequents that maximize the happiness and minimize unhappiness of all people.* Also, consequents should be taken into account as far as is 'reasonably fair to expect a normal person could realize'. Thus, the questions related to egoism and altruism are solved, and in principle, an answer to the question of the case where there are good as well as bad consequents is given, and 'good' is equated with 'happiness'. Admittedly 'reasonably fair to expect a normal person can realize' is a vague

[2] For an account on Consequentialism, see Pettit ,1991

concept, but there are agreeably clear cases in certain contexts where a normal person should understand that a certain action has bad consequents. Now, some problems still stand: What is happiness and does it not differ from person to person? We may concede that there is no precise and universally acceptable idea of happiness, but it could still be maintained that most people wish to avoid pain and seek pleasure, wish to fulfil basic biological, psychological and social needs and things alike. Perhaps we might also agree that happiness comprises of the maximum possibility to choose for oneself. This notion would leave the choice of ideal life to the individual. From the consequentialist point of view the notion means that we should try maximize the possibilities to seek happiness, however defined, and despite the fact, that there is no objective measurement or way to differentiate between qualities of the consequents.

When it comes to research, in the consequentialist view the ethical question faced at every choice along the work is: does this choice further happiness? One should carefully consider all parties affected: the researcher, the research subject, the financier, and finally, the general public. If the research process has practices that deprive one from living a happy life, then the practices are wrong from the consequentialist perspective. If the results obviously enable someone to restrict the freedom of general public, then there is an ethical problem, how to prevent anyone to act on the possibility, to be solved.

When applying consequentialist approach to epistemic issues relevant to research, such as objectivity, criticality, autonomy, and progressiveness, the value-question differs from its ethical equivalent. We could rephrase the maxim as follows: a researcher should follow such rules that yield to maximal objectivity, criticality, autonomy, and progressiveness. The set of desired values should be viewed as a whole, since all of them are seen as necessary but not one of them as sufficient to guarantee the quality of scientific knowledge. Obviously the rigorous nature of the scientific process at all stages may produce tensions between scientific values and other values, such as efficiency or profitability. Cutting corners decreases up the quality of knowledge, making it less reliable and thus unscientific.

Kantian approach[3]

One of the most influential philosophers of all times is Immanuel Kant. Kantian approach can be described as a rational, formal, or universalistic one. Kant formulated the famous ‘categorical imperative’, which suggest to ”[a]*ct only according to that maxim whereby you can at the same time will that it should become a universal law*”. The upshot of this is that one should always consider whether the action to be taken is something that one would want to become a rule that everyone should follow in that situation. In other words, the result should be that whatever we think we should do, is universalizable. Unless one accepts exceptions for oneself, this should be a good rule. It should be noted though, that the rule dismisses such approaches where ethics are equated with emotions in the sense that moral judgements are mere expressions of emotions towards actions. One main difference between the Kantian and consequentialist approach is that Kantians may end up choosing a line of action that is not followed by anyone’s pleasure; what matters, is that the right thing gets done. Another difference is the emphasis on motive of action: in consequentialism there is no question regarding motives behind actions, whereas Kant focuses on the motive. According to Kant, the only acceptable motive is the sense of duty (not, for example, pity).

[3] For an account on Kantian Ethics, see O’Neill, 1991

It is difficult to see how a Kantian approach could provide precise and substantial rules for a researcher to follow; the value of it is rather in the attitude that it promotes, which perhaps is best illuminated in the second formulation of the categorical imperative, where human beings are to be treated as ends themselves, not instruments to extrinsic goals, such as profit. For Kant, so-called hypothetical imperatives would be of the form: if you wish (for example) pleasure, you should do X. This would fall short from being an ethical principle, since morality should not be conditional on anything, thus the categorical and universal nature of Kantian ethics.

Ethics as reflective skills

From the approaches to ethics above, one might not get answers by seeking them. This is the nature of philosophical ethics; there are no ready made answers to any specific ethical questions that philosophy can offer. If there were, then philosophy would be *the* author on matters of moral nature, whereas everyone *should* be able to deal with ethical matters. Philosophy can hope to provide abstract tools to analyze and evaluate problematic situations, that is, equip, for example researchers, with concepts that are useful in reflecting what to do.

Ethics as virtues[4]

Another approach to ethics may be helpful in grasping how reflective skills may be improved. When asked, "What is a good person like?", one might want to refer to virtues, such as benevolence, bravery, truthfulness, just, and alike. Whatever is the set of virtues we require of a good person, we require a good person to have all of them. Virtues are perhaps more concrete than the moral maxims mentioned above, and we may set the question for a researcher: how can a researcher show benevolence, just, truthfulness, or bravery in work? Taking bravery as an example: researcher might show bravery when choosing an unconventional method to study a question, even when it is not used in the discipline before. We may incorporate the ethical reflection into the schooling of the researcher, and make it our objective that the virtues become habits, or second nature if you wish. Ideally, a good person is 'naturally' inclined to make virtuous decisions. A 'good' or more specifically 'truthful' researcher would strive for objectivity and criticality and other 'scientific' virtues.

The Fundamental Principles of Science

The fundamental principles that have made the field of science differ from other professions have been discussed for decades. In 1942, Merton (1973, pp. 270–278) phrased four institutional imperatives to comprise the ethos of science – *universalism*, "*communism*", *disinterestedness*, and *organised scepticism*. His concern was directed toward the science's dependence of certain social structures and the historical moment in which scientists needed tools to defend their work against hostile attacks and to become more self-conscious. With the term universalism Merton covered the aim that the presenter of a truth-claim and his or her personal characteristics should not influence on how the claim is weighed. "Communism" refers here to the view that scientific findings are a product of social collaboration and belong to the scientific community, leaving the claim to intellectual property to be limited to recognition and esteem. Merton's third institutional

[4] For an account on Virtue Ethics, see Pence, 1991

element of science, disinterestedness, means that a desire for knowledge and a will to benefit humankind should, with no ambition to personal profit, be the driving force for researchers. Finally, organised scepticism ensures that no claim is approved without systematic and critical dissection.

A slightly different set of characteristics for science has been suggested by Niiniluoto (2002, p. 37) on the basis of the ideas of Charles Peirce (1839–1914). Niiniluoto's historical perspective on the nature of science suggests *objectivity*, *criticality*, *autonomy*, and *progressiveness* as its integral qualities. The ethos of science is formed, as Merton states, by a complex of values and norms to which researchers are bound (1973, p. 268). Furthermore, following good scientific practices (see e.g. Finnish National Advisory Board on Research Ethics, 2002) means that the principles of science should be considered throughout a research process, from planning phase to publishing. In this chapter we will introduce Niiniluoto's characteristics of science in relation to Merton's institutional imperatives. We will also discuss how they appear in different phases of the research.

Objectivity

The first of Niiniluoto's (2002) characteristics of science, objectivity, refers to offering as truthful and informative picture of the subject as possible regardless of the presumptions of the researcher. Merton addresses partly the same question with universalism (1973, p. 272), but where Niiniluoto is more concerned about researcher's own objective relationship to a subject, Merton emphasizes the impersonal character of science and neutrality in evaluating someone else's scientific work.

Issues related to objectivity are faced already when planning a research project – plans, schemes and guidelines are part of the information that researcher yields. In the actual execution of a study researcher's choices of using as value-free methods as possible and being careful not to let his or her personal preferences to affect the task at hand are the choices that promote objectivity. For example prompting phrasing of a question or interviewer's behaviour during an interview can lead to a hoped-for answer, not to an answer that describes interviewee's true feelings and thoughts (Fielding, 2001, pp. 147–150). Objectivity is an important factor when it comes to reporting and publishing of results. No such interpretations of the results should be reported that cannot be argued on the basis of data, and all significant results should be stated also in those cases where they don't match with the researcher's own expectations.

Thus, objectivity can be seen as a fulcrum of the whole research process. Starting from the conduct of the research, the ambition is to yield scientific information that is as close to the truth as possible. It can be argued that researcher always has some preconceptions and opinions about the phenomenon under study – often the whole research process is an attempt to get support to researcher's ideas and hypothesis. We understand that the significance of objectivity is in striving to realise own presuppositions and emotions. In that way it is possible to aim at minimising their influence to the ongoing research.

Criticality

Publicity and transparency of scientific work makes criticism – or organised scepticism, as Merton (1973, pp. 277–278) puts it – possible. Both criticality and organised scepticism

emphasize, that science should be public and open to critic from other the members of scientific community. Pietarinen (1999) writes that researcher's basic task is producing reliable information of reality. To ensure that, information has to be argued critically. Following good scientific practices creates a foundation to build on researcher's professional ethics. It also enables criticality: research is repeatable and members of scientific community can judge reliability and validity of both research process and the results. Under the watchful eye of colleagues science controls itself – at least most obvious faults and ethical uncertainties are righted.

According to Merton's imperative of universalism, each research should be criticized only on the basis of the quality of the research and truthfulness of the results, not on the basis of the researcher's repute or personal traits. This principle gives us a guideline when we estimate other researchers' work: critical examination is in order also when the author is famous in his or her field. On the other hand, personal antipathies or rivalry should not lead to over-criticism or unequal judgements. Respect for colleagues as human beings should not be forgotten, even though the competition for financing and career opportunities is these days tough.

Autonomy

Autonomy of science refers to a fact that science takes place in scientific community and no other powers should affect the results of scientific research. Merton (1973, p. 273) calls this principle communism. Whereas Niiniluoto concentrates in the principle of autonomy on working within scientific community, Merton discusses more about science being an open community, where the ownership of findings is shared. He sees that scientific results are a product of social collaboration, and so belong to the community. Researcher then has only recognition for being the one who published the findings. This feels to us a bit strict principle in the time where intellectual property rights are part of our everyday life.

Scientific community is becoming less isolated from other society and market forces. Especially the so called 'Big Science' (Niiniluoto, 2002, p. 39), in which considerable amount of capital is needed to provide large research groups and expensive devices, has strong ties to commercial enterprises. It is imaginable that the dependency for companies and sponsors increases pressures to compromise with characteristics of science and to try the boundaries of ethical guidelines. Although compromises with non-academic parties are hard to avoid when funding of the research project is in question, the decisions made should not conflict with professional ethics. For example, in planning phase researcher has to draw the line to financier's demands if there are any parts of the research that might cause harm to subjects or other parties involved. Especially reporting, writing and publishing are important to autonomy of science. If research is not visible to the scientific community, science's self-correcting nature cannot come true. Merton (1973, p. 274) takes this idea even further in communism of science: he sees open communication as an imperative, and secrecy as an antithesis of this norm. Again, concealed, contract-based studies with their restrictions can be problematic to a researcher.

What is important to note when the collaboration between universities and industry is under consideration, is the Merton's fourth institutional imperative: organized scepticism. The imperative is interrelated to the other imperatives, as well as, it is clearly related to Niiniluoto's autonomy. Merton suggests scepticism as a means to confront situations in which science

extends into new areas covered by meanings and attitudes of other institutions, such as church, economy or state. After all it is the existing distribution of power in Western societies that evades scepticism.

Progressiveness

Niiniluoto's progressiveness refers to the constant ambition to find new truths and correct earlier mistakes. It has common characteristics with both Merton's imperatives of communism and disinterestedness: according to them, new discoveries can be seen as a product of collaboration that belongs to scientific community (Merton 1973, p. 273), while the driving force of scientists should be sheer passion for knowledge (Merton 1973, p. 276). Merton's imperatives appear once again to give quite an idealistic picture of scientific work, whereas Niiniluoto's progressiveness leaves more room for economical ambitions.

Progressiveness starts from the planning phase: it is worthwhile to make good use of the knowledge of colleagues. Researcher also should ascertain that new study really is going to yield some new information that contributes to the field of research (Pietarinen, 1999). Also sufficient knowledge about research methods is a prerequisite for progressiveness: an objective is to make things better than in earlier studies, to learn from what has been done before. By writing and publishing the results and how a study has been carried out, the researcher gives his or her colleagues an opportunity to learn from gained experiences. Pietarinen (1999) includes this in researchers' professional ethics: a researcher has to act in a way that contributes to research. In addition to reporting and publishing, this can be advanced by taking part to science politics and administration. Also research process management should be striven to do better than in earlier studies - without downplaying the importance of earlier work.

These days either the above-mentioned four characteristics of science or Merton's imperatives are not always fulfilled. Growing proportion of scientific work is non-public research nowadays (Niiniluoto, 2002, p. 39). In 1942 Merton wrote about the virtual absence of fraud in science, and believed this to be the credit of the unity and openness of scientific community. At present, when researcher's own subsistence may be at stake in the form of funding, it might be reasoned to say that ethicality and morality are more important than ever before. Even if the introduced characteristics of science sometimes give all too idealistic picture of the scientific work, they still are a foundation to scientific way of working and making own decisions in problematic situations.

The Nature of Industrial Production of ICTs

Companies take part in and establish research projects in collaboration with universities for several reasons. Generally what lies behind the need of a research for a company is economical growth. Companies may want to rationalise manufacturing processes to make more products more cost efficiently or gain competitive advantage by developing better products than the ones competitors have. In the field of ICT, where development is fast and new innovations lead the market, also future uses and future users of company products play a major role within research issues. In general, principles influencing in the background of the general business operations of

a company also define the conducted research. To gain profit operations have to be fast and effective, and the products should be flawless and by choice, the best ones available.

UI cooperation is conducted because projects may get external funding and academy offers different kind of expertise than what the company holds by itself. Employees of UI research projects are potential future employees for the company, as well. What is usually studied covers different perspectives to the use of existing products, testing, new target groups, new products and new uses for existing products. Thus, research can be applied or basic research. Some companies may also do research just because of imago or societal responsibility. More broadly taken, ability to adapt changes in technology, major position in influencing the new technology for offering more value, improved quality, lower costs, better value, and new approaches on solving problems are advantages companies may gain by doing research (Jalote, 2006).

When writing about "university-industry gap", Zaky & El-Faham (1998) make six confrontations of points of view between academia and industry. In the following, the juxtapositions that are relevant to the scope of this paper are discussed. The most important of the juxtapositions noted by them is that whereas academic institutions don't aim for profit, it is nearly a sole objective for the industry to make profit. Zaky & El-Faham's other juxtapositions can be seen as legacies of this primary difference. Within the academia, maximal publicity for the new knowledge produced is valued. The research conducted within the industry is a closed activity, due to the requirement of safeguarding the investments. This leads to restrictions of communication and publishing. Within academia "*acquisition of knowledge itself is valuable*", whereas within industry "*knowledge is valuable only if it can be exploited in products*". (Ibid.) Also Jalote (2006) suggests that company aims to create knowledge that can be used in order to improve business. Thus research acts as a long term investment helping to make more revenue and earnings (Ibid.).

Due to commitments such as teaching, some members of academia cannot pursuit their research interests full-time. Those, who are employed as researchers on the private sector, are usually working only on research. Furthermore, academic work is not usually urgent. It is easy to subscribe to this, especially if the traditional values of academic research are on the other side of the scale. In industrial research, the "*goals are usually short-term*" and in technological development "*the overriding consideration is time*". (Zaky & El-Faham, 1998.)

Dilemmas during the phases of research

While universities and ICT companies cooperate within research projects, different interests meet and may conflict with each others. Ethical principles and characteristics of science, such as Merton's or Niiniluoto's, advise the work of an academic researcher. In addition, the National Advisory Board on Research Ethics in Finland offers practical advices regarding the researchers' work, as well as procedures for handling alleged violations of good scientific practice (see National Advisory Board on Research Ethics, 2002). On the other hand, economical growth usually lies behind the need of a research for a company. But also industry has its own guidelines. Among others, ACM, IEEE Computer Society, DPMA, and ICCP offer ethical codes

of conduct concerning with issues among computing professions (Friedman & Kahn, 2003). In addition, a growing amount of corporations also have their own codes of ethics.[5]

Thus, interests of a faculty researcher are things such as objectivity, criticality, autonomy, and progressiveness or universalism, communism, disinterestedness, and organised scepticism while business partner may look for the use of company-made technology, fast results, customer-ready product or effectiveness. An industry partner may also want to keep results or the whole research process undisclosed for better benefit to the own company. In general, different interests for a research raise interesting, albeit sometimes difficult questions that can be formed as ethical dilemmas of the research. Dilemmas are broadly used in the situations where no definitive answers are available. In the following these dilemmas are introduced from the perspective of an academic researcher and the related argumentation is formed after characteristics of science and our own opinions and experiences. Dilemmas are divided according to the phases of a research project.

Planning

When looking at the planning phase of a UI research project from the perspective of objectivity, many issues appear. Two dilemmas will be discussed hereafter:

1. Who is the one initiating the project and offering goals for it?
2. How is the project personnel recruited/chosen?

Research projects grow from many different grounds. The starting point may be to reach purely academic goals or entirely industrial goals. In the most optimal situation, the project offers both possibilities to conduct academic basic research and to apply the results into product development of the industry partner. However, it can be stated that if a project has its basis on the needs of a company, the autonomy as a characteristic of science may be threatened. Autonomy is understood to mean that no power external to the science itself can dictate the results of research and the academic community supervises the standards of science (Niiniluoto, 2002, p. 37). When this concept is inspected in terms of planning a research project, it comes down to several questions on research subject, materials and methods, which cannot be completely separated from same issues related to objectivity. When autonomy is endangered, so is the objectivity. If, for example, researcher agrees to a methodology proposed by the industry partner, (s)he might be risking the autonomy of the research. Again, if not agreeing, the researcher might be risking the whole project and possibly even employment or livelihood of other people. Furthermore, a researcher may be asked to join a project (s)he consideres unethical. In our opinion, the clash of personal ethics and professional ethics is problematic and a solution would be to count on objectivity. If the researcher finds out that (s)he had been acting on false or incomplete knowledge when making ethical choices, we see no discrepancy in him or her changing one's mind when confronted with additional information and "seeing the big picture". The researcher's problem of relating the choices regarding his or her work to his or her personal ethics is also an issue of objectivity as it may affect the way the value assumptions are made visible. We see ethical challenges in situations when it is impossible to work by objective

[5] An online collection of professional codes of ethics, including those of corporations', can be found from the web page of the Illinois Institute of Technology's Center for the Study of Ethics in the Professions. Retrieved January 15, 2006, from http://ethics.iit.edu/codes/index.html.

information due to the researcher's own personal conviction such as religion. Within this paper, we have no opportunity to discuss these issues in larger scale and have to settle on a workaround that the researcher cannot take part into something that is in disharmony with his or her personal ethics.

In research planning objectivity as a characteristic of science also appears in the ways in which employees are hired. Part of the project personnel may be selected through university administration, some by an already defined project manager. There may also be differences between durations of selection processes and the use of research professionals. In addition, it may be the case that administrative department and required research personnel initiate a project is gathered either based on their general research skills and experience or their experience in the particular topic. All these factors may have impact on the quality of the research. Conducting projects also often includes students and trainees taking part. These participants do not always have as deep knowledge on the ethical and many other aspects of making research as the experienced researchers and professors do. Taking account the criticality in science, situation raises a further dilemma related to hiring project personnel: Is the use of students' and trainees' work contribution fair and ethical at all? The students may not understand what are they involved in and what their commitment is like. It would be appropriate to think that it is ethical to use students in research projects as long as one makes sure they know what they are involved in and take care they get a decent recompense. This is because experienced researchers can then have more time to use with the most challenging tasks. It can be stated, that there is no-one to tell students about their rights and responsibilities as everybody are busy and students are working only for a short period of time. The students should also be let to do their studies. Furthermore, if we agree that a researcher should lead up to avoid mistakes and make them minimal (e.g. Niiniluoto, 2002, p. 37), it is noteworthy to ask if working with students and trainees is possible when one tries to avoid mistakes. Other side of the students' work from the epistemic perspective is that by participating research projects, students learn valuable knowledge and practices and their further studies will be of better quality. Furthermore, new ethical issues related to recruiting might raise if some members have worked earlier in projects benefiting the competitors of the current industry partner. In applied research projects, the research might be exposed to pressure related to some principles of good scientific practice.

Data collection and analysis

Tensions between academic and industrial research at the data collection and analysis phase(s) mostly derive from issues of choosing the method for the study, sampling, and data access. As Sieber (1992, p. 25) states, research ethics and methods are conceptually distinct topics, but in practice inseparable. In the following we will discuss the following dilemmas that are related to the data collection and analysis:

1. How to ensure unbiased data collection and analysis?
2. What are the possibilities of a researcher to reuse the collected data?

Data collection raises several issues regarding the needs and attitudes of each research partner. Both faculty researchers and people working for industry may have their own biases towards the results. First, a researcher may have strict opinions about the products or company under study or the company with which (s)he cooperates. Researcher should be aware of his or her own values

and expectations so that they won't skw the analysis. Otherwise, the criticality as a characteristic of science is compromised. Secondly, if the participants of a study are chosen by financier, there is a possibility that samples are intentionally biased for making the results look more favourable for financier. Also when the participants of the study are employees, it is important to discuss whether they participate voluntarily or because they are condemned to do so. Good research practices presume that informed consent is concluded to ensure that participants are aware of what they are participating in and how anonymity and confidentiality will be handled (Sieber 1992, p. 49). After being informed participants should have a free choice to decide whether to participate or not.

A matter that can harm confidentiality and subjects' right to refuse from participating is reuse of collected data in other studies. This is clearly a issue of autonomy, but touches progressiveness as well. It may be that a Non-Disclosure Agreement (NDA) made conflicts with researcher's further intentions to a subject under study, but researcher also has to decide if it is ethical to use data in ways that participants were not informed when they gave their consent. In addition, one has to consider if it is right to give other researchers access to the data. In industrial research, data access is a question that is worth to agree in advance. Especially when participants are employees of the financier, giving access to data might influence their working life. Another important issue is to note that the employees of a company may have very well pondered and ready-made answers to some subjects under study. The ideas of such experienced personnel and gained through interviews, for example, should not be used as research results as such, but further discussed with the participants.

Reporting, writing and publishing

NDAs are probably the biggest causes for tensions between academy and industry. The NDA policies clearly have thei impacts on the publishing and reporting results. In addition, the different languages of academy and industry partners cause another group of ethical dilemmas. Thus, two dilemmas pondered here are:

1. What are the researcher's possibilities to publish the results of a research?
2. Whose "language" and format should be used in publishing and reporting the results?

The conditions under which funding for a research is gained need to be considered carefully. For example in product development projects financier often requires an NDA that determines the conditions under which participants are obligated to work and which may influence on the publishing policies. The dilemma emerges from the different and even controversial objectives and lies between commercial beneficial purposes and scientific openness. Scientists have an obligation to present reliable and valid research results and the financiers' demands may in some cases compromise this. Even though everyday reality is seldom black and white, researchers are responsible for their work and thus they should not agree with those contracts that restrict their accessibility to data and possibilities to analyze it independently, prepare manuscripts, and publish them. Progressiveness is one of science's central characteristics and science is self-corrective in nature. Writing and publishing research reports is a way to keep science in progress. Through reading publications scientific community gains information about the new accomplishments in their field of interest and has an opportunity to assess and comment on the work that has been done. Unbiased, independent and critical assessment is an essential part of

academic work and scientific processes; the researchers who have published text gain feedback and ideas about how to improve the quality of their work. (Niiniluoto, 2002.) The NDA may affect writing in a way that the accuracy needed for a valid scientific peer review may not be reached. Financier may even require censoring parts of the research report, that include business secrets or information about unwanted results, which compromises the researchers standing as an objective participant and academic actor. Sometimes even concealing the report is contemplated. It can be considered if NDAs and concealed research reports stand in the way of the idea of progressiveness of science when prohibiting the publishing of information.

Academy and industry are very often talking about the same thing but using totally different language. Thus, a research report or an article that could benefit academy may be useless for a company. Vice versa, a faculty researcher is not able to publish text in a format in which it is usually delivered to the industry partners. It is also important to consider which channel to use when publishing research reports. Academic researcher can have a strong say in this matter and even decide it on her or his own, but in industrial research projects it may not be so simple. All in all, publishing channel plays a significant role first of all on who has access to the information. For example scientific journals are nowadays often published in the Internet in addition to the paper version, but some electronic journals are liable to charge, which limits the opportunity to use articles as a resource for some that might be interested. It can also be deliberated, if the publishing channel can compromise the validity and reliability of the research by for example being clearly biased.

Summary

Philosophy is unable to provide definite answers to specific questions on how should we act. Philosophical ethics may be used as conceptual aids to develop sensitivity towards value-issues of actions in general or research in particular. This sensitivity may be phrased as a reflective skill, and it gains from knowledge of philosophical analysis of values. As everyone may be held responsible for their actions, it is imperative that values are acknowledged and reflected. To recognize that values – epistemic or ethical – are involved, different conceptual models may be utilized. The approach taken in this paper is to systematically view scientific values in respect of research phases to illuminate problematic questions from the perspective of two roles: academic and industry actors. Obviously other agents should be considered for a more comprehensive study as the choices made by researchers and financiers affect also customers and research subjects.

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