

**How Does Technological Development and Adoption Occur in the Media?
A Cultural Determinist Model**

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Critical commentary on published works submitted in partial fulfilment
of the requirements of the University of Lincoln for the degree of Doctor
of Philosophy on the basis of published work.

May 2006

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Abstract

The commentary hereby submitted, 'How Does Technological Development and Adoption Occur in the Media? A Cultural Determinist Model' is on a thesis originally published in *Media Technology and Society A History: from the telegraph to the Internet* (London: Routledge 1998).

Media Technology and Society A History: from the telegraph to the Internet deals with the history of electrical and electronic mass media proposing a model for the nature of such developments. It is a final iteration of an approach to this history which has its origins in work first begun in the 1970s. The thesis argues that all these media developments can only be understood by having their histories placed in a social context; that they are exempla of what is termed in the thesis 'cultural determined' technological developments. The central claim made by the thesis is that the concept of an 'information revolution' cannot be sustained because the development of the technologies underpinning it exhibit no exceptional rapidity or fundamental social impact; and that, on the contrary, new communication technologies are conditioned by social factors and diffused at a pace and in a manner so that their potential for radical social disruption is contained.

This is contrary to the received dominant view that technology itself is the driver determining social formation – termed the 'technological determinist', 'technicist' or 'diffusion theory' approach. In rejecting technicism, the thesis here presented is a pioneering history of mass media technologies in using a cultural determinist framework as well as outlining a model to explicate at a theoretical level how innovations and adoptions occur.

The Published Work

1998 *Media Technology and Society: A History from the telegraph to the Internet* (360pp). London: Routledge (0-415-14229-6).*

(RECIPIENT, **BEST BOOK OF 1998**: AMERICAN ASSOCIATION FOR HISTORY AND COMPUTING.)

*Publishing history:

1998 electronic version

1999x2 paper reprinted

2000 "

2003 "

2004 "

2001 Chapter 1 translated as "Ein Sturm von Paradies: Technologische Innovation, Verbreitung und unterdrückung/ Die Informationsrevolution als Hyperbel" (pp 9-22) in Lorenz Engell & Joseph Vogel, eds., *Mediale Historiographien*. Weimar: Universitätsverlag Weimar (3 86068 158 3).

(2000 Chapter 1 from *Misunderstanding Media* (1986) London: RKP [first version of *Media, Technology and Society*] reprinted as "Breakages Limited" (pp 77-89) in John Caldwell, ed., *Electronic Media and Technoculture*. New Brunswick, New Jersey: Rutgers University Press (0-8135-2734-1).)

Introduction

This candidacy is for a doctorate on the basis of published work and on this accompanying critical commentary.

The commentary, in accordance with the University of Lincoln's Research Degree Regulations, has been designed to furnish a synoptic explication of the thesis and its intellectual context and development. It therefore demonstrates how the published work constitutes a significant, coherent pioneering contribution to the field of media studies, specifically:

- to an emerging revisionist tradition of media history, viz.: the history of the development of media technologies since telegraphy by grounding such developments in the social sphere (the 'cultural determinist' approach); and
- to a parallel emerging critique of the alternative dominant view of this history as being technologically determined; and
- to an original and coherent model of how such culturally determined technological development has operated as a force to diffuse new media technologies throughout the period since the Industrial Revolution.

The commentary is organised:

- 1) to afford an intellectual context for the thesis:
 - first in terms of a critique of the received history (i.e. technological determinism)

- then in terms of an alternative approach (i.e. culturally determined technological development and adoption);
- 2) to provide an account of the thesis;
 - 3) to outline my own intellectual formation and the specific development of the thesis as a revisionist historical project;
 4. to offer issues for further research.

Declaration and Acknowledgements

All parts of this thesis are my own work.

Critical to it has been the encouragement of Professor Sylvia Harvey without whom the task would not have been undertaken.

Ideas contributing to the development of the thesis date back more than three decades and to make a full acknowledgement of my debts to all who have influenced and informed the work is therefore not entirely possible. But I can note that my earliest published thinking on this topic (1974) acknowledges Nicholas Garnham, Dave Ryden and the late Caroline Heller. The first book-length articulation of the model (1986) was deeply indebted to my then colleagues at New York University, especially William Boddy and Michelle Hilmes. The colleagues influencing and informing the published text here submitted are duly acknowledged in the attached.

For guidance in writing this commentary I am most grateful to Professor Sylvia Harvey and Dr. Ann Gray, my supervisors.

And it is to them, my other Lincoln colleagues and my family that I dedicate it.

Critical Commentary

Context

Technological Determinism (Technicism)

Any chronological list of important milestones in the history of communications media is likely to give significant place to technological developments. For example, Downing, Mohammadi and Sreberny Mohammadi suggest that between Cro-Magnon's possible acquisition of language circa 35,000BC and the development of a 'silicon superchip' in AD1994, no less than a third of the significant dates listed commemorate 'technological breakthroughs' (1995: ix-xii). The most widely understood narrative explicating this sequence offers, in essence, a series of overlapping biographies of 'inventors' – Gutenberg and Daguerre, Morse and Bell, the Lumières and Marconi, Baird and Turing etc. etc. – until, by the mid-20th century, the work of 'invention' is wholly subsumed by the research and development laboratories of great corporations whence emerge, as the products of usually anonymous technicians, the transistor and the pocket calculator, the digital watch and the videotape recorder, the mobile phone and the TV satellite etc. etc. in an unending stream, usually perceived as ever more life-enhancing (or, somewhat less commonly, culture-threatening).

This thesis is a response to the inadequacies of such popular accounts of these milestones. Neither the history of the development of technology in general nor the impact of technological developments in the mass media in particular can be effectively captured by a narrative which is merely the 'progress of great men'. Such accounts grossly simplify the complexities of technological creativity; pay scant regard to social contexts and realities not only omitting non-European and female contributions but frequently also allowing distortions of national biases and basic error.¹

¹ Johannes Gutenberg (c. 1400 – 1468) is conventionally credited with the first printed press from moveable type in the West; but he was not the only person at work on this technology at the time and moveable type was anyway long established in, at a minimum, Korea and China. Charles Daguerre (1787 – 1851) is conventionally credited with the development of photography but he was a showman working to an agenda determined by his partner Nicéphore Niépce (1765 – 1833) and anyway his system produced unique images unlike the photographic process that was to prevail which used negatives capable of producing multiple copies. Samuel Morse (1791–1872) was a portrait painter who relied on other scientists and technologically more sophisticated minds, for example, Joseph Henry, a physics professor at the institution that was to become Princeton. He too had many legitimate rival claimants to the title 'inventor of the telegraph'. Alexander Bell (1847 – 1922) was an elocution teacher with an interest in deafness. He, like Morse, relied on assistants, notably Thomas Watson (1854 – 1934), an able young electrical engineer. It is also probable that Bell's first effective telephone was the result of his being given a sight (illegally) of the patent application of his rival Elisha Gray (1835 – 1901). The Lumière brothers (August 1862 – 1954 and Louis 1864 to 1948) were not, as is commonly supposed, responsible for the first cinema show for a paying audience in December 1895. There was the fourth and they were among a host of entrepreneurs and technologists working on moving image systems at that time. Guglielmo Marconi (1874 –1937) was more of a scientist than these others being a physics graduate from the University of Bologna – which is why he knew about the devices he used for his radio experiments. His contribution – no small thing – was to realise that the higher the aerial the further the signal could be sent. Needless to say, others were at work on wireless telegraphy at

It is possible, however, to see 'the great men' account of technological change as a vulgar variant of an equally pervasive but more refined approach, termed 'diffusion theory' (Rogers, 1962). Diffusion theory shares with the 'great man' narrative an inherently linear sense of technological developments as a species of 'progress' as that concept is commonly understood; and whether for good or ill. It does, however, deal in a fuller and more complex fashion with the scientific and technical contexts in which developments take place but, in common with much history or sociology of science, tends to focus less on broader social factors. It privileges the 'progress' of technology as a determining factor on the broader society and can therefore be termed a 'technological determinist' or 'technicist' approach.

Raymond Williams, the leading pioneering British anti-technicist, elegantly suggested that:

The basic assumption of technological determinism is that a new technology -- a printing press or a communications satellite -- 'emerges' from technical study and experiment. It then changes the society or the sector into which it has emerged. 'We' adapt to it, because it is the new modern way (Williams 1989: 120).

Therefore, technological determinism:

is an immensely powerful and now largely orthodox view of the nature of social change. New technologies are discovered, by an essentially internal process of research and development, which then sets the conditions of social change and progress. Progress, in particular, is the history of these inventions, which 'created the modern world'. The effects of the technologies whether direct or indirect, foreseen or unforeseen, are as it were the rest of history (Williams 1974: 13).

It can be argued that technological determinism has achieved its hold over the Western mind exactly because it meshes fundamentally with the Western mindset, notably a deep-seated concept of progress. The underlying driver is the concept of forward motion, seeking spiritual perfectionism, teleologically prefiguring the last days of the Rapture. It is but a short step hence, although one which was to take many centuries to emerge for this to become individualised and then transformed into a demand for freedom of conscience in matters of Christian faith. This

the same time. (He was also the only one among this group to receive a Nobel prize -- for physics in 1909.) John Logie Baird (1888 - 1946) was a failed entrepreneur who became obsessed with mechanically scanned television and never fully grasped the principles of electronic scanning which were to prevail. Nevertheless, the British popularly persist in regarding him as 'the father of television'. Alan Turing (1912 -- 1954) was, undoubtedly, one of the most influential mathematicians of the 20th century, responsible, in 1936, for a breakthrough paper which lies at the very foundation of computing science; but he was not, as is increasingly being popularly claimed, a father of computing in any practical sense. In fact, he had trouble changing light bulbs. The popular understanding of the nature of technological change in the media is completely inadequate.

religious demand was comparatively swiftly echoed in a parallel demand for secular individual autonomy and politicised in a social contract which conceived of society as individuals contracting with each other to create a social sphere in which to function. By the 18th century Christianity's promise of human perfectibility had thus acquired a materialist cast. The Enlightenment view was that the human race, now 'emancipated from its shackles released from the empire of fate' was 'advancing with a firm and sure step along the path of truth, virtue and happiness' (as Concordet put it).

Crucial here is the image of humanity's 'advance'. In the 19th century technology became an autonomous fundamental driver within the social sphere and the bridge from Christian ideas to a technologised vision of progress was completed. The idea of progress exactly echoes Williams's characterisation of the technological determinist vision as an unstoppable flow of emerging technologies moulding the structures of society. This reflection is not, it must be noted, dependent on sharing Concordet's optimism about the end result of this advance; humanity could just as easily be rushing towards an abyss. New technology might be positioned as an engine facilitating 'truth, virtue and happiness'; or it could bring exactly the reverse results.

However, a central difficulty with the technicist account is that it does not entirely explain the phenomena with which it deals. Technicist narratives are not, as in the 'great man' approach, simply largely wrong; but they are still inadequate. By focusing on the technology there is a tendency to simplify. The pre-history of devices is truncated or entirely omitted. So, for example, sound film is a development within the area of Western lens and theatrical cultures and is therefore determined by centuries of socially driven pertinent advances. Technicist explanations of synch film, on the other hand, begin with the application of the 'invention' of the phonograph (dated to Edison in 1877) to motion pictures (dated, at the latest, to animation toys such as the Phenakistiscope in 1832). The social circumstances that drove western aesthetic preferences to realism (including the representation of motion in the form of animated slides with sound effects), the obsession with the visual (Freud's *schaulust*) which together span centuries are ignored. This truncating of history has a profound effect since it supports a vision of technological upheaval and constant change. It lies at the heart of the idea that developments are 'revolutionary' when in fact they are far more evolutionary.

The tendency to hyperbole is another widespread characteristic of technicism. Take Marshall McLuhan, among the first to make the media an object of study in the post World-War II era (and

also one of the few to achieve celebrity thereby becoming in the process a major 'guru' of the 1960s):²

Physically the printed book, an extension of the visual faculty, intensified perspective and the fixed point of view Socially the typographic extension of man brought in nationalism, industrialism, mass markets, and universal literacy and education. In bringing the ancient and medieval worlds into fusion – or, as some would say, confusion – the printed book created a third world, the modern world which now encounters a new electrical technology or new extension of man. (McLuhan 1964:157)

Here, in what has become a quite typical manner, hyperbole meshes with ahistoricism to suggest that a 15th century technological advance (printing from moveable type) is responsible for social phenomena (nationalism etc) which only manifest themselves centuries later. But even where historical causality is not stretched in this way, there is a desire to overstate claims about social impacts, to attribute one social phenomenon (e.g. 'intensified perspective' etc.) to a technology innovation ('the printed book') when both might be the result of the same social pressures and not causally related.

Currently, at its most extreme, such hyperbole suggests that the technologies are advancing at a pace that wipes out the established truths of, say, economics or the lessons of history and old approaches have no further validity. Such spurious technicist reasoning was the root of the 'dot.com' stock market fiasco of the late 1990s. The old rules did apply after all and the market crashed. The tendency to ahistoricism is well illustrated by the current insistence on a 'digital revolution'. This is now, at a minimum, in its sixth decade of development, the first device to encode an electronic signal digitally having been built in 1938 (Winston 1998: 133-4). In turn that device relied on mathematical calculations as to sampling rates that had been theoretically determined a decade earlier. The digital devices, including the computer, that were to suffuse the market in the last quarter of the 20th century relied on solid state electronics which were not 'invented' (as is commonly believed) at the Bell Labs in 1948 but go back to experiments with semi-conductors in 1879. Cats' whiskers radios were the first solid-state technology to be widely diffused from the 1920s on. It is therefore all too often the case that technicist accounts, in so far as they are necessarily historical – else how can 'revolutionary' impact, for example, be established – tend to be histories written by amnesiacs.

² Marshall McLuhan (1911 -- 1980), professor of English at the University of Toronto. A Catholic convert who saw the modern world in terms of decline, he allowed his basic negative position to be systematically misinterpreted. Thus his opinion of advertisements as being a central mark of contemporary Western civilisation was taken by the advertising industry as a very welcome legitimization of its activities, when he thought it the reverse. Advertisers were responsible for propelling McLuhan into the public eye. When there he remained more or less silent as to what he really thought about contemporary culture.

The technicist tradition has a (dominant) positive 'technophile' bias that sees new technologies as beneficent; but there is also a significant 'technophobe' strand in the tradition, equally insistent on the socially-determining nature of technology but seeing this as, in some instances, baleful. (As with Marx, belief in these contradictory social effects can be held at the same time.) The point is that both the technophile and the technophobe variants of technological determinism put technology before (as it were) society. The thesis herein proposed is therefore as much as response to the inadequacies of developed technicist accounts as it is to the vulgarities of populist 'great man' narratives.

*Cultural Determinism (Socially Shaped Technology)*³

Of more significance than any of the above problems is technicism's underlying ideological implication viz.: that technology is an unstoppable social force. It is therefore disempowering, suggesting that the social diffusion of its products 'in the metal' cannot be resisted. Such a concept is of obvious significance in a capitalist society, especially in its late consumerist phase.

As a response, in the specific area of media technological history there has been a move over recent decades towards a second less popularly understood approach that, in essence, denies technology as the driver of social change. Instead, society is conceived of as the major factor determining the technological agenda and conditioning the diffusion of the technologies it produces. This 'social shaping of technology' - 'SST' -- is also deterministic and can therefore be termed 'cultural determinism'; but it seeks to place the work of the technologist within the broader social sphere suggesting that the technological agenda is influenced by social needs and that the successful diffusion of any given technology depends on its social acceptability, its 'fit' (as it were). As it denies technology a determining role in society, it tends to be less judgemental as to technology's effects, seeing them rather as consequences of other social factors.

The technological has obviously been of long interest to social historians, so work on technologies within a broader social context than that offered by technicists antedate the emergence of the technicist dominance of technology history. SST's antecedents lie with the French *Annaliste* school of historians and date back to the 1920s. For example, Marc Bloch's classic essay on the diffusion of the watermill in Medieval Europe focuses on the social and legal structures pushing

³ The term SST was originally SCOT, the 'Social Construction of Technology'. Neither SST nor SCOT is in wide use, even academically (Bijker et al 1981).

and inhibiting its introduction and says little about the technical knowledge leading to its development (Bloch 1935,1967: 136-138). Fernand Braudel sees the history of technology in general as a struggle between forward social movement driven by human ingenuity and advancing knowledge and an oppositional force sustained by human inertia and conservatism. He identified these contrary forces as 'accelerators' and 'brakes' governing technological change in general:

First the accelerator, then the brake: the history of technology seems to consist of both processes, sometimes in quick succession: it propels human life onward, gradually reaches new forms of equilibrium on higher levels than in the past, only to remain there for a long time, since technology often stagnates, or advances only imperceptibly between one 'revolution' or innovation and another (1979:430).

It is therefore the case in Braudel's view that, although science and technology, as are 'uniting today to dominate the world -- such unity *depends necessarily* upon the role played by present-day societies, which may encourage or restrain progress, today as in the past' (1979: 431 --emphasis added). What drove the changes we call the industrial revolution, changes which made the modern world, were grounded in the societal forces unleashed by early Western capitalism and the imperial expansion of Western nationalism. In other words, society always leads technology. This accounts for the fact that, for example, the industrial revolution, an entirely technology-based phenomenon, relies on no new technological knowledge. Explaining it is more effectively done by highlighting the social changes which facilitated the application of science and technology which had been, as it were, lying fallow. This social focus on the technological, though, was long eschewed by Anglophone historians and indeed many of the classic *Annaliste* texts were not even translated into English until the 1960s and later. Their impact on those concerned with technology remained (and largely remain) marginal in Anglophone discourse.

Thus although SST can lay claim to a greater historiographic lineage than diffusion theory, for the media's technical history, now itself in the process of being written-up in a non-anecdotal fashion for the first time, correcting the dominant Anglophone technicist focus was not on the agenda. For Anglophone scholars the subject was at its heart, as it were, the nature of technological developments and, fuelled by a populist post-World War II rhetoric of 'robot brains' and the like, their technicism produced the concept of the information revolution and all its attendant rhetoric and historical amnesia.

Take, as emblematic of this process, the received discourse on the possibilities of digital television. At all levels, scholarly, industrial and popular, this entirely misreads the history and potential of the digital. A.H. Reeves who built the first digital device seldom if ever figures in these accounts and the fact that he demonstrated the efficacy of this signal modulation technique in 1938 never. On the other hand, John Logie Baird is still frequently jingoistically cited the 'inventor' of television although the mechanical scanning he was playing with at the same time was already clearly a dead end. Current accounts, virtually without exception misunderstand the technology, babbling of ones and naughts and never explaining pulse code modulation. But far worse is the technician failing to take cognisance of the crucial social factors which will determine digital modulations development, i.e. the economy of a fragmented audience and their cultural expectations, the limitations of leisure and, above all, the difficulties of creating fresh content forms.

Cultural determinist evaluations of the digital would avoid this widely shared technician blindness and instead concentrate on the paramount difficulty of finding content that people really want (e.g. the struggle for 'hits' in all media whereby, in the US, a third of all prime-time programmes are dumped and only three or four make it to a third season). In an industry seduced by technicism, content becomes a mere question of the intellectual property rights attached to content which is supposedly spurting from a pool of limitless talent. Forgotten here is the fact that production values are a barrier to entry created to protect these same industries but which now limit their ability to produce effective new revenue streams based on the consumption of cheaply made product. The economic consequences of established media forms are more than simply a question of IP. The historic reality of audience expectation that its deep-seated need for narrative be presented with high 'production values' (i.e. costs) cannot be safely ignored merely because the signal is encoded in a new way. The audience expects an hour of drama, say, to meet its cultural expectations and that currently costs the producers of that drama £505,400. But this fact is sloughed aside in favour of the grail of programming which costs nothing and obsesses the audience – a world of 400 channels of 'reality', weather forecasts, make-overs and sex-workers soliciting phone calls.

The cultural determinist, having to hand the sort of history I have tried to provide in my thesis, knows that the media always have exhibited considerable imperviousness to new platforms as a basis for change. The conservatism of entertainment forms is more powerful than mere technological change in essence duplicating of delivery platforms. And digital as nothing but a new modulation mode, is particularly weak in this regard, far more akin to the change from AM

to FM radio than the move from radio to television. Without question, Aristophanes and Menander were they to return today, would have no difficulty in knowing which television situation comedies belonged to which tradition of which they are exempla. This is not to say change is impossible. It clearly is; but the technicism debate ignores such issues, issues which are exactly at the heart of the culturally determined approach.

The ideological force of this cannot be ignored. In this context, for the targeted consumer, it reinforces the inevitability of the digital 'changeover' with the attendant need to buy new TV receivers, junk all recorder video cassettes and DVDs and, if one is inclined to early adoption junk the new receivers in favour of plasma screens. Nobody is immune from the force of technological change, not even those who own the technology. By this light, Rupert Murdoch, for example, is seen as being driven to owning a vast range of media not because he is subject to capitalist ambition but rather because the fact all media use digital technology their supposed 'convergence' is forcing him into this pattern of behaviour.

So powerful is technicism, it was not until the mid-1980s that the first books in a small but persistent literature critiquing the concept of an 'information revolution' (e.g. Noble 1984) started to appear. These included the first iteration of this thesis (Winston 1986).⁴ Given the wide reception of technological determinist explanations of technological change, cultural determinism can often seem counter-intuitive, rejecting technology as an engine of social change and resisting arguments that it is either 'out of (social) control' or that it is a prime force materially altering social – much less (as is sometimes claimed) human sensory – realities.

The Thesis: A Cultural Determinist Model of Media Development and Adoption

This thesis is a pioneering contribution to the cultural determinist approach applied to media technology. In essence it attempts to correct technicist failings by seeking to be more firmly grounded in social science and history and thereby better rising to the basic challenge of capturing some of the myriad complexities of social phenomena with which it deals. It does this by attempting to write what anthropologist Clifford Geertz has termed 'thick' (i.e. nuanced, multifaceted, comprehensive) accounts (Geertz 1973). Given that the assumption of cultural determinism is that society shapes technology there is, as a consequence, an inevitable element in the analysis which takes cognisance of the past -- i.e.: what is the background to the social factors that have been at work conditioning the technological agenda? Prompted by the application of

⁴ Criticism of technicism itself, which is distinct from technophobe attacks on the supposed dominance of technology, has now even started to appear in a more popular form (e.g. Stoll 1996).

concepts of structuralist linguistics to other areas of humanistic study and harking back to the methodologies of formalist historiography in vogue in English in the middle years of the 20th century, the thesis uses a detailed history of the media to develop a theoretical pattern explicating how innovations are born and brought to the point of effective diffusion. Its novelty, then, lies in the application of a theoretical pattern drawn from historical formalism and structuralism being applied to this narrative history.

In contradiction to the basic tenet of technicism – that technologies advance inexorably – the historical record reveals that its diffusion is far from inevitable. Indeed, the opposite is true. Technologies as Braudel suggests can have little impact for centuries before being widely diffused or can fail to be exploited entirely which suggests other factors beyond the technological have to be in play.

Media technologies, at least as far as the historical record is concerned, exhibit the characteristics of other technologies and are just as subject to Braudel's accelerators and brakes. A case cannot be made for any sort of media technological exceptionalism, although the most hyperbolic technicist rhetoric often does this. This, though, is without prejudice to the possibility that other technologies (unexamined here) can better make an exceptionalist case -- e.g. medical or military technology -- essentially because social 'accelerators' are more, and social 'brakes' are less, effective in these areas. Therefore, although I am proposing that there is nothing particularly exceptional about media technology, nevertheless prudence suggests that any conclusions reached as to the pattern of its development and social diffusion should not be more broadly applied without specific further research.

Limiting this discussion to media technologies suggests that the complex Braudelian pattern of accelerators and brakes can be explained by a model which attempts to balance the linearity of historical development against non-linear social factors.

The two main sources conditioning the model in *Media Technology and Society* were the historical record of media technologies from the telegraph to the internet and, secondly, structuralist linguistics.

The historical narrative was interpreted according to assumptions as to the nature of historical causality. The historian C.G. Hempel articulated a theoretical approach to causality during World War II:

In every case where an event of a specified kind *C* occurs at a certain place and time, an event of a specified kind *E* will occur at a place and time which is related in a specified manner to the place and time of the occurrence of the first event (Hempel: 1942: 35).

In this mechanistic approach to the creation of historical 'laws' Hempel was following the influential work of Arnold Toynbee (1934 -- 1961) on the rise and fall of civilisations. The idea of history being patterned in some way clearly resonated with my reading of the received narrative on media technology. However, such an approach had long been out of fashion. There had emerged after the war in German historiography a tendency to argue that the Nazi catastrophe was the inevitable result of German history's 'Sonderweg' or 'special way'. That this application of the notion of historical 'laws' in some way exculpated the Nazis was not acceptable of itself nor as a general principle. Pieter Geyl, for example, attacked Arnold Toynbee's notion of 'challenge and response' as the underlying historical law as being too mechanistic and cavalier with its evidence (Geyl et al. 1949, 1955). For this reason, although the thesis does rely on the concept of patterned causality, the use of the term 'law' (below) in the phrase 'the "law" of the suppression of radical potential' is placed in apostrophes to indicate that it operates in a less definitive manner than is implied by Hempel.

The second theory utilised in building the model was structuralism. This had become something of a supertheory in the post-World War II period, following the work of the Moscow and Prague Linguistic Circles from the late 1920s on in moving from language to literature and subsequently to non-cognate areas such as anthropology (e.g. Jakobson (see Vachek (1964); Levi-Strauss (1958)). For the model it seemed that the concept of transformation -- from *langue* to *parole*, from deep structure to surface -- could be melded effectively with an Hemplerian historical approach to deconstruct the process leading from the idea to the diffused device. Because of these prior applications in fields some far from linguistics, this seemed to be legitimate.

The thesis resulting from these applications suggested the following:

Against a ground of formal and informal scientific understanding (linguistic 'competence' in Chomskyan terms i.e. *langue*), technologists suggested transformative ideas (a stage termed 'ideation') which resulted in the creation, 'in the metal' of devices which were 'technological performances' (cf. Chomskyan linguistic 'performances' i.e. utterances or *paroles*) designated as

'prototypes' (Chomsky 1957). Categories of prototypes were elaborated but the crucial point was that this process of competence, ideation and performance, and all subsequent phases of the model, took place inside a social sphere which therefore determined the ideation transformation of scientific competences into technological performances.

A second transformative stage – designated 'supervening social necessity' – also arose from within the social sphere and impacted on this stream of technological performances with the result that, on a comparatively arbitrary basis, one of the prototypes – technological performances -- created subsequent to the operation of this transformative event was declared to be an 'invention'. Therefore, in communications, 'inventions' are prototypes created after the supervening social necessity (which could take a variety of forms as outlined in the model) was identified. Given that supervening social necessity created a general social context for the technologist's research and development activities, the phenomenon of simultaneity, a marked characteristic of the historic record, was thus not surprising; nor was the marginalisation of original thinkers and prototype builders.

What also needed to be explained was why hyperbolic claims for the impact of new communications technology did not ever actually materialise in significant 'revolutionary' outcomes (or, better, had not thus far done so). Hyperbole appeared to be foundational to the technicist approach. That is illusory was important in combating technicism's ideological thrust. To do this required the introduction of another social transformative phase into the model, to operate subsequent to the 'invention' phase. I designated this a 'law', using quote marks to indicate that although its operation was certain enough to be always present as Hempel suggested is the case with elements within his accounts, its specific outcomes in the model were not quite as inevitable as the operation of his law's would (or ought to) be. This transformative 'law' argued that new media technologies, already determined by social necessities, were introduced – that is diffused – only in so far as their socially disruptive ('revolutionary') potential was suppressed. The price of diffusion, as it were, was exactly the suppression of those effects identified as inevitable revolutionary outcomes by hyperbolic technicists. The 'law' of the suppression of radical potential ensured the new technology's social 'fit' and conditioned the last phases addressed in the model, that of diffusion and spin-off.

It also had the effect of moving the focus of the model away from established concerns about the economics of diffusion and adoption in the market. The model, on the contrary, attempts to understand the processes in play prior to the business of diffusion as a matter of marketing,

consumer behaviour and the like. By concentrating on phases otherwise largely unexamined or misunderstood because of technicist error, the model offers a basis for conclusions at odds with received opinion. It suggests that the entire received rhetoric of an 'information revolution' was in error, supported by neither the historical record nor current situations. Thus technicist hyperbole may be seen as the result of significant historical amnesia and many commonly received views – that technological change in media produced revolutionary social change; that the pace of technological development was increasing; that technology was somehow 'outside' social control – may be seen as spurious. On the contrary, the model leads to the conclusion that new media technologies developed in line with socially determined agendas. Their progress from idea to diffusion may be seen as being determined by a balance between social needs driving their introduction and social inertias constraining them so that they are only diffused or likely to be diffused if they fit within established social norms. It follows that new media technologies are far more likely to be evolutionary, as they have been in the past, than revolutionary, as received opinion suggests.⁵

Personal Context

My interests have developed since I first published in the discipline 30 years ago but my central concerns have remained constant. The following briefly sketches this background:

I am not a trained scholar as I left university after taking a first degree in law in 1963 to become a television researcher and, over the next decade, a director and producer. I was moved to begin a study of the industry in which I worked because of a growing personal dissatisfaction with what I felt were the day-to-day limitations of public service broadcasting: that is, the institutional limits constraining PSB's potential to bring meaningful information on a full range of events and opinions to the audience. This is not to say I sympathised with the then fashionable Leavisite attack on the media -- as in Denys Thompson (1964) or, more curiously, in elements within Hall and Whannel (1964). Obviously, as a media worker I was much more in tune with the anti-elitism of Hoggart (1958) and Williams (e.g. 1961, 1962, 1966) and the celebration of Hollywood to be found *Cahiers du Cinema* and *Movie*.

Assuming media sociology must have produced the insights I was seeking, my first approach was to examine what was the then to me hidden work of, for example, Klapper (1960), Schramm

⁵ Accounts of the 'missing' technologies of photography and cinematography have been published (Winston 1995 – see below p. XX) as has an account of the press (Winston 2005).

(1957), Halloran (1970); but the media effects tradition in which they largely worked seemed extremely inconclusive and un-illuminating. Marshall McLuhan, with one of whose daughters I was to produce an extremely bad Canadian feature film, once asked me if I knew Wilbur Schramm. I said I did not and McLuhan said: 'Wilbur was the sort of a man who, if you asked him to define measles, would go round counting the spots on people's faces' – as good a critique of positivist media sociology as any. McLuhan's own work (1964), although -- as Jonathan Miller pointed out (1971) -- extremely important because it brought before a wide readership the then startling proposition that the media were worth studying at all, unfortunately seemed to me to be equally flawed especially in its cavalier treatment of historical cause and effect.

Another initial issue that concerned me was my own ignorance of the fundamentals of the mass media technology. Neither I nor the vast majority of my peers as producers, directors and researchers had any clear notion of how the medium actually worked and this ignorance, obviously also shared by the public, contributed to the general ideological obfuscations around media policy and power. Technology, for example, was the key to the media's ideologically powerful claim on the real – a claim that was to also become a central concern of mine in that the scientific basis of broadcasting logically underpinned the objectivities on offer from the media.⁶ My sense, which has not materially altered, is that concerns about media output in general and PSB in particular were a product of a certain insouciance about imaging and electronics as well as stemming from more obvious, and more discussed, editorial and other creative processes. An explanation of the technology and a critique of the sociology of the mass media therefore constituted the subject of my first books (1973, 1974). The technological occupied a subsidiary position in these texts which more centrally constituted a critique, very much from a media professional outsider's perspective, of the various approaches to media studies then in play. Technological history, beyond the received 'great man' narrative, was exactly not on the agenda.

Nor was it to the fore when I moved over to the academy to direct the Glasgow Media Group in 1974. Therefore, it was not until I began work at the New York University Film School five years later that I returned to this topic in earnest. I had noted in the initial chapters I had published in 1974 that the received histories of the development of the media appeared to follow a pattern of almost Proppian regularity (Propp 1928). Apart from the inevitable appearance of a 'great man' inventor there was a curious precursor figure whose fate it was, apparently, to be ignored both at the time he (again, all were men) presented his innovative device and subsequently by history.

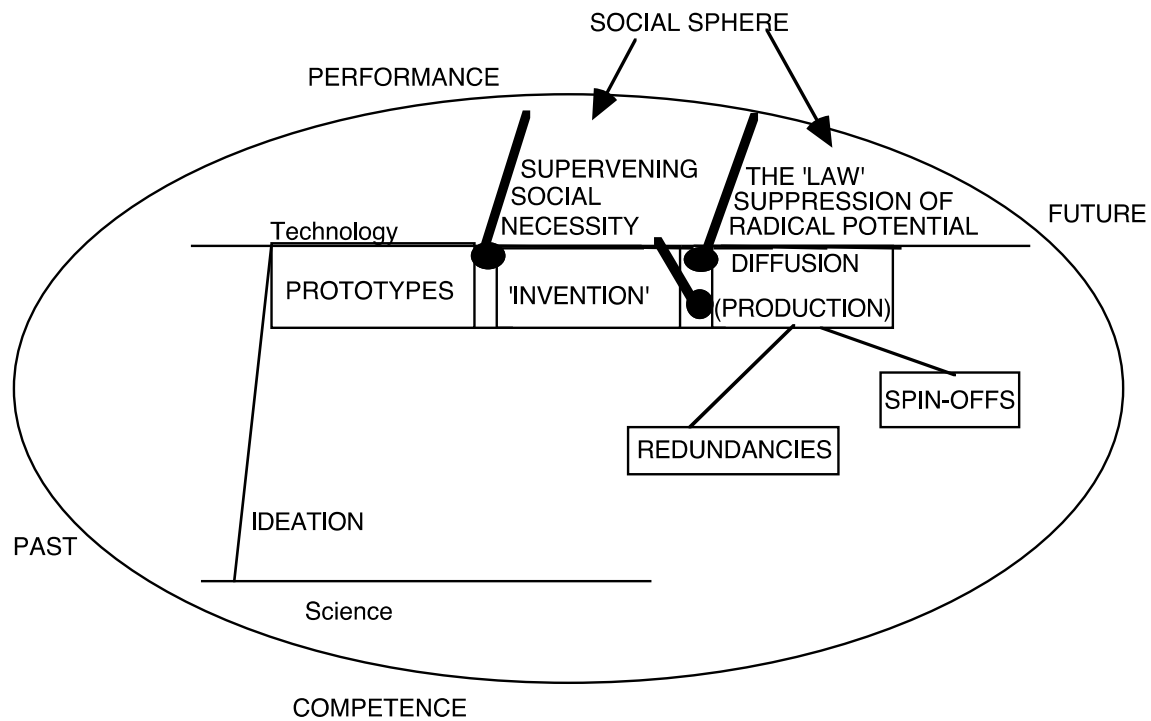
⁶ It is from this concern about the ideological force of the concept of 'objectivity' that the other main focus of my academic work, the documentary film, would also eventually stem.

The obvious explanation for this marginalisation, that the device did not work, was not inevitably the case, for sometimes the devices were indeed fit for purpose; conversely, nor was it true that the so-called 'invention' actually worked better or, indeed, very well at all.

Furthermore, with many media technologies, after the fallow period following the work of this solitary figure there would be a sudden spurt of activity leading to the more or less simultaneous presentation of devices, one of which would be, more or less arbitrarily, selected by history as the 'invention'.

The thesis has its origins in an attempt to answer the question why this pattern occurred. A narrative of the historical social necessities and constraints and their interaction with actual scientific and technological development was elaborated during this period at NYU eventually being distilled into a master diagram into which the major stages in the development of every media technology since the telegraph fitted, I would claim, without distortion or bias. This led towards a revisionist history of media technologies, *Misunderstanding Media* (1986), and the elaboration of a theory of technological development prior to the moment of what was commonly understood as 'diffusion'. This last, of course, was the subject of considerable attention in economic and business studies and was therefore, as I have explained above, not central to my interest. The pattern of change I elaborated sought to explain the phenomenon of 'invention' in terms other than the mysterious operation of individual creativity.

Following this initial publication, in my thinking I altered the diagram in only one respect: the 'arrows' used to represent the 'supervening social necessity' and the "'law" of the suppression of radical potential' because, as with the apostrophes around 'law', these seemed upon reflection to symbolise more pointed and well-defined events than the historical record justified. The model for this thesis is therefore as follows:



More than this I slowly realised that I had tried to do two things simultaneously in the book – articulate the thesis and at the same time mount a secondary and largely implicit attack on technicism, especially as this was represented in McLuhan’s work. Although the book was largely well-received, the result was more opaque than it needed to be. The chronological scramble of the text, whereby television, a central concern of McLuhan’s, was dealt with some 250 pages before radio, alone indicates the confusion of my two aims. Also, I reached the conclusion that the efficacy of the model could be further proved because it fitted the history of other non-electronic media, i.e. the press, photography and cinematography.

Next, published accounts, written over the previous decade but now expanded, on the invention of the cinema, the ideological underpinnings of colour film, the ‘suppression’ of 16mm and analogue high-definition television were gathered into a collection, *Technologies of Seeing* (1995) with wholly new chapters on 16mm and holography added, thus making good some of the lacuna in *Misunderstanding Media*.

Given the problems, as I now saw them, with *Misunderstanding Media* I seized the opportunity of a total rewrite when the publishers approached me for a new edition. This was published as

Media Technology and Society, the thesis here presented. For this I had now not only written up accounts of the visual media in *Technologies of Seeing* but I also had to hand unpublished material on the development of printing. I had also concluded that although the term 'law' (even in apostrophes) implied a stronger level of causality than was perhaps prudent – this further work on print, photography and cinematography gave me no reason to revise the underlying sense of a regular pattern, much less abandon the centrality of the social sphere in these histories. (But I did publish, finally, a revision of the arrows in the model seeking to reflect the more complex nature of the interaction at work by symbolising it in the form of amoeba-like globules instead – as above.)

More importantly, while not modifying the basic anti-technicist thrust of my argument, the revised text became more conventionally chronological. The publishers determined that the new book was so far transformed as to deserve a new title, a decision with which I was not entirely comfortable, especially after financial considerations required the removal of the non -electronic material. Even then, the application of the model to printing remained unpublished.⁷

One last observation: I have explained why the focus of this work largely ignores an economist's approach to diffusion but the entire project here presented also lies somewhat athwart the main thrust of media studies in that it disregards the dominant paradigms in play throughout these decades. I have explained how, at the outset, the founding sociological approach to media studies struck me as inadequate of itself and certainly did not address the issue with which I was concerned. Although later paradigms were far more engaging, these too, primarily post-modernist and heavily inflected by psychoanalytic models, were also unconcerned with technology – or, on the rare occasions where they were this work was slanted towards deconstructing the relationship between the apparatus and the subject and therefore still remained outside my agenda (e.g. Baudry 1974, Comolli 1971, Wollen 1980). Nor did an emerging political science tradition or an ever more sophisticated media historiography, both of which began a long march through the institutions, focus on the technological either, as I have noted above in describing the trajectory of my own work (e.g. Garnham: 2000: Briggs: 1961-1995). This failure to fit within dominant lines of inquiry is fundamental to the claim of originality.

Issues and further research

⁷ The print material now appears, somewhat uneasily, in *Messages: Free Expression, Media and the West* (Winston 2005).

Media Technology & Society has been reprinted five times and was well received internationally. It was awarded the 'Best Book of the Year' prize by the American Society for History and Computing and was also favourably reviewed. Outlines of the basic model have been reprinted a number of times (Winston 2000 {a}, 2000{b}, 2001 {a}, 2003).⁸

However, there were a number of criticisms, most notably that *Media Technology and Society*, failed to deal with older media technologies, viz.: print, photography and cinematography whose histories might support or refute the thesis.⁹ More generally, in discussion within and without the classroom, I have become aware of a number of issues prompted by the thesis in this form. One issue of these, however, remains intractable.

It is the case that the advantages accruing from establishing a pattern in any historical or sociological account is balanced by the disadvantages that the pattern will either exclude pertinent data or distort it. This is the tension exemplified by Toynbee and Gyle, between those seeking and those rejecting patterns, and there would appear to be no conclusive resolution of this difference. It is also the case that the best possible defence to the change of bias or distortion in a patterned account (a model) -- that it be as 'thickly' described as possible -- is very difficult, if not impossible, to perform. It is therefore the case that the model privileges causality as critical to the understanding of the nature of developments in media technology but nevertheless fails to capture all relevant data and therefore is subject to justified criticism. I see no solution to this problem.

On the other hand, there is the problem of Eurocentricism. This takes two forms. In accounts of the earliest phase of media technological developments (i.e. with printing and with photography), there is a very real danger that influences external to Europe are downplayed. Thus the complexity of the Chinese and Korean contribution to the development of printing from

⁸ Using different versions, e.g. the 1986 version has been used in *Electronic Media and Technoculture* (2000), and the iteration in *Technologies of Seeing* was reprinted in *Film and Theory: an anthology* (2000).

The 'mainstreaming' of the model is further illustrated *International Dictionary of Social & Behavioural Sciences*. 2001 (c) "Mass Communications: Technology " (pp 9334-9338) in Michael Schudson, section ed., *International Dictionary of Social & Behavioural Sciences* Amsterdam: Pergamon (0080430767)

To have been allowed to deny technicism an unchallenged voice in a main sociological reference work is not without significance. This is not to say that this model or SST itself more generally is widely accepted; but it is to indicate that received technicist opinion is now being more widely challenged.

⁹ Actually, as I report above, I had been researching these histories and had published accounts to demonstrate how the model applied to these areas. I have continued to do so with a critique of the 'dot.com' fiasco (2001 {b}) and further work on synch sound 16mm in the 1930s (2001 {c})

moveable type in Europe, or of Arab scholars to issues of celestial observation which are fundamental to European optical science and therefore to image culture, are ignored in favour of narratives which stress Western activities as independent of outside influences. (This is, of course, even more true of technicist explanations which focus even less on the social context of technology.) The thesis as here presented does embrace as best it can non-European developments but since the history of printing and photography is omitted this is less comprehensive than it should be.

Equally significant is that any discussion of the social effects of the technology tends to assume the society in question is the West. Thus, for example, mobile phones can be dismissed as a non-transformative technology in Western terms (e.g.: Graham 1999: 69), where the same technology might have far more profound social impacts in non-Western cultures; but these are seldom considered.

There is also a further reverse problem in that non-Western cultures, having become Westernised to the point where, at a minimum, production is sited in their midst, generate consumption patterns – early adoption for example – which technicists might erroneously use to predict Western behaviour.

Even within the West, both technicist and cultural determinist explanations tend to ignore the differential effects of a technology. For example, in 1999 a movie, *Toy Story II*, was released both on traditional celluloid and for the first time also in a form to be projected directly from a computer hard-drive using an extremely expensive high-definition projector, which can duplicate the projected film image in a cinema seating thousands. It had been brought to market by Texas Instruments (TI) and its arrival signalled the end of celluloid just over a century after the introduction of moving pictures on that medium. The impact of this technological change was, for the cinema audience, minimal since the movie was to all intents and purposes identical whether projected from hard-drive or celluloid. For the photographic industry, on the other hand, particularly the dominant world-player Kodak, and for all those involved in film industry processing laboratories, the impact of this change, although moderately slow to work through, was profound. At the time, TI had placed only 15 of these projectors and by the time of writing there were still only 150 worldwide. Nevertheless, by the summer 2005 because of this -- and more immediately, of course, because of the diffusion of the parallel technology of digital cameras -- Kodak announced the loss of another 10,000 jobs world-wide. (It was 'refocusing' its business on digital imaging.) Discussions of the effects of media technological tend to ignore

these nuances by concentrating on the impact on end-users (in this case audiences) to the exclusion of other players.

The example of large-screen digital display highlights a further distortion in the study of media technology. For both the cultural determinist and even more for the technician, there is a tendency not to conceptualise the technology as a complete system but rather to see one part of a technological system as standing for the whole and therefore overestimating its impact. Borrowing a term from rhetoric this can be described as the 'synecdoche problem'. In the case of celluloid, prognoses suggesting the demise of film as a recording medium in both television and cinema have been premature because of synecdoche. With the introduction of videotape in the mid-1950s, the case was immediately being made for the abandonment of film. But videotape was only the storage medium and other essential parts of the film technology system – notably those involving the post-production processes of editing and dubbing – were simply not available with videotape. In fact, it was to take the better part of three decades before there were effective electronic equivalents and film then started to disappear as a medium in television. In the cinema it is taking even longer. It is only now that viable theatrical digital projection technology (e.g. the TI system) is coming on stream. The thesis makes a considered attempt to tackle this issue but establishing a technology's 'completeness' as a system remains somewhat arbitrary.

Finally, there is the question of determining what is, and what is not, 'transformative'. The thesis fails to deal effectively with this which therefore constitutes a main issue in the agenda for further research.

Clearly a technology has differential effects as is noted above. What is marginal in the West can be seismic elsewhere. I have yet to explore this in detail. Nor have I dealt with the same sort of differential effect but operating within the West, within one industry. Again, as I have indicated above, what is of completely marginal concern to one group (e.g. cinema audiences) can be of profound significance to another (film lab workers). I have ignored this dimension in the model. Finally what level of 'transformation' is in play? What constitutes a 'revolution' and for whom? And what technologies have been thus far ignored because they are too embryonic to be recognised as independent systems?

The thesis also needs to be applied to current developments. It is the case that of all the vaunted implications of an information revolution the threat the new technologies collectively impose on the structure of the capitalist exploitation of intellectual property rights is the greatest. Amid the

rhetorical swirls of 'cyberspace' and glib assumptions of 'techno-freedom' questions as to the business viability of protecting intellectual property economically is the central problem now to be investigated. It is a veritable battleground upon which the suppression of new media's radical potential is being fought. If the pattern the thesis proposes is sound, for example, the internet should now be exhibiting signs that it is fully subject to the law of the suppression of radical potential. It can be argued that this was already being seen to be the case (Winston 2001 {b}: 164): the fall of free music recording downloading in favour of paid-for acquisition clearly fits the model and the collapse of Napster is as good an example of the operation of the model's law as any. Nevertheless such indicators cannot be held to be in anyway definitive yet.

Despite the technologically-grounded attack on the economics of the creative industries, it is possible to argue that at the macro-level we are far from being in a revolutionary situation and that society, despite upheavals, remains essentially evolutionary. From gender roles to representative democracy, from religion to royalty over the past century and more, more remains the same than is changed. This is not, of course, to argue evolution is without effect; but it is to deny revolution, for all that development and change is constantly heralded as such. What characterises our situation is summed up in the Communist Manifesto as:

The constant revolutionising of production, uninterrupted disturbance of all social conditions, ever-lasting uncertainty and agitation.

Our current situation, as Marx suggests, still involves discombobulating the Western populace – these days by confusing and exploiting them primarily as consumers. Understanding how this continues to happen conditions the agenda for further research. Changes in media technology can certainly be disruptive but the ways in which they are need to be examined more carefully than technicism allows to take cognisance of particular groups in particular circumstances in particular places. A more nuanced and detailed dismissal of the hyperbole of technicism remains a crucial objective. For behind the work here proposed and presented is a clear assumption as to the disempowering effect of 'constant revolutionising... ,uninterrupted disturbance... , ever-lasting uncertainty and agitation. My motivation has long been summed up by Walter Benjamin's description of a Paul Klee painting which he once possessed:

A Klee painting named 'Angelus Novus' shows an angel looking as though he is about to move away from something he is fixedly contemplating. His eyes are staring, his mouth is open, his wings are spread. This is how one pictures the angel of history. His face is turned towards the past. Where we perceive a chain of

events, he sees one single catastrophe which keeps piling wreckage upon wreckage and hurls it in front of his feet. The angel would like to stay, awaken the dead, and make whole what has been smashed. But a storm is blowing from Paradise; it has got caught in his wings with such violence that the angel can no longer close them. This storm irresistibly propels him into the future to which his back is turned, while the pile of debris before him grows skyward. This storm is what we call progress (Benjamin 1969: 257 -258).

This work is entirely dedicated to understanding the storm we call 'progress' the better to protect ourselves against it.

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