Ethical Assessment of New Technologies: A Meta-Methodology in
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Abstract

Research Paper

Purpose
This paper sets out a structured meta-methodology, named DIODE, for the ethical assessment of new and emerging technologies. DIODE has been designed by a mixture of academics, governmental people and commercial practitioners. It is designed to help diverse organisations and individuals conduct ethical assessments of new and emerging technologies.

Design/methodology/approach
A framework discussion paper was developed for consultation to ensure that DIODE addresses fundamental ethical concerns, has appropriate and manageable scope and is comprehensive in its ethical compass. The resulting DIODE meta-methodology uses flowcharts and templates, encompassing the use of diverse tools and techniques.

Findings
There are two different angles for the ethical assessment of new technologies; a strategic/abstract angle and a project/application specific angle. DIODE includes two channels to accommodate this distinction. Early stage testing yielded positive feedback and mostly favourable comment. Additional guidance materials are being developed in response to the feedback.

Practical implications
Without training and guidance, it is difficult for technologists to take ethical concerns into account during the development and deployment of new technologies. DIODE can provide that training and guidance through a practical meta-methodology which should help ICT professionals, policy makers and academics.

Originality/value
There is very little structured methodology material available on the ethical assessment of new technologies. The depth and sophistication contained in DIODE is therefore believed to be unique. DIODE provides practical help while remaining rooted in the philosophical and theoretical concepts of ethics.

Keywords: Ethics, Framework, Meta-methodology, Technology, Assessment

1) The Need For Such A Meta-Methodology

This paper sets out a meta-methodology, named DIODE, for the ethical assessment of new and emerging technologies. The idea emerged from the work of BCS, The Chartered Institute of IT, Ethics Strategic Panel. The Panel has a broad brief, to examine from a strategic viewpoint any ethical issues that might affect BCS members, their organisations and the information technology sector generally. The Panel comprises a mixture of academics, industry experts and government ICT specialists; the present authors comprise a subgroup of that Panel and represent that mixture.

Several concerns led the Panel to investigate a framework for ethical assessment of new technologies which led to the development of DIODE. The Panel was being asked to consider the ethical issues involved in many different types of new technology, yet it seemed more appropriate that the commercial and governmental people who were asking these questions of the Panel address those ethical issues themselves. It became apparent that most of the appropriate people, including the members of the Panel, were ill-equipped and untrained in this form of ethical assessment and decision-making. The nature of the Panel's remit, in particular its strategic nature and the breadth of interests that BCS covers, led the Panel to seek a generic framework or meta-methodology to help address these concerns. Such a meta-methodology could be used to equip and train people to assess the ethical dimensions of technological ideas and projects from the standpoints of the various interests; commercial, governmental and academic.

Initially it was envisaged that suitable frameworks and meta-methodologies could be found to use and/or adapt. However, research yielded very little existing material which could be described as an ethical assessment meta-methodology, although there are high-level frameworks in related areas (Fisher & Lovell, 2003, pp. 138-9), (Jeurissen, 1997, pp. 246-254), (Gotterbarn & Rogerson, 2005, pp. 730-750) and several helpful papers (Battye et al., 1999), (Mason et al., 1995, pp. 109-148), (Harris & Mainelli, 2001), (Moor, 2005, pp. 111-119), (Rundle & Conley, 2007) that provided vital input into the work.

Health technology assessments (HTAs), for example, is a related field which lends itself to structured, methodological assessment, but although ethical analysis forms

part of HTA, cost-benefit analysis (or "value for money") is the main issue (Banta, 2004). While it is recognised that such technology assessments should include ethical reflection, the role of that ethical reflection depends on the problem situation (Decker, 2004). Further, the need for ethical enquiry remains a methodological and conceptual challenge in the HTA field (Reuzel et al., 2004), while the integration of ethical dimensions into HTA reports remains limited (Sacchini et al., 2009).

The term "ethical framework" is often used in the context of environmental ethics, but tends to be using that term to refer to an environmental model such as I = PAT (Gupta, 2009) or social impact assessment processes (Howitt, 2005), rather than a methodological framework with potential for use in a variety of ethical assessments of new technologies. Similarly, there is a substantial body of literature on participatory Technology Assessment (pTA) and constructive Technology Assessment (cTA). Attempts at pTA and cTA methodologies have not been clear and straightforward, because they are seen to need customisation for each specific project (Hennen, 2002). Significant benefits can accrue from such bespoke methods, not least improved democratisation of decision making in technology assessments (Genus & Coles, 2005) and technical designs with improved responsiveness to social concerns (Schot, 2001), but the need for a professional ethicist to design the process is generally identified (Reuzel et al., 2004).

The absence of a meta-methodology suitable for technologists to use in diverse circumstances indicated that something workable should be developed, as such a meta-methodology would be very useful, not only to BCS but also to many communities beyond the BCS.

2) Anchoring The Meta-Methodology

Virtue ethics, which is an important seam of ethical theories, should be covered by professional codes of practice and conduct such as those deployed by BCS, (see Figure One below) and is therefore outside the scope of the meta-methodology itself. The meta-methodology can nevertheless be designed on the assumption that users of the methodology will operate the meta-methodology in the context of such codes of practice and conduct. The meta-methodology should take account of classical ethical theories, both deontological and teleological, in order to determine what the underlying moral problems might be, while forming a bridge with the

pragmatics of technological innovation and design (Albrechtslund, 2007). Such philosophical analysis is needed to draw out all the relevant ethical issues, some of which might be non-obvious (Moor, 1985), (Rundle & Conley, 2007) or unpredictable at that stage (Albrechtslund, 2007). Yet, the end product would also need to be a practical guide and tool for people who are not accustomed to grappling with ethics. In particular, professional practitioners are often not familiar with the challenges of applied ethics, which are conceptually quite distant from the ICT professional's regular professional domain. John Dewey, founder of pragmatism ethics, sees no difference between ethical decision making processes and any other form of intelligent decision-making process, which he believed should always be deliberative (McVea, 2008). It was therefore decided to adapt tools and techniques used in deliberative forms of strategic organisational decision-making. While such methods tend to be anchored in utilitarian analysis (Banta, 2004), deliberative methodologies lend themselves to adaptation; in this case to ensure that deontological ethics as well as teleological ethics are taken into account.

In itself, blending teleological and deontological ethical assessment into systems planning is not novel; Critical Systems Heuristics (CSH) spans a wide range of issues, starting from the philosophic to the pragmatic implementation of systems methodologies to solve problems (Ulrich, 1983). CSH applies systems thinking not as a science of "how to do things" but as a practical philosophy which helps us determine "what we ought to do", recognising the wider contexts of power, interests, motivations, proposals and counter-proposals (Mainelli, 2006). Yet, the meta-methodology sought should be comprehensible to generally intelligent business decision-makers, technologists, inventors and system designers, as well as to people who have a solid grounding in ethical theory and professional ethicists.

Examples of technologies users of the meta-methodology might wish to assess include Radio Frequency Identity Devices (RFID), Smart Dust, Biometrics, Nanotechnology and Robotics. Each one of these technologies might be deployed for diverse purposes; the potential ethical implications of the deployment of such technologies are many and varied. The meta-methodology would need to be useful in assessing such diversity in practice, yet sufficiently anchored in ethical theory to

ensure that the requisite depth and breadth of ethical concerns and contexts could be addressed.

Therefore the meta-methodology needs to:

- address fundamental ethical concerns;
- have appropriate and manageable scope;
- be comprehensive in its ethical compass.

Fundamental ethical concerns

Whilst recognising the need to build upon ethical theory there is also the need to remain practical. It was therefore decided that normative instruments such as codes of ethics, international declarations and legal statutes would be a reasonable population from which to add elements of deontology to the teleological base of the decision-making meta-methodology. Given that most ICT relates directly or indirectly to humans, two normative instruments were chosen as the foundation. These were the Universal Declaration of Human Rights (UDHR) (United Nations, 1948) and the Charter of Fundamental Rights of the European Union (CFREU) (European Union, 2000), which has a great deal in common with the UDHR but also has some additional sections (e.g. Article 8, Protection of Personal Data and Article 37, Environmental Concerns) more clearly aligned with potential ethical concerns in respect of new technologies. The UNESCO study; Ethical Implications of Emerging Technologies (Rundle & Conley, 2007), while not providing a framework itself, does anchor its discussion in several articles of the UDHR and provided useful input for the research.

Detailed analysis of UDHR and CFREU revealed several fundamental ethical concerns which should underpin those elements of the meta-methodology that ensure that the user is considering the requisite breadth of ethical concerns:

- rights of individuals;
- educational rights and freedoms;
- non-discrimination rights;

- environmental concerns;
- justice.

The following table summarises the analysis of the fundamental ethical concerns and cross-references the relevant articles of CFREU and UDHR.

Ethical Concern	Relevant CFREU Articles	Relevant UDHR Articles
Rights of individuals	Article 3 – Right to the integrity of the person Article 6 – Right to liberty and security Article 7 – Respect for private and family life Article 8 – Protection of personal data	Article 3 Article 12
Educational rights and freedoms	Article 13 – Freedom of the arts and sciences Article 14 – Right to education	Article 26 Article 27
Non-discrimination rights	Article 20 – Equality before the law Article 21 – Non-discrimination Article 22 – Cultural, religious and linguistic diversity Article 23 – Equality between men and women Article 24 – Rights of the child Article 25 - Rights of the elderly Article 26 – Integration of persons with disabilities	Article 2 Article 7 Article 18 Article 19 Article 20 Article 21
Environmental concerns	Article 37 – Environmental protection	UDHR is silent on this subject
Justice	Article 47 – Right to an effective remedy and to a fair trial Article 48 – Presumption of innocence and right of defence Article 49 – Principles of legality and proportionality Article 50 – Right not to be tried or punished twice	Article 11

However, CFREU and UDHR do not cover all relevant fundamental ethical concerns. Ethical issues around environmental concerns, for example, go beyond the principles set down in CFREU and many of the technologies to be assessed might be intended to have positive impacts on the environment. Similarly the principles of justice a set out in the human rights documents tend to focus on state justice. Those state justice concerns might be relevant, but the justice concerns for assessing ethical issues in new technologies are more likely to involve the broader context of civil justice, such as power relationships between several commercial

parties (or between commercial parties and other stakeholders, such as states and/or consumers). Further, human rights documents, by their very nature, do not cover specific cultural and stakeholder group concerns, which can often form a significant subset of the ethical concerns surrounding new and emerging technologies (Battye et al., 1999), (Capaldi, 2005, p380), (Knapp, 2007, p36). However, the foundation created is believed to be sufficiently broad on which to base the first version of the meta-methodology.

Appropriate and manageable scope

Several relevant philosophical sources (Jeurissen 1997, pp. 246-254), (Fisher & Lovell, 2003 pp. 138-139) refer to governmental/organisational/ individual perspectives, which is helpful in determining the scope of the meta-methodology. In the matter of new technologies, most of the fundamental ethical concerns relate to governmental and organisational ethics rather than individuals' ethics; nevertheless it was agreed that all three perspectives, governmental, organisational and individual, should be included in the meta-methodology.

A further set of approaches focuses on three levels of embedding technologies (Introna, 2005) artefact/social constructivist/phenomenological. Each informs the ethical view as follows:

- In the artefact view, technologies are perceived as tools to assist society. You look at the ethical impact of the use of that particular new technology, using existing moral constructs. The UNESCO approach to emerging technologies essentially uses this view (Rundle & Conley, 2007). The assessment of positive as well as negative ethical issues in the UNESCO paper seemed compelling; the framework therefore focuses mainly on this view, while also recognising Kranzberg's first law of technology – "technology is neither good, nor bad; nor is it neutral" (Kranzberg, 1986, p544). Developing, implementing and using technology is never a value-free act (Van den Hoven, 2007). There is always some disruption, whether at the macro-scale examining changes in societal practice, or at the micro-level of emergence of new technologies into a relatively bounded environment;

- In the social constructivist view, technologies and society are perceived to construct each other conjointly. You build ethical assumptions and concerns into the design and implementation of the technology. This approach looks at co-participative development and appropriation - for example in how the data networks were appropriated for email against everyone's expectations in the 1970s to early 1980's, or how (to the service providers' surprise) teenagers adopted SMS texting for messaging. In this approach one cannot talk of a 'technology' but only of interdependent systems resulting in mutually dependent ensembles as a result of 'unintended consequences and unanticipated possibilities' (Wajcman, 1995). The ethical thinking in this approach tends to focus around the indeterminacy of an emergent future and so the dynamics of technologically-introduced change (Leonardi & Barley, 2008), (Clausen & Yoshinaka, 2004). The framework allows for the social constructivist view, where relevant. For example, the ability to deploy project/application specific assessments where relevant, in addition to or instead of strategic abstract assessments (see Section 3 below) enables the user to return to a particular technology if a new specific use of the technology emerges;

- In the phenomenological view, technologies and society are perceived to coexist as a single phenomenon. You examine the ethical context which led to the emergence of a particular technology or technologies. You also interrogate the underlying assumptions about and attitudes towards the ethical domain. The concept is that most modern human practices and relations tend to entail some kind of technological or material mediation and so deny that there is an ontological separation that allows a position on which to stand in order to ask such questions about impacts, affects and unintended consequences. Instead, it is argued we need a 'relational ontology that dissolves such analytical boundaries between humans and their technologies' (Orlikowski & Scott, 2008). This philosophical perspective only has limited relevance to new technologies that have yet to enter society; consequently it is not directly included in the framework. However, societal attitudes can influence the technologies that are likely to emerge. The meta-methodology therefore strongly encourages wide consultation, public engagement and debate, which does to some extent identify and challenge underlying assumptions and attitudes.

Finally, there is the distinction between strategic/abstract technologies and specific applications/projects. Should the meta-methodology be deployed "top down" when considering emerging technologies from a strategic/abstract point of view, or should it be deployed "bottom up" when considering a specific project/application? It was decided that the meta-methodology should be capable of assisting with either and/or both of those problem domains, while recognising that the meta-methodology would need to offer two distinct channels to enable it to be appropriate for both strategic/abstract and project/application assessments. The distinction between these channels and a flow chart to help users to choose the appropriate assessment routes are set out in Figures One and Two in Section 3 below.

Comprehensive ethical compass

In attempting to provide an accessible method for ethical reasoning, there are four fundamental questions, combining the two main classical ethical traditions (teleological and deontological), to provide a focus for information management (Mason et al., 1995, p115):

- Who is the agent? (including their motives, interests and character)
- What action was taken or is being contemplated?
- What are the results or consequences of that action?
- Are those results fair or just?

These questions seem to be suitable for many types of ethical decision making (not just new technologies). The Mason et al. model also provides some helpful guidance on when an ethical decision needs to be made; described by the authors as a "moment of truth". The Ulrich model, considering sources of motivation, control, expertise and legitimation is also relevant to the meta-methodology when considering the breadth of stakeholders to consider (Ulrich, 1983). However, for assessing new technologies, many relevant ethical questions will necessarily be more abstract. The identity of all relevant agents might not be determined. Some of the possible actions might be unknown and the possible results highly uncertain.

Answering questions of fairness and justice based on a range of possible outcomes is a valid approach (Duquenoy & Thimbleby, 1999), but is probably not sufficient on its own.

The product of this approach is therefore more a meta-methodology than a framework, enabling the user to deploy appropriate tools, techniques and frameworks of their choosing, depending upon the ethical questions that require answers.

3) The DIODE Meta-Methodology

It is recognised that professional activity comprises two components; the process of work and the product of work. Process is concerned with promoting virtuous action through, for example, codes of conduct, whilst product is concerned with technological integrity through embedding ethical norms (Rogerson, 2010). It is the latter on which the meta-methodology focuses.

This section outlines the five stage meta-methodology which emerged from the initial research. It is named DIODE to reflect the five stages: Definitions, Issues, Options, Decisions, and Explanations:

- Define Questions: ensures that the assessor has defined the technology or project to be examined and is therefore able to frame the ethical questions.

- Issues Analysis: ensures that all relevant parties who might be affected are considered (and where appropriate consulted) and that the relevant risks and rewards are examined from both teleological and deontological perspectives.

- Options Evaluation: ensures that relevant choices are made. This is not merely a go/no go assessment; often the answer will be to go ahead with appropriate safeguards and/or checkpoints along the way.

- Decision Determination: ensures that the assessor can clearly state the ethical decisions made and reasoning behind them. It encourages the assessor to revisit minority interests at the stage before making the decision. The decision should include guidance on the circumstances which would lead the assessor to revisit the problem.

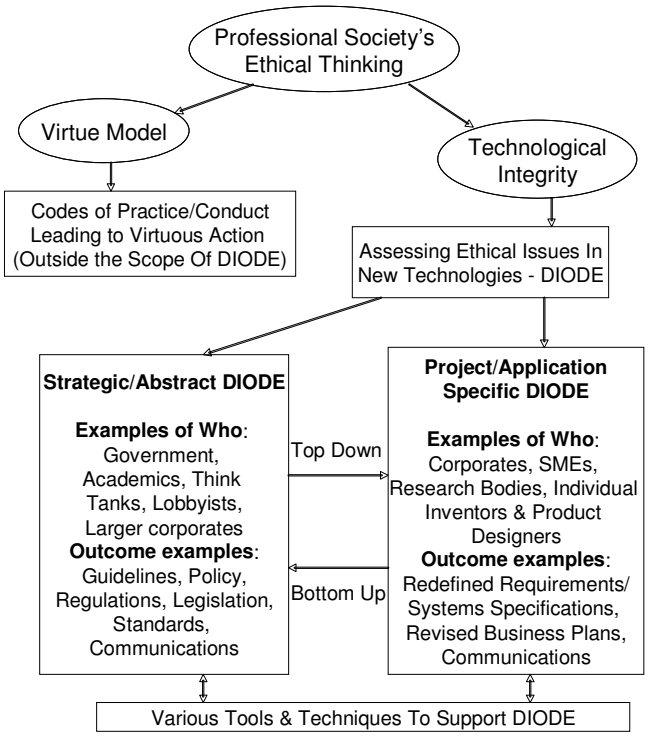
- Explanations Dissemination: ensures that the decisions are communicated appropriately, including public domain publication wherever possible.

Figure One illustrates the scope of ethical thinking in a professional society such as the BCS:

- process elements, following the virtue model line, are outside the scope of DIODE. Professional codes of practice and conduct are a vital element in a professional society's ethical thinking. The product elements (in this case, DIODE) are designed to accord with the principles contained in such codes and should be implemented accordingly,

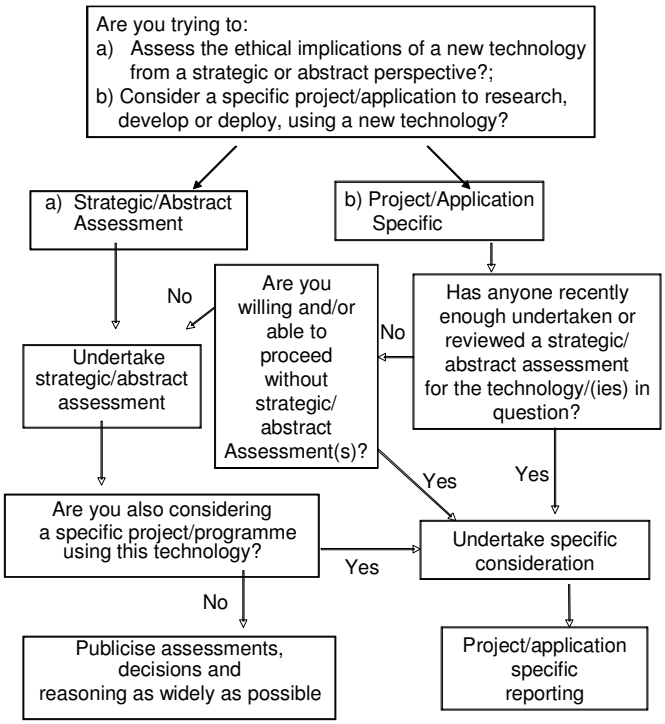
- product elements, following the technological integrity line, cover the scope of DIODE) , including the two channels of DIODE (described in the scope section above), examples of who might use DIODE in each of those contexts and examples of the sorts of outcome that might emerge from each type of DIODE assessment.

Figure One
Ethical Thinking in a Professional Society
Context and Scope of DIODE



A flow chart to help users to choose the appropriate assessment route(s) for their particular ethical decisions was developed. At a very early stage of a new technology, it is likely that a strategic/abstract assessment would be conducted. When a specific application or deployment of a technology is being considered, then the project/application specific assessment would be more appropriate. This in part addresses the issue raised above that the original strategic intentions of a new technology might become at variance with the specific deployment of the technology (Albrechtslund, 2007). The flowchart illustrating how to decide which type of assessment to undertake is set out in Figure Two below.

Figure Two
Ethical Assessment Of New Technologies Meta-Methodology Flowchart



The project/application channel of DIODE questions the user to ensure that sufficiently recent and relevant strategic/abstract assessment has been undertaken prior to a specific project/application consideration for the use of that technology. Sometimes a project/application specific user might decide that a strategic/abstract assessment is not needed; that might be the case if the technology in question is not especially novel but the user nevertheless wishes to consider the ethical

implications of a particular project or application. The flow chart covers each of these eventualities, guiding the user to undertake the appropriate route (or routes).

Most strategic assessments should end up in the public domain, as those assessments will often emerge from government and/or academic sources keen to promote public understanding. Most project/application specific considerations are likely to be (at least to some extent) commercially sensitive and reported only to appropriate stakeholders.

Each of the two channels, strategic/abstract and project/application specific, has a different checklist, although there is a great deal of commonality between the two checklists. It is not the purpose of this paper to set out the DIODE checklists and templates, but to illustrate the distinction between the two channels, the following extracts show the "define" sections of the strategic/abstract (Extract One) and the project/application specific (Extract Two) checklists respectively. Extract Two also shows the issues analysis section from the project/application specific checklist.

Extract One – Strategic/Abstract Assessment – Define Terms Section

STRATEGIC/ABSTRACT ASSESSMENT CHECKLIST								
File reference:			New Technology Name/Description:					
Ref	Action	Onus	Source/Reference Documentation	Destination Documentation	√ X	Comment and/or reasons if X	Initials	Date
DEFINE TERMS								
SA1	Have you identified a clear name for this new technology which would enable a reasonably informed layperson to recognise with relative ease the technology in question?			Terms of Reference				
SA2	Can you clearly describe the new technology in question?			Terms of Reference				
SA3	Can you readily identify whether related new technology ideas are within the scope or outside the scope of your definition?			Terms of Reference				
SA4	Can you clearly state the initial ethical question(s) you wish to answer in respect of this new technology?			Terms of Reference				

Extract Two – Project/Application Consideration – Define Questions & Issues Analysis Sections

PROJECT/APPLICATION SPECIFIC CONSIDERATION CHECKLIST								
File reference:			Specific Project/Application Name/Description:					
Ref	Action	Onus	Source/ Reference Documentation	Destination Documentation	√ X	Comment and/or reasons if X	Initials	Date
DEFINE QUESTIONS								
PS1	Have you clearly described the project/application in question?			Terms of Reference				
PS2	Have you identified which new technology/(ies) are within the scope of your project/application?		Strategic/ Abstract Assessment	Terms of Reference				
PS3	Has anyone recently enough undertaken or reviewed strategic/abstract assessment(s) for the technology/(ies) in question?		Strategic/ Abstract Assessment	Terms of Reference				
PS4	Are you willing and/or able to proceed without strategic/abstract assessments?		Framework Flowchart	Terms of Reference				
PS5	Can you clearly identify all of the agents involved in the project/programme (e.g. you, your business, joint venture partners), including their motives, interests and character?			Terms of Reference				
PS6	Can you clearly state the initial ethical question(s) you wish to answer in respect of this project/programme?			Terms of Reference				
ISSUES ANALYSIS								
PS7	Have you identified all the main parties who could foreseeably be affected by this specific project/application?		Terms of Reference	Stakeholder Chart				
PS8	Have you considered qualitative risks and undertaken risk assessment on foreseeable results or consequences of the specific project/application?		Risk Assessment Template	Risk Assessment				
PS9	Have you undertaken an evaluation of the potential rewards (or benefits) of the Specific project/application?		Benefits Evaluation Template	Benefits Evaluation				
PS 10	Have you ensured that risks and rewards are sufficiently examined from each of the following perspectives: ♦ Rights, fairness, justice		Stakeholder Analysis Template					

PROJECT/APPLICATION SPECIFIC CONSIDERATION CHECKLIST								
File reference:			Specific Project/Application Name/Description:					
Ref	Action	Onus	Source/ Reference Documentation	Destination Documentation	√ X	Comment and/or reasons if X	Initials	Date
	and common good of society and the environment as a whole; ♦ Other specific parties (e.g. suppliers, customers, competitors) you can foresee being affected by your project/programme ♦ The IT industry/profession's interests; ♦ You/your organisation/ your joint venture partner's interests							
PS 11	Have you cross-referenced rewards to risks?			X-Ref Chart				
PS 12	Have you considered revisiting the define questions section of this assessment and, if appropriate, worked through questions PS1 to PS11 again?		This Checklist	PS1 to PS11				

The meta-methodology is iterative; notice that issues question PS12 encourages the user to revisit the earlier questions if necessary, including the definition stage questions. Similarly, the options stage has an iterative question referring the user back to the issues stage questions. This reflects the deliberative approach sought (McVea, 2008).

When completed, DIODE assessments clarify ethical thinking and can be kept as a record of how decisions were accomplished. This approach is useful for "ethical audits" and can also be used as "living assessment" to be revisited and revised as circumstances progress.

4) Testing and Evaluating DIODE – Ways Forward

The meta-methodology is currently at an early stage, and is now being tested against case studies (both strategic/abstract and project/application). Early stage testing has yielded positive feedback and mostly favourable comment. The

underlying thinking and the potential value of the meta-methodology have been especially well received.

More challenging is the feedback on the meta-methodology's usability for professionals who are working outside their regular problem domains. To date, the meta-methodology has only been tested by people with some grounding in commercial ethics. Several testers raised concerns that lay users might struggle to self-train in the use of the meta-methodology in its current form.

Additional guidance materials are being developed in response to the feedback. Those guidance materials, together with the meta-methodology, will be tested on a wider audience of potential users.

Some tools already exist which would support the DIODE approach, for example SoDIS Project Auditor which explicitly addresses a range of qualitative and ethically grounded questions about the impacts of the information system from a stakeholder perspective. (Gotterbarn & Rogerson, 2005, p735). It is envisaged that a toolkit could be assembled to help people put DIODE into practice.

This meta-methodology should be helpful in teaching and professional training to show how existing guidance, such as law, codes of conduct and principles from ethical theory can be used to further ethical decision-making (Kallman & Grillo, 1996).

5) Conclusions

There was an absence of a meta-methodology suitable for technologists to use on diverse circumstances for the ethical assessment of new technologies. There were frameworks for ethical assessment in specific and related fields (e.g. health technology assessments, environmental technology assessments and participatory technology assessments), but in those instances the frameworks tend to be specific and are often oriented towards use by professional ethicists rather than technologists. In contrast, DIODE is a generic meta-methodology, more akin to scaffolding, supporting whichever tools, techniques, templates and frameworks are relevant to a particular ethical assessment.

Virtue ethics are outside the scope of DIODE itself, but the design of DIODE assumes that the user subscribes to a virtue model such as codes of practice and conduct. DIODE seeks to blend teleological and deontological ethical assessment, using normative instruments such as CFREU in the design of templates to help ensure that the requisite breadth and depth of ethical concerns and contexts can be addressed. The meta-methodology is designed to encourage ethical assessment at various levels of embedding of technology in society, encouraging wide consultation and public debate where appropriate.

DIODE seeks to provide an accessible method for ethical reasoning for practitioners as well as professional ethicists, by covering fundamental ethical questions and helping the user to determine when ethical assessment and ethical decisions are required. While feedback from early stage testing is mostly positive and favourable, several challenges remain, not least finding accessible ways of presenting the methodology and determining the extent to which the meta-methodology can be a self-training mechanism. Scenarios are likely to be a useful interactive training aid in this context. Analogous work has been done with scenarios to support codes of conduct and research ethics (Bebeau, 2007). The meta-methodology should also help businesses to embed ethical decision-making into the way they do business (Webley, 2006).

Ultimately DIODE might require an element of hands-on training and/or a presumption of underpinning commercial ethics understanding acquired through degree or professional qualifications courses. Ideally, however, DIODE can be further developed to enable it to provide the training and guidance required through the practical nature of the meta-methodology, thus enabling it to help ICT professionals, policy makers and academics regardless of any formal training in ethical theory.

References

Albrechtslund, A. (2007), “Ethics and technology design”, *Ethics and Information Technology*, Springer Netherlands, Volume 9, Number 1, pp. 63-72

Banta, H. D. (2004), “Ethical inquiry and (health) technology assessment: the social shaping perspective - Foreword”, *Poiesis & Praxis: International Journal of Technology Assessment and Ethics of Science,* Springer Berlin / Heidelberg, Volume 2, Numbers 2-3, pp. 93-95

Battye, J., Blair, H. and Mellor, D. (1999), *Ethical Issues of New and Emerging Technologies*, Ministry of Research, Science and Technology, New Zealand.

Bebeau, M.J., Pimple, K.D., Muskavitch, K.M.T., Smith, D.H., Borden, D.L. (2007) *Moral Reasoning in Scientific Research,* Poynter Centre, http://poynter.indiana.edu/mr/mr-main.shtml

Capaldi, N. (2005), "The Role of the Business Ethicist", *Ethical Perspectives,* Vol. 12, No. 3 pp. 371-383.

Clausen, C. and Yoshinaka, Y., (2004), "Social shaping of technology in TA and HTA", *Poiesis & Praxis: International Journal of Technology Assessment and Ethics of Science,* Springer Berlin / Heidelberg, Volume 2, Numbers 2-3, pp. 221-246

Decker, M. (2004), "The role of ethics in interdisciplinary technology assessment", *Poiesis & Praxis: International Journal of Technology Assessment and Ethics of Science,* Springer Berlin / Heidelberg, Volume 2, Numbers 2-3, pp. 139-156

Duquenoy, P. and Thimbleby, H., (1999), "Justice and Design", in *Human-Computer Interaction, INTERACT'99*, M.Angela Sasse and Chris Johnson (Eds.), IOS Press on behalf of the International Federation for Information Processing (IFIP), available at: http://www.uclic.ucl.ac.uk/usr/harold/srf/justice.html

European Union (2000), Charter of Fundamental Rights of the European Union (200/C 364/01), available at: http://www.europarl.europa.eu/charter/pdf/text_en.pdf (accessed 22 April 2009).

Fisher, C. and Lovell, A. (2003), *Business Ethics and Values*, Financial Times Pearson Education, pp. 138-9

Genus, A. and Coles, A. (2005), "On Constructive Technology Assessment and Limitations on Public Participation in Technology Assessment", *Technology Analysis & Strategic Management*, Routledge, 17(4), pp. 433-443, DOI: 10.1080/09537320500357251

Gotterbarn, D. and Rogerson, S. (2005) Next generation software development: responsible risk analysis using SoDIS, Communications of the Association for Information Systems, Vol 15, May pp 730-750

Gupta, A., "Ethical Frameworks for Research Agendas and Policy in Environmental Ethics", Ethics and Climate Change in Asia and the Pacific (ECCAP) Project, RUSHSAP, UNESCO, Draft 2 of 4, August 2009, http://www.unescobkk.org/rushsap/energyethics/

Harris, I. and Mainelli, M. (2001), Information Technology for the Not-For-Profit Sector, ICSA Publishing

Hennen, L. (2002), "Impacts of Participatory Technology Assessment on its Societal Environment", in Joss, S and Belluci, S (Eds.), *Participatory Technology Assessment: European Perspectives,* London: Centre for the Study of Democracy, University of Westminster, pp. 257-275

van den Hoven, J. (2007), "ICT and Value Sensitive Design", in Goujon, P.; Lavelle, S.; Duquenoy, P.; Kimppa, K.; Laurent, V..(Eds.), *The Information Society: Innovation, Legitimacy, Ethics and Democracy*, Springer, Boston, pp. 67-72.

Howitt, R. (2005), "The importance of process in social impact assessment: Ethics, methods and process for cross-cultural engagement", *Ethics, Place & Environment A Journal of Philosophy & Geography,* Routledge, Volume 8, Issue 2, pp 209 - 221

Introna, L. (2005), Phenomenological Approaches to Ethics and Information Technology, Stanford Encyclopaedia of Philosophy, http://plato.stanford.edu/entries/ethics-it-phenomenology/ (accessed 22 April 2009)

Jeurissen, R. (1997), "Integrating Micro, Meso and Macro Levels in Business Ethics", *Ethical Perspectives,* Vol. 4, No.4, pp. 246-254.

Kallman, E.A. and Grillo, J.P. (1996), *Ethical Decision Making and Information Technology: An Introduction With Cases*, McGraw-Hill, New York.

Knapp, J. C. (Ed), (2007), *Leaders on Ethics: Real World Perspectives on Today's Business Challenges*, Praeger, pp. 35-40

Kranzberg, M. (1986), "Technology and History: "Kranzberg's Laws"", *Technology and Culture*, Vol. 27, No. 3, pp. 544-560

Leonardi, P. and Barley, S. R. (2008), "Materiality and change: Challenges to building better theory about technology and organizing", *Information and Organization,* Number 18, pp. 159-176

Mainelli, M.R., (2006), *"How can you have too much choice?",* Gresham College, 15 May 2006, available at: http://www.gresham.ac.uk/event.asp?EventId=464&PageId=108

Mason, R. O., Mason, F. M., Culnan, M. J. (1995), *Ethics of Information Management*, Sage Series in Business Ethics, Sage, pp.109-148

McVea, J. (2008), "Ethics and Pragmatism: John Dewey's Deliberative Approach" in Donaldson, T. and Werhane, P.H. (Eds.), *Ethical Issues in Business: A Philosophical Approach*, Pearson Prentice Hall, pp. 89-100

Moor, J. H. (2005), "Why We Need Better Ethics for Emerging Technologies", *Ethics and Information Technology,* Vol. 7, No. 3, pp. 111-119.

Moor, J. H. (1985), "What is Computer Ethics?", available at: http://www.southernct.edu/organizations/rccs/resources/teaching/teaching_mono/moor/moor_definition.html (accessed 22 April 2009).

Orlikowski, W. J. and Scott, S. V. (2008), "Sociomateriality: Challenging the separation of technology, work and organization", *The Academy of Management Annals Volume 2*, Routledge, pp. 433-474

Reuzel, R., Oortwijn, W., Decker, M., Clausen, C., Gallo, P., Grin, J., Grunwald, A., Hennen, L., van der Wilt, G.J. and Yoshinaka, Y. (2004), "Ethics and HTA: some lessons and challenges for the future, *Poiesis & Praxis: International Journal of Technology Assessment and Ethics of Science,* Springer Berlin / Heidelberg, Volume 2, Numbers 2-3, pp. 247-256

Rogerson, S. (2009) Ethics and ICT. in Galliers, R. and Currie, W. (eds) The Oxford Handbook of Management Information Systems: Critical Perspectives and New Directions, Oxford University Press, forthcoming.

Rundle, M. and Conley, C. (2007), "Ethical Implications of Emerging Technologies: A Survey", available at: http://unesdoc.unesco.org/images/0014/001499/149992e.pdf, (accessed 22 April 2009).

Sacchini, D., Virdis, A., Refolo, P., Pennacchini, M. and de Paula, I.C. (2009), "Health technology assessment (HTA): ethical aspects", Medicine, Health Care and Philosophy, Springer Netherlands, Volume 12, Number 4, pp. 453-457

Schot, J., (2001), "Towards New Forms of Participatory Technology Development. Technology Analysis & Strategic Management", *Technology Analysis & Strategic Management,* Routledge, Volume 13, Number 1, pp. 39-52

Wajcman, J., (1995) "Feminist theories of technology" in Jasonoff, S.,Markle, G.E., Peterson, J.C. and Finch T, (Eds), *The handbook of science and technology studies,* Thousand Oaks, Sage, pp. 189 – 204

Webley, S. (2006), *Making Business Ethics Work: The Foundations of Effective Embedding*, Institute of Business Ethics, London.

Ulrich, W., (1983), *Critical Heuristics of Social Planning: A New Approach to Practical Philosophy*, Paul Haupt

United Nations (1948), Universal Declaration of Human Rights, available at: http://www.un.org/overview/rights.html (accessed 22 April 2009).