

APPLICATIONS OF NARRATIVE ETHICS TO ENGINEERING

Marion Hersh¹, Larry Stapleton² and Deborah Duffy²

Electronics and Electrical Engineering¹

University of Glasgow, Glasgow G12 8LT, Scotland.

Tel: +44 141 330 4906. Fax: +44 141 330 6004. Email: m.hersh@elec.gla.ac.uk

Information Systems, Organisational Learning Research Group²

Waterford Institute of Technology, Waterford, Republic of Ireland/

Tel: 353 (0)51 302059. Fax: + 353 (0)51 378292. Email: LSTAPLETON@wit.ie

Abstract: Since information and communication systems provide the underlying infrastructure of modern society, ethical behaviour by engineers, computer scientists and others working with and developing these systems is central to social stability. At the same time there is a range of increasing pressures and temptations to behave unethically or, at the least, to cut corners. Despite the very welcome development of codes of ethics or professional conduct by a number of engineering and other professional societies, there is still a lack of support mechanisms for engineering and information technology professionals who want to behave ethically. Narrative ethics provides an alternative view of ethics in which codes of ethics are de-emphasised in favour of a process-based approach. This paper unpacks this concept and proposes narrative ethics as an important way forward in the ethics debate for engineering and social stability. *Copyright © IFAC 2005.*

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1. INTRODUCTION

Western economies are now entirely reliant on complex information technology infrastructure at the institutional and increasingly at the personal level. At the institutional level the infrastructure seeks to deliver control systems and stability in commerce, government and a wide range of other institutional activities. The ubiquitous nature of information and communications technologies in particular implies that the key design decisions engineers and technologists make about these systems will have a major impact upon society, including social stability. This paper is particularly concerned with the ethical decision-making processes which accompany the design and development of ICT and other ubiquitous technologies. Recent evidence suggests that systems engineers, especially in information systems development, are not explicitly aware of key ethical questions, or the importance of ethics in their work

(Devereux, 2004). There are even more serious problems associated with the (lack of) support available to technologists who have ethical concerns about the systems they are developing, the methodologies used or other aspects of their work. It is very hard for engineers to 'blow the whistle' on projects, and 'heresies' (new paradigms) and 'dissidence' (challenges to existing paradigms and/or power structures) are often actively discouraged, both in higher education and the work place (Stapleton and Hersh, 2004; Hersh and Moss, 2004; Hersh, 2002a).

There is evidence that the process of Western global technology development is leading to increased bureaucratisation in which technology is determining how people should live out their daily lives. This bureaucratisation has been described as dehumanising and therefore will create fault-lines across the dynamic stability that is society (Stapleton and Kile, 2005; Stapleton and Murphy, 2003).

2. ETHICS AND HUMAN-CENTRED SYSTEMS

Debates on ethics in engineering, information systems development and other related fields are central to the healthy unfolding of technology development and its application to remove social inequality. Codes of ethics have been drawn up which embody a view of engineering professionalism. However, though codes of ethics are important, reliance on codes of ethics alone is not sufficient for modern engineers. Some of the deep structures within engineering discourse can act as barriers to an authentic ethics for engineering in a global context (Stapleton and Hersh, 2003). In addition, it is now recognised that the introduction of a new technology can have such a profound impact upon the organisation or society that an entirely new system is created during the implementation process. This hybrid system, comprising social, technical and other components, must itself be carefully designed in terms of learning support and sense-making processes (Stapleton, 2003ab; Mills, 2003; Checkland, 1999). This implies complex negotiations and other social interactions which must, in turn, be informed by an ethical process which is sophisticated enough to cope with such complexity.

2.1 Human Centred Systems and Ethics

Human centred systems approaches have a long history within the automation and control engineering literature, stretching back into the 1970s. Kling and Star (1998) stated that human centred systems are:

- Based on an analysis of the task being performed by a human that the system is aiding.
- Monitor performance relative to human benefits.
- Developed to take human skills into account.
- Easily adaptable to the changing needs of the human users.

Therefore human centred systems are based on the social structures that surround the work and information being used by the individual and have been developed to complement the skills of the user (Kling and Star, 1998). A summary of recent European experience in one specific application domain is given by Brandt and Cernetic (1998). Human-centred design and development within control engineering have developed in response to the growing complexities and interdependencies of organisational and technological systems. Indeed, as Brandt, one of the central thinkers in human-centred systems engineering for the past thirty years, has said:

1. People first
2. Organisation second
3. Technology third.

It is readily apparent that this simple triad is driven by ethical considerations (for example Rose, 2004;

Bitay and Brandt, 2004), and has deep implications for the functionally rationalistic methodologies which currently dominate engineering design and delivery. Therefore, engineers utilising human-centred design concepts must engage with humans in order to design and deploy new technologies. This will require complex negotiations and in depth discussions of what is being done, why and even whether it should be done. In short, human-centred systems require a narrative and dialogue based approach to technology deployment.

3. THEORIES OF ETHICS

Since human-centred design and deployment require narrative and dialogue, ethical considerations must also be framed in these terms. There are a number of different theories and philosophies of ethics, which are often associated with rules or principles of ethical behaviour. These approaches are most commonly divided into:

- Consequentialist, which focuses on the consequences of actions, regardless of motivation or other factors.
- Deontological, which is based on consideration of duties and obligations, independently of consequences.

Another approach which is commonly used, for instance in medical ethics, is normative ethics, which is based on the principles of autonomy, beneficence and (distributive) justice. Further approaches include:

- Virtue ethics which supports actions which build good character and focuses on the effect of the action on the person carrying it out.
- The ethics of care which is a context based approach to preserving relationships (Gilligan, 1982).

The authors (Hersh 2002ab) have discussed the deficiencies of applying each of these theories on its own and the need for a multi-faceted approach based on a combination of the different philosophies, which can highlight different aspects of the problem and reflect the complexities of designing and delivering modern systems. The combinatory approach to ethics has the advantage of giving a much fuller picture of all the different ethical issues and perspectives. However it is frequently the case that the application of different ethical theories leads to different conclusions with regards to appropriate action. For instance, consequentialism often gives different recommendations for action from deontological or virtue ethics. Therefore it is generally necessary to make value judgements in order to reach decisions.

It is often useful to put ethical decisions in a wider context, which recognises that ethical issues are not just a matter of individual concern, but often arise out of a wider organisational and social context. One approach to doing this is based on multi-loop action learning (Nielson, 1996; Hersh, 2004ab). Single loop action learning is about changing behaviour,

rather than values, whereas double loop action learning involves changes in values (generally of individuals) as well as behaviour. Triple and quadruple loop action learning respectively involve changes in the underlying tradition or ethos of the organisation and society, as well as changes in values and behaviour. Thus, this structure highlights the ethical responsibility to make changes at the organisational and societal level in order to lead to an organizational and societal ethos which encourages ethical behaviour and does not put barriers in its way. However such changes generally occurs slowly, so it will generally be necessary to also look at changing behaviour and attitudes at the individual level.

Phenomenological research approaches applied to engineering design show that an understanding of the technology stakeholders' deep level assumptions and subjective life views can be used to understand the impact of a technology in an organisational space. For example, some authors have suggested that information systems development is primarily a hermeneutic process in which we engage various stakeholders in an attempt to understand and make sense of the complex set of constraints, subjective life-worlds and human experiences which impinge upon the technology design and delivery process (Boland, 1985; Boland and Day 1989; Myers, 1995). This idea of a hermeneutic of systems design and development implies a narrative approach to ethical considerations. It emphasises the importance of the stories and experiences of both systems engineers and the users they seek to support. Although longitudinal studies will be required to provide a rich set of data on which to base conclusions, dialogue based approaches have been developed for the key problems associated with, for example, requirements engineering (for instance Mumford, 2000).

The availability of a space within which users (for example) can explore and share their previous experiences of technology adoption within the organisation in turn provides a forum for working to avoid design flaws and process problems. Given that ethical violations at any level could contribute to systems failure, this approach would seem to hold merit both in the immediate life of the individual project, and the more generic direction of technology development. It is then a short step to a narrative approach to ethics which can practically inform systems engineering project work. This implies a view of ethical decision making which goes beyond a reliance upon codes of conduct, to something more dynamic. In short we need to address the complex question: for technologists and engineers, what is an appropriate ethical decision making process in the context of the complex negotiations often associated with technology development and deployment?

4. ETHICAL DECISION MAKING

Ethics and ethical decision making are often treated as being about discrete actions and decisions rather than processes which are embedded in systemic structures. Sensemaking processes have been shown to be a success factor in technology development and deployment. Sensemaking processes are typically cyclic in nature and comprise learning activities by which people adapt to stimuli in the field of the technology project (Stapleton, 1999; Weick, 1995). In these sensemaking cycles, people create their own identities and learn to adapt effectively. However sensemaking often focuses on the details of decision making and information processing activities rather than values and ethics. What is needed is an approach which will enable us to develop theory and, ultimately, methodology and processes, which inform engineering ethics as a process.

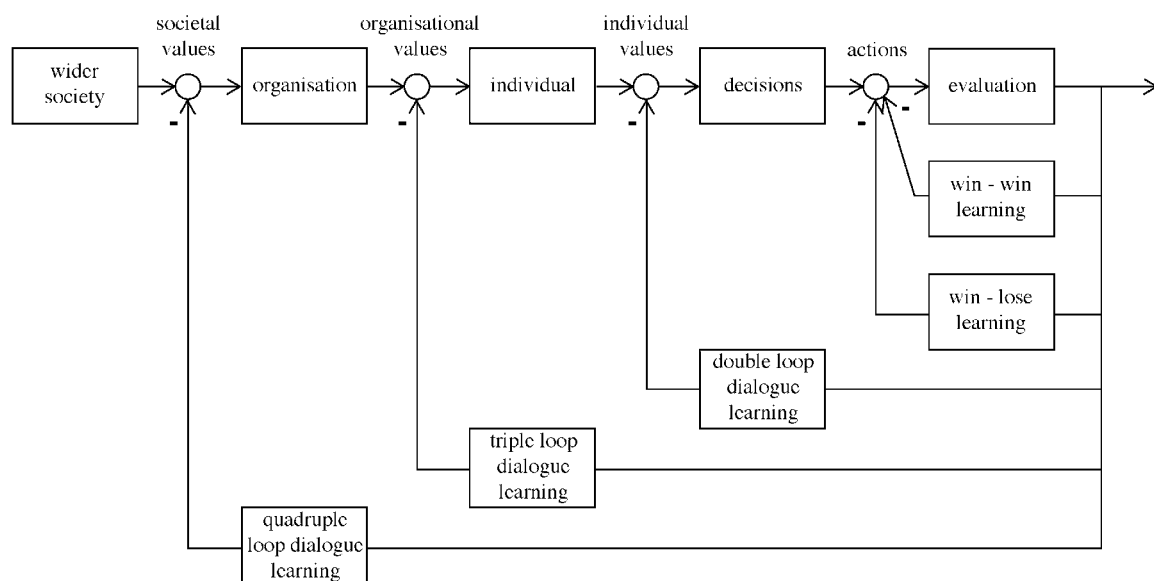


Figure 1, Multiloop Action Learning

Multi-loop action learning (Nielson, 1996; Hersh, 2004ab) shows the importance of considering systemic values and process. Another approach which also stresses these two factors is narrative ethics, for instance (Charon and Montello, 2002; Widdershoven and Smits, 1996). To date there has been little if any work on the consideration of the ethics of engineering and information systems in terms of narrative ethics. One of the areas in which there is a body of work on narrative ethics is nursing, for instance (Lindsay and Graham, 2000; Sørli et al, 2004). The lessons from this work can also be applied to engineering. The human relationship i.e. between nurses and their patients was for a long time the most important. Technology is now being introduced into nursing and may change its nature, not necessarily for the better (Marck, 2000). For a long time the focus in engineering and information systems was on the technological system. However there is increasing recognition of the importance of human centred design and that the satisfactory performance of technological systems may even require the subordination of technological specifications to the needs of the people involved. One of the interesting points in the literature on narrative ethics and nursing, it that nurses tend to use narrative approaches to ethics, whereas doctors prefer the application of rules and principles, generally autonomy, beneficence and/or non-maleficence (Widdershoven and Smits, 1996). There are a number of possible explanations, including the fact that nurses are generally more closely involved with their patients as people, whereas doctors may tend to focus on particular conditions or diseases. If this is the case, then there is an implication that narrative ethics may be particularly appropriate for human centred approaches to engineering, as they encourage a people-centred rather than technology-centred approach.

4.1 Loop Learning and Narrative Ethics

Narrative and rule based approaches to ethics should not be considered to be in opposition, but rather to complement each other. In addition there can be benefits in applying multi-loop action learning to encourage the development of further layers of the narrative. This reflects very closely the phenomenological systems research developed by interprevists in the information systems area. Narratives are often about the relations between individuals, but these relations take place within and are often conditioned by the ethos of an organisation and/or the wider social context. For example a discussion of the use of narrative ethics to obtain insurance funding for rehabilitative exercise treatment does not consider the wider ethical question of why individuals in the US have responsibility for obtaining funding for their own treatment rather than this being considered a societal responsibility (Lindsay and Graham, 2000).

This implies a need for narrative ethics which considers the whole narrative in the context of the complex relationships involved in a technology project. This should thus range from relations between individuals and individuals and technology through their relationship to their organisations and on to relationships in the societal and global contexts. There is then a role for multiloop action learning in examining how the different levels give rise to different ethical problems and what types of leverage can be used to modify the different contextual levels to develop an ethos which encourages ethical practice. The next section of this paper presents a case study which demonstrates how an ethical process was established through a narrative based approach.

5. CASE STUDY

One such study where ethics played a major role was in the design and provision of support for students with a learning disability at an institute of technology in Ireland. The ongoing study aims to develop a framework of 'best practise' for the provision of and support for the use of assistive technology within the Irish third level education system. The study identifies the need for the provision of assistive systems i.e. systems which include all elements of support, of which the technology itself is only one of many, together with the delivery of individually tailored training in how to use the technology, learning and study skills support, psychological support, procedural support and on-going peer support. In this way the study adopts a 'human-centred design' perspective rather than focusing on the technology itself in isolation (Brandt and Cernetic, 1998).

The main ethical issues, apart from those faced by any research project, were privacy and access. The question of privacy stemmed from the fact that, to a certain extent, dyslexia can be considered an invisible disability. By participating in the study, which involved group work, students were allowing themselves to be identified by their peers. Several earlier initiatives which attempted to use group work to support the students within the Institute had failed. This was as a direct result of students' unwillingness to participate and thereby be recognised as being dyslexic. It was recognised that a human-centred systems approach would require a process by which ethical considerations were carefully negotiated and managed. Codes of ethics alone would not be enough to inform the approach that the design team needed to adopt.

In order to address this issue, all potential participating students were met initially on a one-to-one basis, during which the purpose and rationale for the project was outlined to them. Students were informed that training would be carried out in a group setting and that their participation in peer support

through on-line discussions, facilitated by WebCT, would be a requirement. While the percentage of potential students who agreed to be involved was high at 90%, in no case were the issues of group work or privacy cited as reasons for non-participation. Furthermore, students not originally approached to participate in the study later requested involvement, having been made aware of the study from students who were already taking part and were advertising its merits. While the findings of the study are not yet conclusive, it has been very apparent throughout that students are benefiting from the interaction with and support from their peers.

Another issue that had to be addressed was that of access. Due to the Data Protection Act, and very real ethical considerations regarding confidentiality, it was impossible for the researcher to gain access to student files and thereby identify the study population. While the Institute identified that research was needed in the area of assistive technology provision and support for dyslexic students, it was not in a position to make available a list of dyslexic students. The department responsible for the support of students, together with the researcher, spent considerable time and effort trying to identify a viable resolution. Suggested solutions were to contact every member of the student body or alternatively to post notices around the campus advertising the study and requesting potential participants to contact the researcher. Neither suggestion was appropriate; the first was not viable or realistic due the size of the student body, while the second suggestion was inappropriate given the nature of the disability concerned and a possible violation of privacy. Both suggestions also relied on the students taking the initiative and perhaps overcoming anxiety about getting in contact and involved, which it was feared would lead to a very low response rate.

Ultimately, it was decided that the outcome of the research would directly benefit the department and the Institute in their attempts to support the students, regardless of the findings. As a result it was a feasible option for the Institute to employ the researcher to carry out the research and to put the assistive system in place as part of the support infrastructure for these students. As a member of staff within the department (which operates under a strict confidentiality agreement with each student) the researcher would be entitled to access to student records, without infringing on the student's right to privacy or jeopardising the confidentiality agreement entered into. In turn, the researcher was not placed in a position of conflict of interest as there would be no input from the department as to the direction of the research or its findings.

While addressing the ethical issues and concerns relating to this study took a considerable amount of time and effort from all parties involved, the

processes put in place have been directly beneficial to the study and all participants, in the following ways:

- The project was inspected and passed by an ethical clearance committee from the Institute on two occasions. This is normally a one-off occurrence but due the sensitivity of the project, stricter controls were put in place in order to protect the interests and safety of all stakeholders.
- Real and in-depth reflection was given to every aspect of the research in terms of all ethical considerations.
- Participating students were supplied with a document which provided very detailed information about the study and in particular the impact it would have on them. Students who agreed to participate were asked to sign a participation agreement document which ensured informed consent.
- Students were prompted to consider and given a 'safe' forum to discuss the benefits and, in some cases, fears which stem from being identified as having dyslexia.

It is evident that the complexity of the ethics concerned here could not have been managed by a strict code of ethics alone. There was a deep need for all involved to negotiate goals, objectives, plans, and operations, in short, the entire research design. This had to be achieved in the context of extremely sensitive data and could only be addressed through a narrative approach by which an ethical process was established, negotiated and modified as new issues arose or old issues shifted. It was important to return to the research design as an ethical process again and again to ensure that the research navigated an ethical course.

The narrative approach to ethics encouraged a wider perspective which centres on the needs of the people involved, in this case of the dyslexic students to maintain their privacy and dignity while obtaining the benefits of involvement in the study and of the researcher for access to a group of dyslexic students for the study without violating their privacy. Since the narrative approach is process based, it encouraged a continuous re-evaluation of the ethical issues involved and how they were being treated. This means both that new ethical issues can be introduced at any point and that the approach to dealing with particular ethical issues can be changed at any point. This is advantageous, as it encourages all stakeholders to consider ethics as an ongoing process, rather than something which is dealt with at the start of a project and then forgotten. It also makes it unnecessary to try and foresee all potential ethical dilemmas in advance and allows different approaches to resolving these dilemmas to be tried out.

6. CONCLUSIONS

It is readily apparent that narrative ethics centred upon multi-loop learning models provides a sensemaking process which can help address the complex ethical considerations involved in engineering and systems development and deployment. It has real potential in terms of methodology and practise, as well as curriculum development. Approaches could include the use of narrative ethics 'diaries' to encourage engineering and other students to become more aware of and reflect on ethical issues in projects and other practical contexts. However, very little work has been done to either test or debate these ideas within the engineering, information systems, project management or related literatures. This paper is an attempt to initiate this debate, as well as to illustrate the advantages of the narrative approach, including through application to a case study of the provision of human centred support systems involving assistive technology to dyslexic students. The underlying theory will be developed further in subsequent work.

REFERENCES

- Bitay, B. and D. Brandt (2004). The global validity of ethics: applying ethics to engineering and technology development. *Int. Multitrack Conf. of Advances in Control Systems*, Vienna
- Boland, R. (1985). Phenomenology: A Preferred Approach to Research on Information Systems, In: E Mumford et al. (eds), *Research Methods in Information Systems*, Elsevier North Holland: Amsterdam 193-201.
- Boland, R. & Day, W. (1989). The experience of systems design: a hermeneutic of organisational action, *Scandin. J. Management*, **5(2)**, 87-104.
- Brandt, D. and J. Cernetic (1998). Human-centred approaches to control and information technology: European experiences. *AI & Society*, **12**, 2-20.
- Charon, R. and Montello, M. (2002). *Stories Matter: the Role of Narrative in Medical Ethics*, Routledge.
- Checkland, P. (1999). *Systems Thinking, Systems Practise*, Wiley: New York.
- Devereux, N. (2004). Information Technology Professional competence: An Empirical Study of Irish Higher Education, M.Sc. Thesis, WIT, Republic of Ireland.
- Gilligan (1982), *In a Different Voice*, Cambridge, Mass., Harvard University Press
- Hersh, M.A. (2002a). Whistleblowers – heroes or traitors?, *Ann Reviews in Control*, **26**.
- Hersh, M.A. (2002b). Ethical analysis of automation: a comparison of different ethical theories through case studies, *15th IFAC Congress*, Barcelona.
- Hersh, M.A. (2004a). Ethical issues in assistive technology, Tutorial Session, *CHVI 2004*, Granada, Spain.
- Hersh, M.A (2004b). Technology development and ethical decision making *Int. Multitrack Conf. of Advances in Control Systems*, Vienna.
- Hersh, M.A. and G. Moss (2004). Heresy and orthodoxy, *J. Int. Women's Studies*, **5(3)**.
- Kling R and L. Star (1998), Human centred systems in the perspective of organisational and social informatics, *Computers & Society*, **28(1)**, 22-29.
- Lindsay, R. and H. Graham (2000). Relational narratives, *Nursing Ethics*, **7(2)**, 149-157.
- Marck, P. B. (2000). Recovering ethics after 'technics', *Nursing Ethics*, **7(1)**, 5-14.
- Mills, J. (2003). *Making Sense of Organisational Change*, Routledge: London.
- Mumford, E., 2000, A socio-technical approach to systems design, *Requirements Eng.*, **5**, 125-133.
- Myers, M.D. (1995). Dialectical hermeneutics: a theoretical framework for the implementation of information systems, *Inf. Sys. J.*, **5**, 51-70.
- Nielson, R.P. (1996). *The Politics of Ethics*, OUP.
- C. Rose (2005). Towards mutual understanding in global moral conflicts, *Int. Multitrack Conf. of Advances in Control Systems*, Vienna.
- Sørli, V., A. Larsson Kihlgren and M. Kihlgren (2004). Meeting ethical challenges in acute care work as narrated by enrolled nurses. *Nursing Ethics*, **11(2)**, 179-188.
- Stapleton, L. (1999). Information systems development as interlocking spirals of sensemaking, In: J. Zupancic et al. (eds.), *Evolution and Challenges in Systems Development*, Kluwer Academic/Plenum.
- Stapleton, L. (2003a). Information systems and automation technology as social spaces, In: D. Brandt. et al., *Human Centred Issues in Advanced Engineering*, Elsevier: North Holland.
- Stapleton, L. (2003b). Information systems development as folding together humans & IT, In: J. Grundspenkis et al.(eds.), *Information Systems Development*, Kluwer/Plenum Press: NY, 13-24.
- Stapleton, L. and M.A. Hersh (2003). Exploring the deep structure of ethics in engineering technology: *SWIIS '03*, Waterford, Ireland.
- Stapleton, L. and M.A. Hersh (2004). Technology development and ethical decision making, *International Multitrack Conference of Advances in Control Systems*, Vienna.
- L. Stapleton and Kile, F. (2005). A post-structural analysis of progress in engineering, *Control Sciences*, to appear.
- Stapleton, L. and C. Murphy (2003). Revisiting the nature of information systems, *Trans. of International Information Systems*, **1(4)**.
- Weick, K (1995). *Sense-making in Organisations*, Sage Publications: Thousand Oaks, U.S.
- Widdershoven, G.A.M. and M.-J. Smits (1996). Ethics and narratives, In: R. Josellson (ed.), *Ethics and Process in the Narrative Study of Lives*, 275-287, Sage Publications.

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