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ANAESTHETISING OURSELVES: ENGINEERING AND TECHNOLOGY EDUCATION AS A BARRIER TO AN ETHICAL TECHNOLOGY PROGRAMME

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Abstract:

This paper proposes the idea of 'engineering consent' as an important ethical consideration for engineers. The paper illustrates the notion of techno-culture, emphasising the non-neutrality of technology in the world and how technology can be used in cultural and economic colonisation by the west. It advocates a fundamental review of engineering education theory and practice. In this review, the paper argues that engineers must enter new spaces of thought and learning including the post-colonial 'Third Space' advocated by Homi K. Bhaba. The review of education must be based on current ideas as to professional competence, as well as a healthy approach to dissidence through innovative and creative thought processes. In this way a new community of practice will emerge which is centred not upon technological progress but social responsibility.

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1. INTRODUCTION: ENGINEERING CONSENT IN AN OVERDEVELOPED WORLD

Many commentators on the nature of democratic societies in, so called, over-developed countries have pointed to the ways in which mass consent is manufactured (Herman & Chomsky (1989), Chomsky (1994)). 'Over-developed countries' is a recently coined phrase used to indicate those economies which are contributing to serious environmental problems as well as socio-economic disparity whilst maintaining strong economic growth going forward. They are typically western economies and the most stark example is the United States where a minority of the global population consume a majority of resources. The over-developed economies are in direct contrast to those economies, in places such as Africa, where a minority of the earth's resources are supporting a huge population and where, due to political and other structures, the situation is unlikely to be addressed in the near term.

The engineered consent referred to above is manifested in a narrowing of debate to reasonably

'safe' frames of reference, from the point of view of the power elites in those states. This is primarily achieved by a careful and subtle control of the media and education. Through this process societies become anaesthetized and therefore acquiescent. This maintains the 'stability' of democratic societies and ensures that the power elites are not threatened (Chomsky (1994)). In fact it has been stringently argued that this manufacturing of consent has been counter-productive leading to events such as September the eleventh 2001, in New York. In this view, it is argued that people are not allowed access to important debates so that they have little sense of the 'other' i.e. those outside my immediate community who may have a grievance. In this view, the atrocities of September 11 in New York were an inevitable consequence of foreign policies which were not challenged within the internal power structures of western states (Chomsky (2001), Virilio (1998)). It is only now, in the aftermath of the events in New York and Washington, as the west dismantles Iraq and Afghanistan, that many of the policies referred to by dissident commentators are being reviewed in more mainstream debate.

2. THE NON-NEUTRALITY OF TECHNOLOGY & COLONIAL STRUCTURES

Philosophers and researchers recognise that technology, in particular information technologies, telecommunications and televisual technologies, are cultural artefacts. As such they are non-passive and not culturally neutral. Instead they embody the culture from which they were derived and, consequently, some have called the transfer of technology across cultural barriers as the transfer of 'techno-culture' (Ihde (1998) p.48). The technology-transfer process has been criticised because the cultural background of most information and televisual technologies, as well as the content portrayed through these media, resides in western, over-developed nations. Consequently, the export of technology and associated knowledge to other, non-western, cultures can be viewed as a new form of colonialism, structurally similar to the expansion of capitalism, where the current form of capital is, so-called, 'knowledge capital' (Stapleton (2003)). Indeed, it has been widely and consistently argued that technology is highly political, and culturally violent, in fundamental ways (Zizek (2001), Bannerjee (1999), Ezrahi (1995), Rada (1990), Arendt (1970)). Quoting Winner (1988)

'we see.. an ongoing process in which scientific knowledge, technological invention and corporate profit reinforce each other in deeply entrenched patterns that bear the unmistakable stamp of political and economic power' (p. 27).

Echoing early political theorists like Machiavelli, two main social dimensions by which consent management is achieved are identified: education and the mass media (Chomsky (1998), Skinner (2000)). It is self-evident that, according to these arguments, there are serious ethical implications where engineers and technologists who themselves are located within passive western societies, develop information technology and visual media which are exported across the globe. This process of cultural colonisation has been recognised and actively withstood by some western European societies where even language is in seen to be in danger of being subsumed into an Anglophone world.

2.1. Difficulties Resisting Mass Consent: The Case Of France

This perceived Anglo-Saxon linguistic and cultural hegemony is met with ongoing resistance in France. There, the elite watchdog committee the *Académie Française*, composed of French intellectuals, examines new terms and words of foreign origin and decides whether or not to allow these new words to be included in the French dictionary or to coin suitably 'French' terms instead. For example, the Internet was christened '*le toile*' but everybody in the French speaking world calls it *Internet*, with French pronunciation of course! It is perhaps interesting to note that with regard to internet use France is far behind other European countries. Also the French prefer to obtain their information from the television

news rather than the print or electronic media. Images of French President Jacques Chirac addressing the nation in his newly-acquired role of *Résistant* to the Anglo-American war offensive against Iraq have made him a hero in the eyes of millions of French people. On the other hand, giant television networks such as CNN and Sky have ridiculed France's anti war (and therefore perceived anti-American) stance and have promoted the idea that France is the real enemy. As a result, sales of French goods have declined dramatically across the United States. However, contrary to a globalized perception of French people as being intrinsically anti the English language, a whole generation of highly educated 20 and 30 somethings, products of the elite Engineering and Business Schools, *Les Grandes Ecoles*, are preferring the use of English rather than French as a global tool of international communication. They perceive their government's linguistic isolationist policy as an impediment to growth and change. It can therefore be argued that access to the Internet, and its emphasis upon English, has changed the entire perception and outlook on the world of this young generation of French engineers and entrepreneurs.

This process, which is well documented elsewhere, highlights the link between, so-called 'Anglophone hegemony' and global economic activity. If France has difficulties withstanding what they perceive to be a cultural imperialism and invasion of their cultural space, then it is readily apparent that smaller, less affluent nations will experience severe difficulty resisting these pressures.

3. EDUCATION, ENGINEERING CONSENT AND SOCIAL STABILITY

The creation of a manufactured consent by which stability can be maintained raises important questions for those involved in the education of technologists and engineers. For example, is it possible that educators themselves can become complicit in this through the very process of education itself? The evidence suggests that modern western education actually ensures that those who pass through it are passive, non-questioning and acquiescent. This is especially true of engineering disciplines¹.

Research in engineering education recognises the need for a more creative and innovation lead approach to teaching in this area. For example, changes in the role of engineers within society is leading to an evaluation of engineering education, which, in turn leading to a cry for the integration of creativity and innovative learning into engineering education programmes (van der Vorst (1998)). This debate has highlighted the social responsibilities of engineers and implies the need for more creative thinking, and critical thinking, within the discipline. This has been

¹ Examples of this process are often cited in studies of ideology. For example, see Chomsky (1993) where he links intellectual dogma and ideology to human rights abuses.

further emphasised as a major issue for furthering research and practice in engineering ethics (van der Vorst (1998)). Brandt (1996), Juric et. al. (1999) and Acar (1998) highlight the international nature of this issue citing similar experiences and imperatives in Germany, Slovenia and the USA.

3.1.Re-Evaluating Engineering Education

Engineered consent is achieved through underlying deep-structures and processes within society rather than explicit and conscious policy. These structures become institutionalised and buried in the deep workings of societies and are, therefore, difficult to challenge or even expose (Foucault (1965), (1980), Kuhn (1996)). We shall now briefly review typical evaluation mechanisms used to assess engineering education programmes, highlighting how they can serve to maintain these structures.

The need for evaluation mechanisms is highlighted in the engineering education literature as means by which quality can be assured and educational standards maintained. These evaluation models and frameworks are to be used to highlight the effectiveness of engineering curricula from both the students and the teachers point-of-view. Whilst these are very useful devices, the methods rarely address deep structure issues associated with the particular curriculum. Consequently, the essential ethos of a course can remain untouched, and debate (or indeed dissent) concerning the essential values, which underpin the engineering subject, go unchallenged. For example, Atieh et. al. (1991) propose an excellent methodology for evaluating teaching effectiveness in engineering. It provides a sophisticated, multidimensional device for assessing perceptions of the effectiveness of engineering educational practice, utilising a mathematical model to deliver a score for individual courses. The variables utilised within the model at no stage address ethical content, openness of debate or independent learning. Instead, they focus upon a very narrowly defined set of input variables, including 'adherence to course syllabus'. Such course-evaluation devices cannot address deep structure issues within the education of engineers. Instead they are premised on the fact the overall educational process is appropriate in terms of creative thinking, reflection and so on.

4. THE NEED FOR CREATIVITY IN ENGINEERING CURRICULA

An emphasis upon dissidence and innovation has been shown to have practical application in the engineering of new products and technologies (Court (1998)). For example, Brandt & Ihsen (1998) illustrate how highly creative thinking applied to robotics creates entirely new research trajectories within engineering. Holmes (1998) shows that creativity in engineering thought is 'not an optional extra'. Instead, it goes to the very heart of engineering as a discipline, what we do and what we are as engineers. She illustrates how the development of a

mature engineering ethics requires a fundamental shift in engineering thought towards, what she terms, the 'forebrain'. Platts (1998) shows how the development of technological artefacts goes hand in hand with the development of a sensitivity of who the others in our society are and how we can live together. He argues that 'the inter-twinning of technical and moral creative skills' is central to engineering advancement, and indeed to the creation of civilised society. Lenschow (1998) argues for a paradigm shift in engineering education from 'teaching to learning', and he illustrates several ways in which this can be achieved.

It is readily apparent that, in spite of several innovative approaches to engineering education in isolated academic faculties, the education of engineers remains largely traditional. This tradition leaves untouched questions about the role of engineers and technologies within society: who gains and who loses in the race for technological progress. Neither does traditional education practice in engineering incorporate broader definitions of competence now appearing in the education research literature and recognised as important in other practice-oriented disciplines such as nursing and management (Carlile (2001), Golding & Currie (2000), Burnard (1995)). The idea of engineering education quality remains fixed upon criteria established by quality standards such as ISO, rather than on fundamental advances within educational philosophy and practice. Engineers from traditional engineering programmes define the quality standards used to measure advances in engineering education. This is the essence of manufactured consent and typifies how Foucauldian power structures are reinforced in society (Kuhn (1996), Foucault (1965)).

4.1. Experiences of a Language Lecturer Amongst Engineering UnderGraduates

One of the authors currently lectures in European languages to a variety of engineering undergraduate classes: in this case compulsory foreign language teaching to Degree in Bachelor of Engineering, Bachelor of Engineering Technology and Bachelor in Manufacturing Systems students. Her views and experiences shed some light on the way in which engineers approach education, as compared to the Humanities. She firstly notes an emphasis on technology as the principal means of disseminating information. In her experience, an over reliance on PowerPoint presentations and overheads had rendered the engineering student passive and incapable of independent enquiry and thought. The students tended not to understand the relevance of learning a foreign language and they were not educated as to its importance. The students expected task-based learning exercises (such as grammar exercises, translation exercises etc) and were horrified when the communicative approach was promoted. They seemed not to be able to make the connection that language is principally a means of communication, of *active communication*. Autonomous learning does not seem to be part of their repertoire. However, when

reflective learning and autonomous learning strategies were introduced into the learning process, students became empowered with the sense of their learning of a language as a self-determined process, with the lecturer as facilitator and not director of that process. At the end of the year the positive response of engineers to this approach is very apparent and they describe being enabled to think for themselves and assess their own needs, thoughts and ideas. The other author introduced a similar, independent-thought oriented, approach amongst fourth year computing students in an information systems course. Whilst students took a little while to adjust a questionnaire handed out at the end of the year registered a 91% satisfaction rating with the alternative approach when compared to the more traditional approach. Students told how they were able to learn much more by engaging in research, thinking through the basic assumptions of their discipline and developing more critical faculties in the complex area of information systems.

5. FROM ENGINEERING CONSENT TO ENGINEERED DISSIDENCE

As illustrated in the opening section of this paper, it is readily apparent from the political literature that many academic institutions still provide an important means by which power elites within society can be maintained and strengthened. In order to combat this within engineering, engineers and educationalists need to reconfigure educational processes to allow for increased freedom of debate, through an emphasis upon the engineer as located within society – rather than the engineer simply located within a profession. This requires new ways of thinking about professional development in engineering. These new approaches must be based on advanced, broadly-based models of engineering competence as hinted at by engineering educationalists elsewhere but rarely addressed in the literature (see for example Brandt (1996). We need to adopt recently developed notions of professional competence such as Carlile (2001). In his work he states that the four main dimensions of competence include Administrative Competence, Technical Competence, Personal Competence and Ethical Competence. The latter two refer to life-skills and moral judgement and incorporate these as essential dimensions of any programme wishing to address issues of competence. In order to enable engineers to enter new spaces of competence and learning it is appropriate to briefly map out recent developments in post-colonial criticism and assess how these developments can be utilised to transform key aspects of engineering education and thought.

5.1 A Post-colonialist Approach to Engineering Education: The 'Third Space'

In order to overcome deep structural problems within engineering education, and thus encourage free thought and dissidence, we need to rethink the approach we take in thinking about culture in engineering. Typically, engineering ethics debates,

like many other cultural debates, focus upon binaries i.e. 'me' as opposed to the 'Other'. This is reflected in notions such as the 'engineer'/'user' binary for example. These binaries are often associated with cultural hegemonies and identified in the deep structures of cultural discourse. The postcolonial critic Homi K. Bhaba has dismissed the notion of fixed binary definitions in relation to hegemonic discourse such as: teacher/student, master/servant, native/foreigner in favour of a new 'art of the present'. This approach requires us to 'think beyond narratives of originary & initial subjectivities' and focus upon the *processes* produced in the articulation of cultural differences. He advocates a hybrid or 'Third Space' as a place of possibility and an agency for new ideas (Bhaba (1994)). In this process-oriented view, the subject is empowered to intervene *actively* in the transmission of cultural inheritance or transition, rather than *passively* accepting transmitted customs and pedagogical wisdom. He or she can question, refashion, or mobilise received ideas (McLeod (2000)). Such an approach actively encourages interventions in technology design by all, and opens a way for a new discourse about what technology design should be all about. In this view, the engineering student is empowered to act as an agent of change, deploying received knowledge in the present and *transforming it as a consequence*. Thus received wisdom (as embodied in engineering syllabi) becomes a starting point for debate and criticism, rather than an end in itself. Deconstruction is a useful tool in promoting a non-hegemonic process. It creates an energy that decentres the cultural centres that represent former (and present) colonial networks, and contributes to the recognition of new forms of thinking from non-hegemonic sources ((Orlando (1999)).

In this process difference is no longer a negative (Deleuze (1968)). Instead it functions as a means of *affirmation*. Representation is 'replaced by the expression or actualisation of ideas, where this is understood in terms of the complex notion of differentiation'. For Deleuze, modern thought is the product of the failure of representation or the loss of identities and of the discovery of all the forces that act under the representation of cultural similarities. Those who do not fit some hegemonistic view of 'normality' are banished to the fringes of cultural life. Our modern world is thus simply one of simulacra in which repetition plays upon repetitions and differences play upon differences (Baudrillard (1994)). Quoting Bell Hooks (1990)

"To imagine is to begin the process that transforms reality".

8. CONCLUSION

It is self-evident that a reflective-learning based model of technological and engineering education is urgently needed and should be widely adopted. It refutes the idea that technology itself will, by its very nature, overcome the traditional limitations of western

educational systems (Dreyfuss (2001)). Instead it argues that we need advanced educational processes and interventions to ensure that technology does not become another nail in the coffin of free-thought. The arguments presented here ensure that students are made aware of the particular context in which they operate, and can critically judge the processes and products they develop. Furthermore, this educational model demands a research lead approach, and can create great intellectual challenges for the educationalist herself. This paper argues that unless society addresses engineering and technology education as a process of socialisation, ethical demands cannot be satisfactorily fulfilled. Only by revisiting fundamental practice in engineering education can a new, dissident and open engineering education process be established by which engineers not only concern themselves with ethical issues, but lead the way in ensuring that communities and individuals alike are empowered by advances in technology. Even Machiavelli promoted dissension as a means by which the power of elites within republics is curbed (Skinner (2000)). This model of engineering education can help contribute to the counter-balance desperately needed if we are to overcome the engineering of consent.

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