Ethics and Social Eco-Informatics

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***Abstract*—Ethics problems in emerging fields, typically, do not get advance consideration. It is not until after an ethical lapse occurs in a field of study does ethics get a serious examination. Social Eco-informatics is no exception. I will show the extent of the existing consideration in the academic literature concerning eco-informatics of ethics problems and their ethical basis. Lessons from the history of emerging fields in information technologies will be examined as a way of pointing out the detail of ethical problems that this field might encounter. This paper looks at the ethics-first – ethics-last debate and offers some guidance for researchers in this emerging field. The challenge for emerging fields such as eco-informatics lies in keeping ahead of potential ethics problems not reacting to them after they occur. Finally, I use a paper on social eco-informatics to point to possible places where the eco-informatic researcher might look to include ethical considerations.**

***Index Terms*—ethics first; ethics last; eco-informatics; personal ethics;**

It needs no proof that neither economic activities nor any other class of human activities can rightly be made independent of moral laws. (Keynes, 1890, 24) [8]

I. Introduction

I would have liked to have written a paper about ethical problems in social eco-informatics, showing significant and deep insight into common concerns such as privacy protection. However when I began to examine the usual ethical suspects, harm, rights violations, unprofessionalism, and so on I became aware of the lack of extant research into ethical problems in the field. I had encountered this problem before when examining the moral issues in enterprise computing [11]: No literature. I could have retreated to the established and field of environmental ethics and expounded on, for example, privacy protection and what might be done about it, but my interest was piqued: I wondered why there might be nothing so far? Was it just a coincidence that two emerging IT fields have no current, or past, interest in their ethical dimensions? Out of this wonder emerged this paper.

A. A word about terms

The usual practice in science research is to precisely define terms. For this paper, fortunately, such a requirement is unnecessary when discussing ethics and social eco-informatics. Why is this?

Even if there were precise definitions of the individual terms ETHICS and SOCIAL ECO-INFORMATICS that all could agree on they, as discussed in the next part, would have no effect on the thrust of this paper. What I was looking for in this paper was the *occurrence* of the term pair ETHICS and SOCIAL ECO-INFORMATICS, regardless of what the individual terms might mean to any particular individual.

Nonetheless, ETHICS is a sufficiently common term that, while there may be some disagreement about what counts as ethical (or more usually, unethical), there is no substantive disagreement that everyone has a conception of what counts as being ethical. A common example might be:

Ethics is a set of values for determining right and wrong.

I could find no such common example for SOCIAL ECO-INFORMATICS. For this paper I take the characterization of eco-informatics used by Kineman and Kumar [9].

> represent natural biodiversity and ecosystem phenomena, and to communicate such information to society, for science, valuation, management, and policy

II. What is there to be ethical about with Eco-informatics?

Apparently nothing. Ethics, it seems, is not on the radar of researchers into eco-informatics.

In a search of Google Scholar conducted at the last possible moment for this paper (18 June 2012) using the keyword phrases “eco-informatics” + “ethics”I searched for the occurrence of research papers on the topic of ethical problems in eco-informatics. I had originally planned to take the results of this search and refine it by adding “social”. However, as the results below show this became unnecessary. Also note that a mere seven search results were in the “ethical”list that did not also appear in the “ethics”list: this made discussing them separately unnecessary.

A. The Google Scholar Search

Google Scholar was searched for academic papers and books that examined the phrase “eco-informatics”. The term eco-informatics alone without additional search terms resulted in a mere 303 results. The search uncovered the first occurrence of the term “eco-informatics”combined with “ethics”and

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"ethical"as part of the more weildy "geo-eco-informatics"(or geographical and ecological information systems) in Koshkariov, Tikunov, and Trofimov (1989) [10]. This makes the use of the term eco-informatics a relatively new phenomenon. The results were then categorized into nine groups:

TABLE I
KEYWORD SEARCH RESULTS CATEGORIES "ECO-INFORMATICS" + "ETHICS"OR "ETHICAL"

	Category	ethics	ethical
1	Jnl or Org Code of Ethics	1	0
2	Another field's ethics	5	4
3	Reference to an ethics paper	3	2
4	Ethics is important	5	2
5	Personal Ethics	1	1
6	Soft Science	1	1
7	Actual Examples	0	0
8	Moral evaluation	0	0
9	Unable to locate term	39	9
	Categories Totals	55	19

Now, I do not want to make too much of these results. I am fully aware that the ethics of eco-informatics could be regarded as a melding of the fields of environmental ethics and information ethics and merely examining each of these fields ought to be sufficient to identify any ethical problems and be aware of any moral evaluations. This may be true but any connections to these already established fields does not make the point that I want to make here. The point here is that if a field chooses to create a new term, such as eco-informatics, then the field, presumably, has substantial reasons to distinguish itself from other closely related fields. This difference then ought to result in unique ethical problems and present unique opportunities to show its moral worth.

A cursory analysis of this shows some interesting features.

1) Jnl or Org Code of Ethics: This category refers to those search results that mention a journal or organizational code of ethics. One search result made reference to the need to follow a code of ethics but did not say why or what the relevance of such a code might be.

2) Another field's ethics: This category refers to those search results that mention another field's ethics, environmental ethics, for example. Several search results (5 and 4) made reference to another academic field's ethics. Environmental and information ethics both got a mention. However no details were drawn out nor any ethical problems relating specifically to eco-informatics were mentioned.

3) Reference to an ethics paper: This category refers to those search results that specifically mention a paper that has ethics in its title or is in an established applied ethics journal. Three search results included a reference to a paper in an ethics journal such as *Journal of Information Ethics* and *Journal of Environmental Ethics*. However no use was made by the articles found to discuss the ethics of eco-informatics.

4) Ethics is important: This category refers to those search results that, in some form or other, emphasise the importance of ethics or ethical concepts (such as harm, benefit,trust, autonomy, honesty, virtue). Five search results mentioned the importance of ethics but did not say how or why.

5) Personal Ethics: This category refers to those search results that refer to personal or a person's ethics. One search result said that personal ethics were important when dealing with eco-informatics. Again there was no caching out of this claim nor evidence of how this might be.

6) Soft Science: This category refers to those search results that refer to ethics obliquely by bundling it in with other social or 'soft' sciences. For one search result the authors, referring to those constructing eco-informatics systems, wrote that it was important to take into account soft sciences such as ethics, management, and society into account. However, "Soft or social sciences, in so far as they embrace environmental issues, history, ethics and philosophy have til now run a very poor second." [14]

7) Actual Examples: This category refers to those search results that refer to specific ethical problems that have occurred, and are named in connection with eco-informatics. No search result gave actual examples of ethical problems. I would have also taken (and did search for), the usually erroneously named, ethical dilemma but there were none. This will be one of the two main discussion points in the next subsection.

8) Moral Evaluation: This category refers to those search results that mention any sort of evaluation of eco-informatics, eco-informatics systems in terms of its moral or social worth. No search result gave actual examples of ethical problems. I would have included any indication of the ethical merit of specific examples of eco-informatics (data, information, or systems) , the usually erroneously named, ethical dilemma but there were none. This will be one of the two main discussion points in the next subsection.

B. Some (non-scientific) analysis

My conclusion is that ethical eco-informatics, as a serious field of study, has been much neglected.

I do not intend to provide a sophisticated statistical analysis of the above search nor an in-depth defence of my conclusion. That is not my goal here. My goal here is to point out that for a term that is 23 years (see [10]) old there are no serious academic papers tackling the idea that there might be ethical problems lurking in the background or that the moral worth of eco-informatics be examined. This might be explained by the fact that no ethical problems have occurred in the field; that the moral worth of eco-informatics is so obvious so as to not need stating.

Perhaps, the findings above are just artefacts of history, that will go the way of all technological implementations of informations systems: we will work out the problems eventually. Is it merely a matter of time before researches into eco-informatics and ethics come good; that academics have a go at examining the ethical problems (potential and actual) to measure the ethical merit?

Put another way, is eco-informatics any different to any other field? After all, it seems that ethics gets mentioned, eventually, in every field. However, if you look closely at nearly any field it turns out that ethics gets a mention only

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after some unethical, usually catastrophic, event has occurred. That is, ethics gets considered last.

III. Ethics first or ethics last?

It seems clear to me that in the emerging field encompassing the environment, technology, and information (eco-informatics) there has been no forethought about its ethical implications. That is, ethics has not come first. Also pointed out previously is that this is nothing new, it happens all the time. But why should this be so? Why does ethics not get considered first, as the field emerges? Why is ethics not discussed ahead of time?

A. Lessons from history

To frame a discussion on whether ethics ought to be done first or last I will use, one traditional area of information and communication technology (ICT) ethics, systems development, and two emerging areas, radio frequency identification device (RFID) tags and data matching. In a forthcoming book, *Professionalism in the Information and Communication Technology Industry* [20] Bernd Stahl and Simon Rogerson, say that: "A central problem of the ethics of technology is that it [ethics] tends to arrive too late". Michael Kirby the recently retired (2009) Justice of the High Court of Australia, showed that there were many difficulties in regulating new technologies, ICT specially. In a similar vein, Philippe Goujon and Catherine Flick state that "the strong push for technology development too often obscures the need for any deep ethical consideration before a technical project is funded, developed and deployed".

Researchers can, either react to the technology, that is the ethics is done last, after the technology has been developed, or, it can be proactive, that is be done first, before the technology is developed. This ethics first – ethics last, approach seems to raise what is commonly known as the Collingridge [2] dilemma. If the ethics is done before the development has impacts it is difficult to predict what those impacts will be and if done after development it is difficult to control these impacts. Croy [3] formulates the dilemma this way:

> Either a technology is in a relatively early stage of development when it is unknown what changes should be made, or a technology is in a relatively late stage of development when change is expensive, difficult and time-consuming.
>
> If the former, then control is not possible.
>
> If the latter, then control is not feasible.
>
> Therefore, either controlling technology is not possible, or controlling technology is not feasible.

In short, controlling technology is not possible because prediction is so unreliable and is not feasible because, once the technology is developed; change is difficult. While this appears to pose real difficulties, it is not quite the dilemma that it initially appears to be. Some prediction can be informative and some control after the development is possible. Furthermore, it is possible, to some extent, to slip between the horns.

B. What is the difference between reactive and proactive active ethics?

1) Reactive ethics: I will show the difference between reactive and proactive ethics through a brief look at the history of the closely related (to the informatics part of eco-informatics) field of the ethics of information technology. Problems in IT ethics are not different or new in the sense that they are different in kind from other ethical problems. Moral philosophy has been studied , at least, for the past 2500 years, and the ethical issues in computing are an extension of this. What is new and different is that the development and use of computers has raised old questions in interestingly new and different ways [7], often creating what Moor [12] calls policy vacuums: problems without worked out ways of dealing with them. The work of the computer ethicists then is to develop policies to fill those vacuums. One example in computing is hacking. Breaking into someone's computer account is in some ways like breaking into someone's house, but there are interesting differences. It is a logical rather than a physical entering. Another is unauthorised copying of software, which is a bit like unauthorised copying of a book, and a bit like taking a television set, but there are significant differences. There are also questions relating to work and the loss or creation of skills, which arise in a unique way. This way of doing computer ethics is essentially reactive [7] and, unfortunately, the most common role of applied ethics in general.

2) Proactive ethics: When a proactive, or ethics-first, approach is taken, the emphasis is different. One is much more likely, and in fact it is necessary, to think carefully about what is wanted from the technology, and that involves thinking about what sort of life one thinks is a good one. This approach means taking action that will guide the development of the technology in a particular manner. This proactive stance also highlights a more positive view of applied ethics. Ethicists are frequently seen as playing only a negative role, always criticising and attempting to hinder development. While this view is to some extent correct, it is not the only thing that ethicists should be doing. Technology clearly has a positive role. In many ways our lives are much better because of various technologies.

In software engineering (a common area of ICT), calls for ethics to be considered early in the development process are not new; Don Gotterbarn [6] has been promoting a piece of software called SODIS (for the ethical evaluation of software development projects) for years. This, however, is rare. In ICT development, as in most technical development, ethical questions have generally been left until problems appear.

3) Both: So, should ITC ethics be reactive, proactive, or both? That is, should ICT ethics just respond to existing problems, try to anticipate problems, or both respond and anticipate?

The argument here is that the ethics first model and the ethics last model are popular but poor solutions to a false dichotomy (see Weckert [19] for a detailed examination). ICT ethics is not something one can complete satisfactorily either

first or last but something that needs be done continually as the technology develops and as its potential consequences become better understood. Ethics is dynamic in that the factual component on which it relies has to be continually updated. Norbert Wiener outlined this approach in 1960. In talking about automated machines, he writes:

> To be effective in warding off disastrous consequences, our understanding of our man-made machines should in general develop *pari passu* [in step with] with the performance of the machine.
> (Wiener, 1960, 1355) [22]

What he is suggesting is that if we wait until the technology has been developed, it may be too late to avoid disastrous consequences. Predicting is hazardous and he does not suggest that these machines should not be developed on the grounds that they may produce undesirable consequences. Rather, the understanding must develop in step with the development of the technology's systems. Similarly, the contention here is that the understanding of ethical questions must develop as the technology develops. This will be dynamic; partly reactive, partly *pari passu*, and partly proactive; continually returning to the technology to understanding how it is developing and what its actual or likely consequences are.

Technologists must work with ethicists to predict future problem areas. This is of course fraught with danger given the uncertain nature of prediction, but if care is taken, it is a useful and important activity. In many cases it is at least plausible that ethical problems will arise and that we can know something about what they will be like. Take the case of RFID chips (These are the chips that are embedded in clothing or otherwise attached to desirable and disposable goods. They emit a radio frequency which is detected by a scanning device within its range.). It is known that they have been developed significantly compared to the passive chips currently used in libraries and other places and research is continuing. For example a new passive RFID chip is under development that will be able to be printed onto clothing, and paper, with a range eventually of around 300 metres (Williams [21]).

As another example, think of data matching (the process of aggregating information across a number of disparate sources. Usually, these, many sources were never intended to be put together or matched) within a large organisation. Consider the enterprise as a multinational, multi-industry conglomeration. This enterprise has a number of customer loyalty cards. People who took out the individual, separate, loyalty cards never imagined that the information they contain would be combined to provide a comprehensive profile of the card holder. Neither did the designers of the loyalty systems. Were it only restricted to the giving bonuses for loyalty but it never ends there. It gets extended to more and more activities that are less and less relevant to the card holder.

It is, now, fairly clear that developments in ICT in this context, will lead to further consolidation and aggregation of citizens' information. Given these developments and uses of the citizen data already in other contexts (Thornley, et al. [17]), it is certainly plausible that government agencies and private enterprise (for example the marketing departments for both groups) will extend their uses in ways that are increasingly threatening to privacy and make them much more than mere isolated databases. This is not inevitable of course: I am not a proponent of technological determinism, the view that technology will move on regardless of what we do. However, given the extent to which the values of efficiency and productivity seem to override other values in the assessment of technologies and their uses, the pressures to extent their uses will be intense if it is seen to aid efficiency. Resistance might also be weak. In other areas privacy is eroded a little at a time in a way that is almost unnoticeable. Imagine if, say about twenty years ago before paying for groceries with credit cards was popular, the supermarkets had employed people to sit and watch all customers as they paid, and made a record of their purchases, names, and addresses. Most of us probably would have been a little concerned about this. Now it all happens automatically for those who pay by credit card; most people do not give it a second thought. This suggests that what the eye doesnt see doesnt really bother most people: what happens gradually goes largely unnoticed.

C. So What?

It is here that proactive ethics comes in to play.

1) RFIDs: The argument is not that RFID chips should not be used in libraries because of future dangers. The question to be asked is, is it morally responsible to use the chips in certain extended ways? And how can the technology be designed to mitigate the dangers? What kind of regulations need to be put in place to control the use of the chips? These are all legitimate questions for the proactive ethicist and their answers should feed into policy decisions about the future use of RFID chips.

2) Data Matching: In the other example of data matching the questions to be asked are; is it morally responsible to use loyalty card information in certain extended ways? How can the technology be designed to mitigate the dangers? What kind of regulations need (or ought) to be put in place to control the use of the information?

D. Summing Up

Ethics has a role to play early in the process of technological development. Stahl and Rogerson (in [20]), the current and immediate past directors of the Centre for Computing and Social responsibility at DeMontfort University, acknowledge the difficulty of forecasting future developments, but through an examination of European Union projects isolate a number of ICT trends. These are; increasing computational power and decreasing size, new types of interfaces, network connection anywhere and anytime, and increased development of virtual places. These trends suggest ethical issues that require addressing, or at least, serious consideration. Goujon and Flick (also in [20]) are critical of the sharp divide that appears to exist between ethics and technology, and argue for ethical reflexivity, that is, the constant reassessment of ethical norms in response to the technology to economics, to politics and to gaps in regulation. The context of development is particularly

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important and the non-neutrality of ICT requires emphasis. Inadequacies in both current risk assessment and technology assessment are highlighted.

IV. The case for eco-informatics

So, what lessons can eco-informatics take from this discussion? Think of eco-informatics as part of the larger environmental ethics movement. Think of eco-informatics as part of the larger information ethics movement. But, as discussed earlier, if eco-informatics is to stand as a meaningful term then we must search the eco-informatics literature for an example that can be used to highlight where ethical deliberations might be put.

I will use the paper, *What is meant by "decision-making" in the context of eco-informatics?* by János Fülöp, David Roth, and Charles Schweik [5] to show how an eco-informatics researcher might include ethics in their deliberations.

A. Decision Styles

The paper starts with the standard descriptions of decision making styles: Rational, Contingency Perspectives, Incremental, and Garbage Can Decision-Making. It is in the Rational style that ethics makes its only appearance in the whole paper. In the context of choosing the cheapest copier and vendor in which all the copiers are identical, they quote Rainey [15] saying that "to choose another vendor 'would invite others to question the [manager's] competence, ethics, or sanity"'. They suggest that it would be unethical to not take the cheapest offer.

However, it is not nearly so straightforward. There are some decision makers who consider themselves to be perfectly rational but would make their choice in the following way.

1) Determine the integrity of the Vendor. If it is acceptable,
2) determine the character of the Vendor's Representative. If the Representatives are acceptable,
3) determine the way in which the copiers are identical. Are they merely functionally identical? They cannot be absolutely identical without violating someone's copy or patent rights. Are the differences ethically relevant? If so which is the most relevant?
4) Having done the previous steps which copier makes the greatest contribution to society.

This decision making process is rational but, simply choosing the cheapest alternative is not necessarily the right choice. In fact, using this process it would be reasonable to 'question the [manager's] competence, ethics, or sanity' if they did not take ethics into account.

Similar comments could be made for each of the other styles; Contingency Perspectives, Incremental, and Garbage Can.

With Contingency Perspectives the emphasis is on 'judgment and intuition'; the decisions makers engage in'bargaining and political manoeuvering in their decision-making process'. Here, the authors could easily include ethical judgment and moral intuition [1] in these descriptions.

Incremental decision-makers 'choose to make less controversial, intermediary decisions to ensure some degree of success of achieving vague goals'. Vagueness, can be seen to be either a virtue or a vice. Some success can be seen as providing some benefit while minimising (usually) potential harm. Virtue and harm are both standard ethical concepts. This decision making style is already (if implicitly) framed in ethical terms.

Finally, the Garbage Can style is epitomised by 'waiting for an opportunity to advocate actions already planned'. Opportunism is usually seen in an unfavourable light. It is frequently considered unethical to be opportunistic as this has hints of using people, treating them as means to an end. Of course this is not necessarily true but the mere mention of this style is an opening to bring in the ethical notions of respect for persons, responsible decision making, and so on.

The authors end this section of their paper with:

> it is probably safe to say that most developers of eco-informatics tools or information hope that their work will be utilized in some form of rational decision-making processes or that at the very least, their tools and information are used to help inform incremental decision-making processes

Again, this a point at which the ethically sensitive eco-informatics researcher might add that 'their tools and information [could] be used to help inform' projects with ethical merit.

B. Optimization approaches

Here the authors attribute to Nemhauser the idea that optimisation 'can be applied in decision settings where there is a single criterion to base a decision on (such as cost)'(Nemhauser, et al. [13]). It would be relatively easy to include other criterion such as ethical worth, contribution to society, and so on.

Also, in this section, they refer to the development of 'GIS-based models'– a natural for eco-informatic systems. Given the recent problems that Google earth has had with privacy, identity theft, and the like it would be prudent to include such considerations in the constructions of such systems. See the Professional Ethics in engineering Forum [4] and Stephen and Cizek [16] for contemporary discussions of such ethical matters.

In the last example for this section of their paper, the authors are right to say:

> Another important point related to the various decision-making tools and approaches cited above as well as others falling in the domain of eco-informatics is that often variables used in computer-based models (such as multi-attribute decision models) are set to subjective values. These models may contain uncertainties, either because subjective scoring or are based upon some data or model output that contain some level of uncertainty. It is therefore an important question how the final ranking of alternatives are sensitive to the changes of input parameters contained within the decision model and how uncertainties are communicated to the user through analytic tools.

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This is a perfect opportunity to introduce ethics into the discussion. It is not enough to simply say that communication with users is an important question. Here, they might say that it is not only an important question but rather it is a moral imperative to communicate the user so they can make the most fully informed choice, so they can give real, meaningful, informed consent.

C. Politics

The authors then touch lightly on the important topic of the use of eco-informatics for political ends.

> some scholars lament the fact that various eco-informatics-based tools, computer-based models and information are utilized as 'weapons in political and policy warfare,'while others accept this supporting role

There is insufficient space in this paper for a full examination of the ethical implications of this statement. Suffice it to say that introducing the ethics of such use is very important. Eco-informatics researchers ought to have strong well thought out moral stances to these kinds of uses of their work and these stances ought to be communicated through their writing.

D. Complexity

Also in this part of their paper the authors say that:

> Others worry about the complexity of eco-informatics-based computer models and decision makers' abilities to understand them.

This fits in nicely with the previous discussion that eco-researchers ought to strive to enable users of their work to be able to take informed decisions, to give informed consent. They could easily stress the ethics of such enabling writing.

E. Context

In the graph of the main part of their paper, the authors make the important point that:

> it is probably the case that developers of eco-informatics tools develop these methods without too much concern for the context in which such tools will be applied to decision making. Developers may focus more on getting the tool right (scientifically) and concentrate less on how the tool might be used or abused in particular decision-making settings

They present this in a neutral way: it ought not to go uncommented. They could to make the much stronger point that the developers have significant and important duties to the users, and society at large, for the responsible use of their efforts. The authors have an excellent opportunity to show the ethical urgency of changing this sort of attitude. Developers ought to be concerned about the context in which their tools are used.

V. Conclusion

I have shown that ethics does not get a serious examination by eco-informatics researchers and hence by social eco-informatics researchers. I have argued that ethical deliberation ought to be in the forefront of all researchers thoughts. Also, I have shown that with some reflection it is straightforward to put ethical deliberation into an eco-informatics research paper.

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