TECHNOLOGY DEVELOPMENT AND ETHICAL DECISION MAKING: GATEKEEPING, IDENTITY AND SOCIAL CONSTRUCTION

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Abstract: This paper investigates the use of feedback block diagrams to explore the role and mechanisms behind gatekeeping and the relationships between identity, values and behaviour. Feedback block diagrams are also used to investigate the ways in which power dynamics impact on technological and social development. The models are introduced by a discussion of values and virtue ethics and the relationship between technology and society. In addition a model of behavioural and attitudinal change of individuals, organisations and societies is presented in terms of single, double, triple and quadruple loop action learning. *Copyright © 2005 IFAC*

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1. INTRODUCTION

Technology development is one of the most important factors in shaping modern society, both in the richer industrialised countries, which fairly quickly experience new technologies, and the poorer so called developing countries, where access to new technologies is more restricted. Many of the scientists and engineers who are involved in the research, development and implementation of these new technologies often still consider themselves to be purely problem solvers and pay less attention to the nature of the problems they are solving, who has set them and whose interests the results will serve.

However there is also growing awareness of the importance of ethical decision making in science and engineering and interest in the development of tools to support it. This includes the codes of ethics or professional conduct, developed by many science and engineering societies (Martin et al., 1996; Hersh, 2000) and a variety of ethical theories, principles and methodologies. In many cases such theories and methodologies can be used to structure problems and highlight issues, but value judgements will be required to support ethical decision making. Approaches such as the Johari window can be used to support engineers and other professionals in determining their own values (Stapleton et al., 2003). However the technique will need to be modified in order to take account of the values of engineers who experience social exclusion, either for identity reasons such as being female or black, or due to approaches which are not part of the engineering mainstream. Unfortunately, like other fields of research and human endeavour, engineering is not immune to the use of gatekeeping to marginalise or exclude minority individuals, groups and paradigms. This is problematical in both ethical and engineering terms.

This paper will discuss the ethical issues related to gatekeeping and use engineering modelling techniques and, in particular, feedback block diagrams, to explore the processes and mechanisms associated with gatekeeping and relationships

between identity, values and behaviour, as well as how these relationships together with power dynamics impact on technological and social development. In deriving the models, tradeoffs have been made between complexity i.e. including all relevant factors and comprehensibility i.e. having a model which is simple enough to be meaningful.

2. MODELLING BEHAVIOUR, IDENTITY AND VALUES

2.1 Values

In some cases the requirements for ethical action in a particular situation are very clear. However, in others applying different ethical theories, philosophies or approaches will clarify the issues, but value judgements will still be required to support decision making. There are a number of different sources of values, including religion, politics, humanist or other non-religious philosophies, education, family and friends, culture and the society you are living in. There also seem to be considerable differences between the ethical values of different societies and a wide range of different codes of values. However this does not mean that all possible codes of values are acceptable and ethical.

Unfortunately specifications to be met by ethical codes of values or tests to determine which sets of values are ethical have not yet been devised. Common elements have been noted in the value systems of very different societies and groups. For instance it has been suggested (Kluckholm, 1955) that every culture has a concept of murder and distinguishes murder from other types of killing which are not considered murder, and that every culture has some regulations about permitted and forbidden sexual behaviour. However the significance may be in the details, where there are often very great differences, rather than in the superficial commonality. Even within one society there are often significant differences of values, as evidenced by hectic debates about abortion, euthanasia and capital punishment.

2.2 Virtue Ethics

There are a number of different theories of ethics. Virtue ethics (Oakley, 1998) will be discussed here due to the feedback relationship between conduct and the development of 'virtuous' character. It supports actions which build good character. It differs from some other types of ethics, such as deolontological (concerned with duties and obligations) and consequentialist ethics (concerned with consequences) in that the focus is the effects of the action on the person carrying it out (and the relationship between action and character) rather than on the results of the action or particular obligations

and rules. Thus virtue ethics assumes that the main ethical question concerns desirable character. It is based on the premise that a person with moral virtues is more likely to behave ethically than someone who purely follows rules. Behaviour often has an impact on character. Therefore virtue ethics is concerned both with the expected behaviour of a person with particular virtues and the type of behaviour which will promote the development of these virtues. There then remains the issue of the list of relevant virtues, which will depend on a number of factors, including culture, age and gender.

The strength of virtue ethics is its recognition that conduct has an effect on the person. This gives a feedback system, as illustrated in figure 1, in which ethical conduct has an effect on character and the development of virtues and these virtues lead to further ethical behaviour. Virtue ethics is also consistent with spiritually motivated approaches to ethics, since it could be considered to encourage personal and spiritual development through ethical behaviour. However even 'virtuous' people sometimes make mistakes or do things they regret and there is no universally accepted understanding of a 'virtuous' person, since, as discussed above, concepts of virtue depend on factors such as gender and culture.
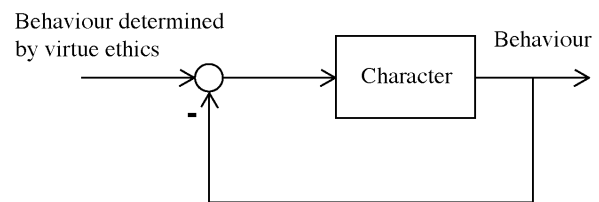

Figure 1, Ethical Behaviour and Virtuous Character

2.3 Model of Behaviour, Identity and Values

The simple model in figure 1 can be used to develop the model of behaviour, identity and values in figure 2. It will be assumed that identity status, including factors such as gender, race and ethnicity, class, sexuality, age and nationality, contributes to determining your values and that these values will determine your perspective on virtue ethics. The values of the dominant social group generally have an important role in influencing your values. There are a number of different ways of representing this influence and it is represented here as 'noise' to highlight the fact that it may be counter to the values, particularly of outsiders, and have the effect of distorting them. In addition there may be a struggle to maintain these values against outside pressures. The resulting virtue ethics then generates ethically desirable (virtuous) behaviour which is fed into real world dilemmas and situations and leads to actual behaviour
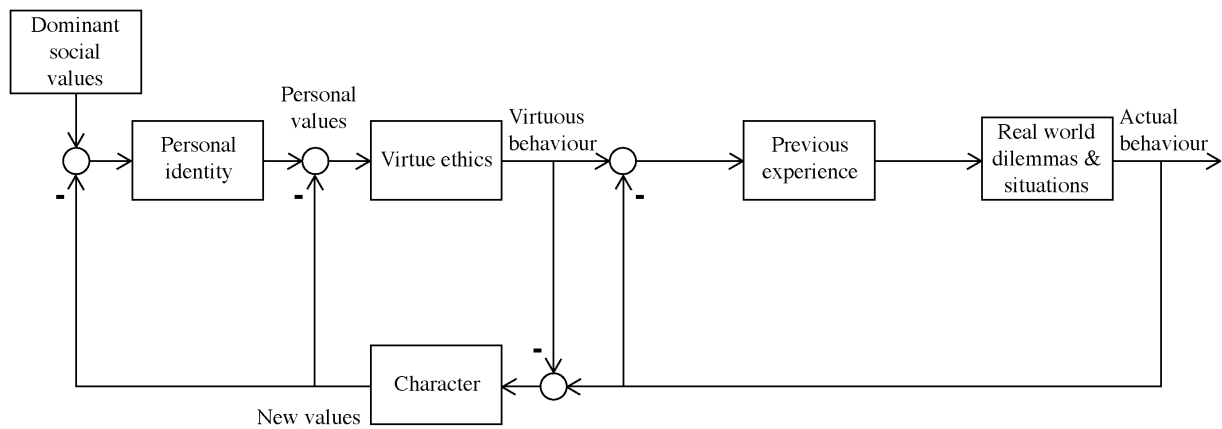
Figure 2, Model of Behaviour, Identity and Values

This actual behaviour is also influenced by previous positive and negative experiences which generate fears, concerns and/or self confidence. Comparing actual and ethically desired behaviour can be used to modify actual behaviour by feeding the difference into the real world dilemmas and situations. Actual behaviour has an effect on character, either directly or through comparison with the desired virtuous behaviour. This modified character then generates a new set of values which can be fed back and compared with the values generated by your identity, leading to a modification in your view of virtue ethics. This new set of values can then be fed back into the identity module and may lead to a change in how you perceive your identity or how it is perceived by the dominant social group or the minority group(s) you identify with. This is consistent with the fact that identity is not necessarily fixed but may be constructed through discourse and could be the temporary outcome of the powers, regulations and experiences encountered by an individual (Karreman et al., 2001).

3. MULTI-LOOP ACTION LEARNING

There are a number of different theories, philosophies and methods which can be used to support ethical decision making (Babcock, 1991; Beauchamp, 2001; Beauchamp et al., 1978; Kuhse et al, 1998; Madu, 1996; Martin et al, 1996). However, once decisions have been made on what is ethical in the particular context, it will be necessary to implement them. In some cases action will require the involvement of other people and/or organisations and there may be institutional and other barriers. There is thus a need for methods for overcoming barriers to ethical action and persuading individuals and organisations of the value of such action. Some of the available methods have been categorised (Nielson, 1996) as single, double and triple loop action learning. Quadruple loop action learning can also be added, as shown in figure 3.

Single loop action learning is about changing behaviour, rather than learning about ethics and changing values, whereas double loop action learning involves changes in values (generally of individuals) as well as behaviour (Nielson, 1996).   Triple and quadruple loop action learning involve changes in the underlying tradition or ethos of the organisation and surrounding society respectively, as well as changes in values and behaviour.   Alternatively quadruple loop learning could involve changes in the nature of the underlying tradition of the organisation in addition to its practices.

In terms of a simple example:

- Single loop action learning could lead to measures to increase the proportion of disabled people recruited to senior positions, for instance due to fear of legal action on the grounds of disability discrimination, without any increase in awareness of the ethical responsibility to recruit more disabled people or a change in values.

- Double loop action could lead to a change in ethical values by some individuals in the organisation with a recognition of the ethical responsibility not to discriminate against disabled people, in addition to practical measures. This ethical commitment is likely to make the practical measures more effective than they would be otherwise.

- Triple loop action could lead to a change in the ethos of the organisation with a recognition of the value to the organisation and its ethical responsibility to employ more disabled people at a senior level. This could be accompanied by measures to overcome structural barriers and make the organisation attractive as a place of employment for disabled people.

- Quadruple loop action could lead to a change in the ethos of the wider society with a commitment to the value of diversity in society
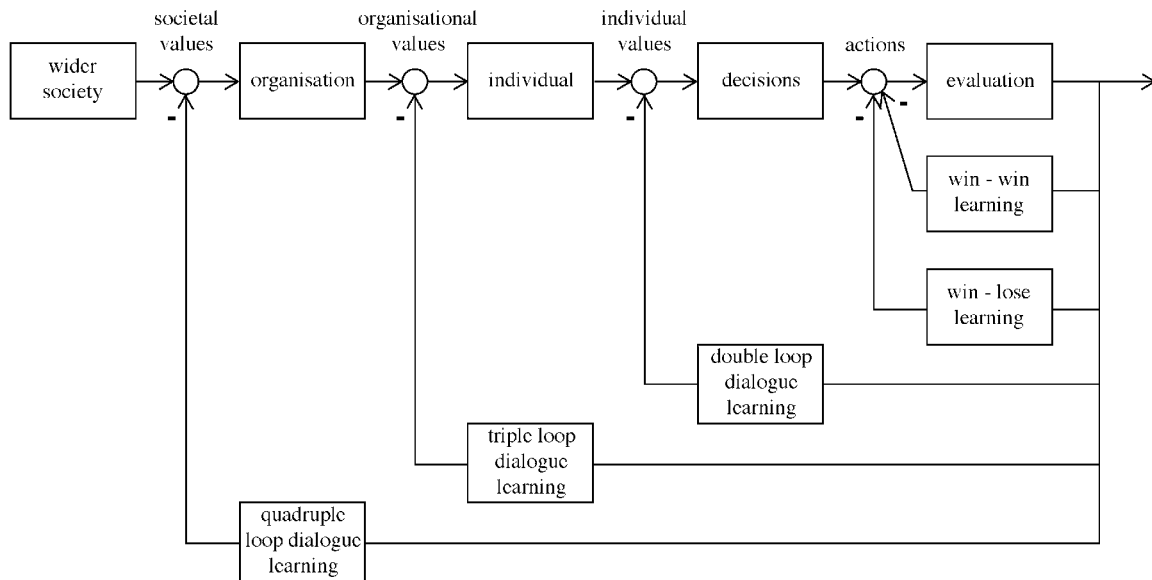
Figure 3 Single, Double, Triple and Quadruple Loop Learning

and ensuring equality and lack of discrimination. Disabled people would be considered one of the many diverse groups which enrich society. Measures would be taken to remove structural barriers and make all environments attractive and accessible to the whole population, including disabled people.

Alternatively, the difference between triple and quadruple loop learning can be illustrated as follows:

- Triple loop learning involves a particular organisation examining and discontinuing its behaviour of defrauding the Ministry of Defence by charging for materials that have not been used on the Ministry of Defence project.

- Quadruple loop learning involves the organisation examining the whole context of military contracts and deciding to have nothing to do with them.

Real technological and social change requires triple and quadruple loop learning. It has been suggested that real change or innovation happens at the margins. This is where women and minorities are situated. Therefore triple and quadruple loop learning is required to change the ethos of organisations (triple loop learning) and of society as a whole (quadruple loop learning) to allow us all to benefit from the knowledge and expertise that is currently sited at the margins. Nielson (1996) suggests some methods that can be used to achieve triple loop learning, but they will not always work. The problem of quadruple loop learning or changing deep seated attitudes in society as a whole is generally even more difficult to resolve. In practice change occurs slowly and not necessarily linearly. It should also be noted that once such change occurs the margins will have shifted and new sources of creativity and learning will be required to achieve further significant change and innovation. This gives

an iterative process which should converge to a state in which significant change is no longer feasible and possibly also no longer desirable.

4. TECHNOLOGY AND SOCIETY

There has been considerable discussion of the relationship between society, technology and science, but power relations have rarely been mentioned explicitly in mainstream advanced technology literature. One perspective considers technology to be neutral in itself and its consequences to be determined solely by the nature of particular applications. An almost diametrically opposed perspective, technological determinism (Ellul, 1954; Winner, 1977), considers technology to be all-powerful.

In the strongest versions of this perspective technology totally determines the future directions of society in ways that are not possible to resist. Although useful, both these perspectives are too simplistic. In particular they ignore the power relations and dynamics that effect choices about what technology is developed, how it is used and in whose interests it is deployed. These are highly complex processes that are difficult to address according to the positivism underpinning current engineering research (Jervis, 1997). Technology design and development are influenced by existing power structures and contribute to developing and further institutionalising particular structures (Baudrillard, 1999; Borgman, 1984).

Figure 4 illustrates some of the relationships between science, technology, society and power dynamics. Rather than either technical or social determinism, it is assumed that there are feedback relationships
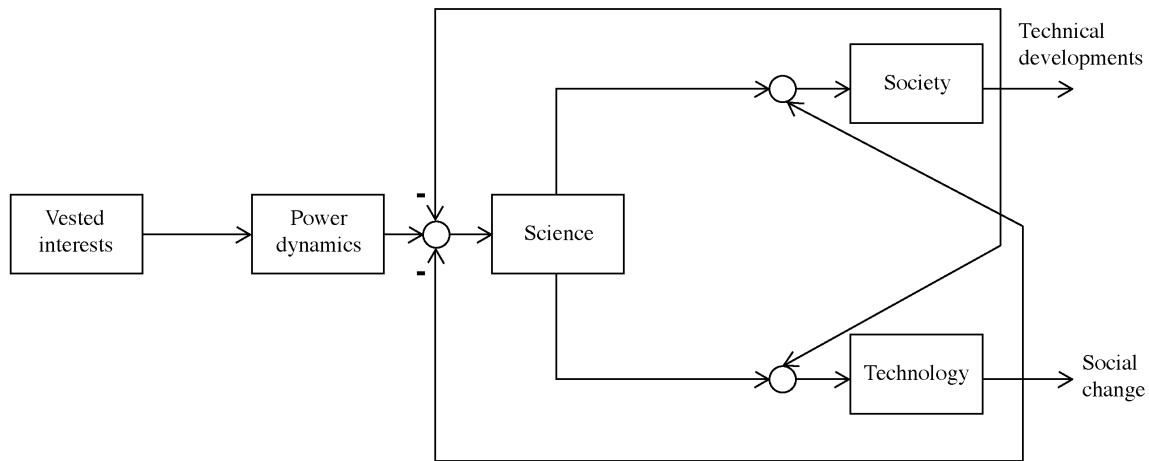
Figure 4, Feedback Relationships Between Power Dynamics, Science, Technology and Society

between technology and society and that influence existing power relationships, as well as science. In order not to overcomplicate the model a number of factors have not been shown. For instance, the unconscious, or deliberate attempts to impose the economic, political and ideological structures in which this technology developed have not been included in the model. This can be considered a form of colonisation through technology, which is subtler, but no less insidious than previous attempts (Banerjee, 2001).

4.1 Gatekeeping

There has been some discussion in the previous section of the fact that change occurs at the margins. This means that real technological innovation which occurs in new directions, rather than purely continues with more of the same, requires the involvement of women and minorities. However there are gatekeeping processes which are used to maintain orthodoxy through restriction of access to resources and publication in respected journals to individuals who are considered to conform and who present ideas or projects within the canon. As a consequence, indigenous knowledge, for instance, of

edible plants, is disappearing or even being suppressed, since it is not recognised as valid or authoritative (Ilkkaracan and Appleton, 1995). The mechanisms by which this occurs are different in different contexts and include the lack of transparency and gender and race discrimination in the peer reviewing process for academic journals and the deliberations of research councils and other funding bodies.

A simple model of some of the processes involved in gatekeeping is presented in figure 5. This shows how the increasing importance of industrial and military finance and the lack of transparency and bias in the peer review process act to keep out minority individuals and ideas. This occurs both through filtering out through lack of access to resource and discouragement through feedback mechanisms. Gatekeeping processes can be considered to act as a filter on innovation from minority or marginalised researchers and paradigms. Figure 6 illustrates the way in which creative development and innovation at the margins is to a certain extent in competition with more mainstream developments which tend to result in more limited change within existing paradigms. Facilitating the involvement of minorities and minority opinions and paradigms will require
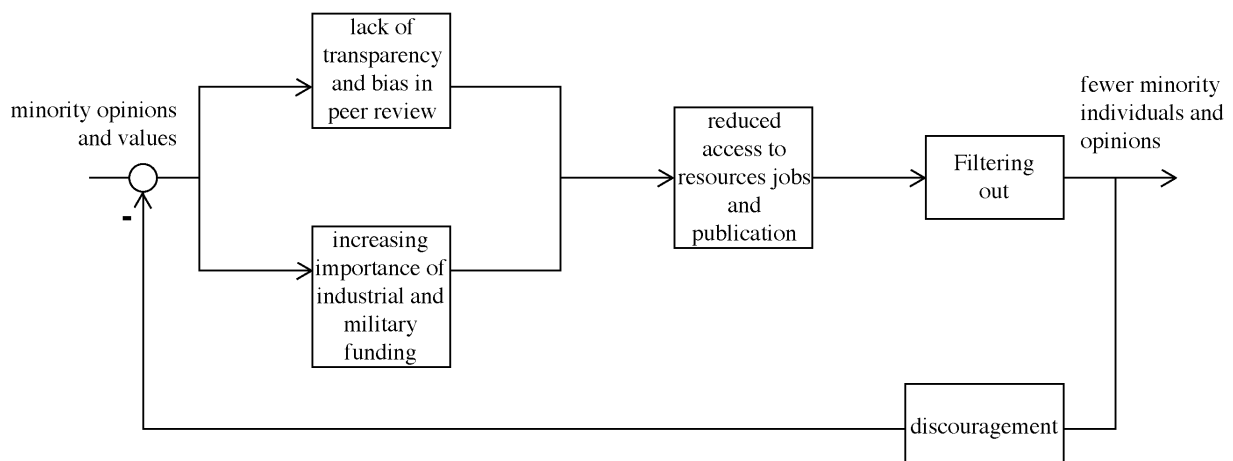

Figure 5, Gatekeeping Mechanisms

organisational and societal change i.e. triple and quadruple loop learning, in terms of the multi-loop learning model presented in the previous section.

5. CONCLUSIONS

This is the second in a series of papers using engineering modelling techniques to explore the relationships between science, technology, society and power dynamics. The first paper in the series (Hersh, 2004) presented a number of feedback and block diagram models of the relationships between identity, values and behaviour, as well as how these relationships and power dynamics impact on technology and society. These models have been further developed and a model of gatekeeping processes has been introduced, based on the increasing importance of industrial and military sponsorship of research and the lack of transparency and bias in peer review.

This model of gatekeeping processes has then been embedded in a discussion of the role of minority and marginalised individuals and loops in real innovation and change and an quadruple loop extension of Nielson's (1996) work on triple loop action learning. This extension has been used to present a model of multi-loop individual, organisational and societal learning and change.

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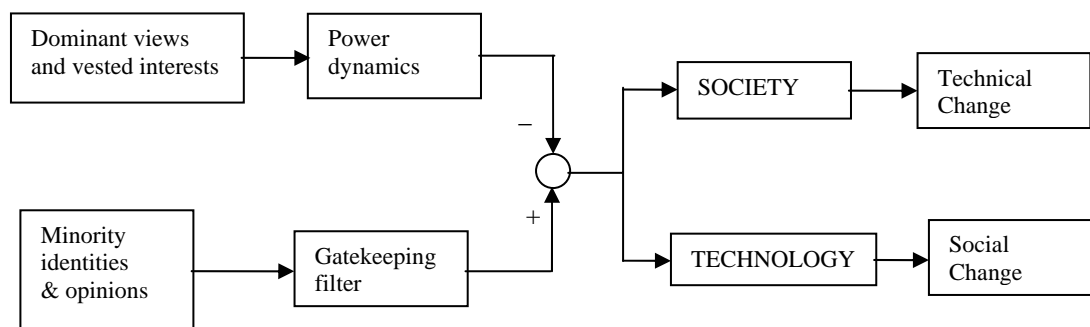Winner L. (1977). *Autonomous Technology, Technics-out-of-control as a Theme in Political Thought*, MIT.

Figure 6, Innovation: The Role of Minority Identity and Views