Technology Drives Organisational Change In Health Services: Artifice Or Actuality?

Stream 15: Technology, Language and Power

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Medical technology, ‘the apotheosis of medical magic’ (Lupton 1994) is idealised as central to changing practices in hospitals and self perpetuates the rising cost of providing health care to the community. Hospitals are edifices of what Baudrillard (1983) refers to as the era of ‘hyper-reality’ in which technology and its effects are normalised to the extent that individuals view healthcare as implicitly high tech. How effective is technology in bringing about changed practices, and how sophisticated is the decision making about the organisational benefits of medical technology. In making decisions how do managers take into account social, institutional and other factors that might impinge on the effectiveness of systems and functionality of technology deployed in a hospital. To assess managerial attitudes to technological change in hospitals it is necessary to assess how managers locate technology in its broader social and economic context and whether they avoid technological determinism.

This study was conducted in a large metropolitan hospital undergoing discontinuous change. A new $300 million, 525 bed hospital was designed and built to replace the old 900 bed hospital and surrounding buildings. The new building created an opportunity to change the infrastructure, organisation and delivery of services. The manager of the hospital promoted it as an opportunity to produce a “state-of-the-art” facility. Not merely to construct a “high-tech” building but to create a new and better model for service delivery and a new organisational culture.

Using a longitudinal, critical ethnographic approach, this research is aimed at exploring how the massive change process was managed over a five-year period. A total of 40 in-depth interviews were conducted with managers, who were integrally involved in the change, as they were continuously confronted with difficult decisions often with a feeling they were launching into an abyss.

This paper explores the notion of technological change in literature from a range of disciplines, sociology, management and health science. We then discuss a framework for analysis developed by Foucault that views technology as more than merely products. Data is presented and findings discussed leading to conclusions and implications for theory and practice.

Technology and Health

Previous research on technology in health have been critical accounts of the use of techno-therapeutic innovations (Beck in Annandale 1998). Amidst the abundant research on the importance of genetic and other biotechnologies in discovering the cause of diseases some have revealed ‘technophobia’ and associated biological determinism (Willis in Germov 1999). While some authors argue that technology increases efficiency and reduces costs, other studies have found no evidence to support this assertion (Harrison 1997). Public health research shows there was a decline in infectious diseases long before vaccines and antibiotics (McKeown 1971) and the increase in life expectancy was more to do with public health initiatives than clinical care (Bunker, Frazier, Mosteller, 1994).

Technological Change

O'Connell argues that a multiplicity of contingent variables, similar in scope to that which affect biological (and scientific) evolution is present in technological evolution. Importantly, in this model of technological change there is no clearly predictable or
unified process occurring at the micro level of analysis because the effects of other evolving technologies, formal and informal institutions and economic conditions make it impossible to sustain arguments based on assumptions about predictable trajectories and outcomes of technological development. This formulation coincides with that of evolutionary economist Richard Nelson (1994, pp. 27-8), who has claimed that as a result of analysis of non-linear models of technological change a view of coevolution or parallel evolution is needed. He argues that running parallel to the history of technology are the histories of institutions, laws, education, science, culture and so on, each influencing the history of the others.

Weber used the German word *technik*, which means both technology (machines and tools) and technique. He saw technology as including both physical products and ideas (intellectual devices or techniques). "Intellectual technologies" might include accounting methods, marketing strategies, medical theory and ways in which products or services are assessed for their social value. This view of technology is well summarised by Ellul (1964, p. 4), who used the French word *technique* in the same way as Weber used *technik*:

> The machine represents only a small part of *technique*… we could say not only that the machine is the result of a certain *technique*, but also that its social value and economic applications are made possible by other technical advances.

The views of Weber and Ellul indicate that the technical or technological elements of the production process are a diverse set of variables and can include cultural and intellectual elements. If this is the case, then it is necessary to develop a system for identifying these variables, while at the same time taking into account the possibility that the variables may have complex and unpredictable relationships with each other. What must also be avoided is the tendency, common to dystopian accounts of technology such as Weber’s, to separate technology and society (even if they do not discount the social influences on technological development). Accounts like these argue that technology is dehumanising or denaturing because society is not seen as technological and technology is not seen as social. We require a framework that goes beyond the technological versus social binary and deals in a more nuanced way with the real complexity of the history of technology.

Broadly speaking, technological determinists claim that technology causes change in society, that the political apparatus reflects technology and that technological development is autonomous and separate from social forces. Indeed, it is common for business managers to assume that technological development follows its own logic and laws independently form social imperatives. A result of this view is that technological determinists promote a teleological view of the process being addressed.

The defining feature of technological determinism therefore is the tendency to identify a simple and direct causal link between technology, which is independent of social regulation, and a society that is the passive recipient of technological change. We therefore not only need to examine how managers contextualise technology but more specifically we need to identify how managers attribute causal links between technological change at the economic and social levels of experience and assess if they are being over deterministic.

Technologies of production
Technologies of production are the implements or tools used to transform or manipulate elements in any production process (Foucault 1988, p. 18). In medical practice this would include obvious things such as radiological CAT, PET, MRI scanners and diagnostics and equipment for monitoring in critical care, laser and transplant surgery to name few.

We want to find the extent to which these kinds of hardware technologies are ‘naturalised’ with social and intellectual practices within the discourse of managers at the hospital in our study. To do this, we set out the other kinds of technologies (techniques) upon which the deployment of technologies of production depends.

Technologies of sign systems
Technologies of sign systems, which we might also call semiotic technologies, are symbols that offer meanings and significations in a society (Foucault 1988, p. 18). In the realm of understanding medicine and medical technology these would obviously include the white lab coats, red crosses and the use of medical terminology on hospital signage etc. Also included in sign system technologies is the clinical look of wards, scrawly writing by doctors on scripts, markers of social and intellectual status and location on the medical hierarchy. Equally important are the semiotic technologies of performance that include gestures, postures, and clothing. It is also possible to see a stethoscope for example as not only as a functional instrument, or technology of production, but also a powerful symbol of membership of the medical profession. These semiotic systems can be seen as technologies because they involve learnt techniques and enable forms of production. This category of technology disciplines us to account for the symbolic modes of organisation of medicine and medical technology.

Technologies of power
Technologies of power are the technologies that have the potential to influence the conduct of individuals. According to Foucault (1988, p. 18) they are the types of technologies that "objectivise the subject" or make individuals submissive to the conditions of domination through hegemony. Technologies of power are a set of technologies (or practices) for the administration or regulation of a society. This is, at least in part, what Foucault has elsewhere called "governmentality". For the purposes of the health sector we can list three general sub-categories under the umbrella of technologies of power: governmental technologies, consumer technologies and organisational technologies. Each of these are discussed in turn below.

Governmental technologies make up much of the superstructure of the health industry, and they include the central regulatory devices in any nation or any industry. In the Australian health sector some examples of governmental technologies are the Australian Healthcare Agreements 2003, state and federal government Health Acts ICD 10 and Casemix DRG classification indexes, Medicare legislation, Medical Benefit Schedule (MBS), Pharmaceutical Benefits Schedules (PBS), the professional colleges and associations, etc. governments. Laws, colleges, associations and imbue the economic, intellectual and social conditions that make it possible to commodify or assign economic value to the work of hospitals. Superimposed on the formal legal and professional structures are the more general regulation device that place ethical restraints on conduct.

Consumer administration technologies, which are closely related to sign technologies, are technologies through which producers seek to control the behaviour of consumers in terms of how much they buy, what they buy, where they buy and even why they buy certain products. Consumer administration technologies include
the technologies of marketing, public relations and advertising. Activities such as these are undertaken by hospitals, associations, governments, pharmaceutical companies and so on. The general purpose of these technologies is to organise or control the market consumers etc. to behave in ways beneficial to the originator of the ‘spin’. In other words, hospitals can seek to shape the ways in which their work and work practices and technologies of production are represented to consumers (and workers) within the hospital, the bureaucracy and in the media.

Organisational technologies are the technologies that allow a business to administer itself. Included in these technologies are the practices of applying technology in management techniques, financial accounting, inventory control, human resources management, sales forecasting, quality control, and price analysis. Without these kinds of administrative practices, businesses would be dysfunctional: they would have poor cash flow, be prone to under or over production, be unaware of unpaid debts, be unable to identify potentially bad capital investments, tend to have inappropriate staffing levels and so on. In short, businesses or organisations would be unable to monitor their own situation in relation to issues such as solvency, market conditions such as consumer spending habits, and the activities of their competitors.

Technologies of the self
Technologies of the self are those practices that allow individuals, often with the help of others, to function in a society by using their bodies and minds to regulate and facilitate their own conduct (Foucault 1988, p. 18). This technology of self-regulation is also an aspect of Foucault's "governmentality" and is closely related to the technologies of power. The main distinguishing feature between technologies of power and technologies of the self lies in whether the objective of the technology is in regulation of others relative to a hegemonic system (technology of power) or in self-regulation (technology of the self). Accounting, for example, could be practiced as either a technology of power or as a technology of the self. In medicine, examples of technologies of the self are found in cognitive and motor skill needed for diagnosis, administering medicines, performing surgery, being able to operate computers, and being able to imagine (through experience gained in the field) what the effects of particular treatments will be on particular patients. Bourdieu (1968) claims that these conduct, or technologies of the self, are learnt, whether in a formal institutional setting, or by informal means such as oral transmission, or through everyday trial and error (by operant conditioning).

Simply put, technologies of the self give us the ability to know how to behave in specific circumstances. In the context of a hospital, an individual knows how to act as a patient, clinical manager, allied health professional and so on. Technologies of the self enable people to behave appropriately in an operating theatre, home visit or in a paediatric ward.

By examining ways in which the Greek Stoics prepared for a verbal improvisation, by learning helpful terms and arguments through rehearsal, Foucault (1988, p. 36) has shown that even a technology of the self such as rhetorical argument is learnt. Such skills often revolve around the use of discursive markers and mantras that become thoughtlessly mechanical and whose underlying values and assumptions are rarely if ever examined for their efficacy. Many of these mantras are acquired by individuals through informal transmission and by the "prestigious imitation" (Mauss 1973, p. 73) of successful or powerful role models. The notion of "prestigious imitation" refers to the copying by a person of the successful behaviours of others, who in the eyes of that person have achieved both authority in that area and the confidence of that person. Importantly, there is in this conception no need for the
prestigious role model to be a "star" performer; the role model may in fact be a teacher, a friend, or even a colleague.

Also of concern for this paper are the technologies of scientific and management know-how and theory that have been developed during the twentieth century. These devices are the schematic and systemic intellectual technologies that guide managers, clinicians, scientists and engineers. In the broadest sense, these devices are elements of ‘scientific’ methodologies and theory.

Methodology
This study used a longitudinal, ethnographic method to collect data through a total of 40 in-depth interviews conducted each year from 1999 to 2001. The purposive sample included: executives, planners, middle managers and clinicians. The framework used for analysis is based on Foucault’s definition of four types of technology, which includes not just hardware but also an assemblage of techniques, social practices and knowledge.

Within the assemblage, health, institutions and technology are not seen as discrete entities. Because each type of technology depends for its existence on specific modes of training and modification of people, we can say that each element of the assemblage can only ever be meaningfully analysed in relation to each of the other elements. We are compelled to say this because training and modification of people’s behaviour requires the involvement of each of the four types of technologies in order to be effective, and persist over time (Foucault 1988, p. 18).

Findings
The planning for a new model of healthcare commenced in 1994 long before the announcement in 1997 that there would be a new $300 million building. Initially, managers and clinicians concurred that a new hospital would result in better health services. Where managers envisioned efficiencies, clinicians’ aspirations were centred on more resources. At first glance these objectives appear to represent divergent interests. Deeper analysis reveals that both perspectives result from a common cause, technological determinism. The data analysis revealed that both clinicians and managers were imbued with the belief that the acquisition of technologies of production would lead to better health services.

Initial plans were for the model of care to integrate the hospital with community health services. However, the main emphasis was on delineating health services as tertiary, secondary and primary. This three tier categorisation primarily serves to demarcate the resources (people, infrastructure and equipment) with the lion’s share to the tertiary facilities. This comes under the category of semiotic technology, as tertiary hospital is itself a symbol of status. Large metropolitan hospitals are considered the domain of tertiary services, which provide specialist care and are reliant on high tech paraphernalia. Secondary healthcare is for the most part the responsibility of smaller, regional hospitals and primary services are considered to be community based, in essence low tech. Building a new hospital would provide the opportunity to create a new organisational culture culminating in a supposedly integrated model of care as espoused by senior management.

“Because the new hospital isn’t only going to be bricks and mortar, everybody looks at the new hospital as a new physical building, but the new hospital will actually be different types of clinical services, expanded services in some areas and contracted services in others, it will be different jobs, it will be different people and that to me, is what the new hospital is,
it's not the new physical structure, because the physical structure is just the place to work in. It will actually be the new culture that goes in". 1-3-1

A dominant hierarchical culture prevails in the hospital with an array of semiotic technologies revealed during the course of the study. A revised organisational structure was mooted however this never eventuated probably because over the five years, all except one member of the initial executive team left and were replaced. Other semiotic changes were put in place via changes to position titles: from Medical Superintendent to Executive Director of Medical Services, from Director of Nursing to Executive Director of Nursing (EDON) to Regional EDON, Assistant Director changed to Nursing Directors. Nurse Manager and Clinical Nurse Consultants to Nurse Practice Coordinators.

Numerous symbols of status were attached to positions including beepers, mobile phones, and gold-rimmed executive diaries. Reserved parking spaces and corporate cars were allocated to senior executives and doctors. Personal assistants were allocated to senior managers and there was considerable debate over the size and number of offices allocated to individuals. It was difficult for planners to discern the ambit claims for space in the new hospital.

A prime example of power and semiotic technologies was the Innovative Ward Project. A competition was held for wards to trail all of the new products and work practice changes. The project was launched with substantial media promotion. An architect, one of the planning team and a manager were given a mock diagnosis and spent a night experiencing life as a patient all covered by a current affairs TV crew. (Big brother in a hospital ward) They were portrayed as having the scope to try the latest equipment and work practices. Very few of the initiatives in the trails were successful disseminated or included in the new hospital. They created considerable competition internally and were viewed as elitist. However they were successful as a marketing strategy externally. Visitors both managers and clinicians from all around Australia and some from overseas who were building new units and representatives from corporate office and other hospitals visited to assess the progress as equipment was trailed and applications for additional was funding sought. The project was a symbolic stunt to activate momentum in planning for the new hospital, a team building exercise and hype to draw attention to the hospital.

Like many major building projects of this kind, a public architectural completion for the design of the building was conducted in 1996. One of the first activities following the appointment of the planning team was to send them on a world tour of hospitals. The team returned with a long wish list of high tech equipment and ideas for the physical infrastructure. The people that remained also began to build great expectations. These were primarily technologies of production that would never come to fruition. “I've got some changes that I want to make from our overseas trip and I'm having hell's own job getting anyone to listen because to them, it's just out of this world, it's just things that they think just can't happen. Because there's this block in their mind.” (2-2-2) It was expected the new hospital would virtually be paperless with sophisticated information systems including electronic medial records and PACS (a picture archiving system for radiology). The funding for PACS had been secured and was already implemented in another large hospital on the opposite side of the city. PACS was installed but the electronic medical record remains a costly political football as reflected in this participant’s statement in the final year of the study after the hospital had opened. “There is a fair
bit of truth in what you are saying the amount of money we spend on information technology compared to even 3 years ago – it is just amazing, particularly in this new building very complex and sophisticated systems in ICU and Theatre. Corporately we are trying to bring it all together they don’t talk to each other – they do talk to each other, but there is no global platform – there is a global platform, the clinical information system is a way off from happening.” 5-1-2

Bedside computers and ward-based systems to automate pharmacy (PIXUS) and clinical supplies were proposed. PIXUS was trialed however the upfront cost of one million dollars needed was not secured hence it remains a pipedream. Sophisticated communication systems were planned for all referrals, a new switchboard and paging system and to link with general practitioners and rural hospitals via an extensive telemedicine network. However, in the new hospital referrals remain paper based and the new switchboard pager system was seriously flawed. One participant said: “the last I know is that our lawyers were talking to their lawyers, still big problems”. These technologies of production outlined above demonstrate a teleological view that technologies are mechanisms for improving healthcare delivery however the approval for such products is based on economic imperatives. When new systems are implemented they often fail to live up to expectations. Implementation of new technology has wide implications for the culture of an organisation it is not however the technology that brings about change rather the natural networking process within complex adaptive systems called aggregation (Holland 1992).

A significant investment has been made in the telemedicine network, however the system is used for education more often than real-time clinical procedures in rural hospitals. This is an example of how technology can be forced into new unintended trajectories by people. Furthermore technologies of self such as professional development of clinicians can supersede technologies of production.

Conversely, training in the use of technologies of production would appear a lower priority. High tech infrastructure such as a pneumatic tube for specimens and paper and a computerised maintenance system were anticipated to generate major changes in work practices. In the maintenance area “some of them are going to have to be computer wizards” said one participant although when the new building opened the training had not been done because of staff shortages and high demands in the IT department. A lack of training also meant that the pneumatic tube was broken down within the first few months and worse; the messenger service staffing was cut, despite some clinical areas being not connected to the pneumatic tube. These wards and departments could only get deliveries daily when previously there were several per day. An overly narrow technical focus can distract managers from paying attention to other human factors such as training with significant consequences in the effectiveness of service provision.

It was only late in the process that technologies of self in this context revealed an emphasis on training. In 1997, a consultant was engaged to restructure and refocus the staff development unit, underlying assumptions were that there may be considerable staffing changes and that this department would work with the Change Management Unit to be able to prepare staff for redeployment. Working parties were established to undertake workforce planning however these were unsuccessful as illustrated in the following quote.

“So you’re not where you anticipated you would be?”

“It’s turned out substantially, I won’t say more complex, that’s an understatement, but messier than I had anticipated. Unfortunately one of
the things that is very difficult to get a handle on until you actually do it is to identify the decision making processes. Not only within the hospital but also within the agency generally. And it's only when one actually starts going forward and bringing up various issues that require resolution, that one actually starts to identify how is this decision made.” 2-2-1

The realisation that things were messier than anticipated shows it is only when the process is underway that the contingencies of sociotechnical systems reveals the nonlinear relationship between technologies of production and what is possible to change in terms of work practices, which is symptomatic of technological determinism. That it is hard to know what will arise once implementation of technological change is not questioned here but the lack of anticipation that there would be messy and unanticipated outcome is remarkable.

Another group of consultants were engaged to educate clinicians in interpreting management information to improve efficiency in a program called “Clinicians Taking the Lead”. The program was specifically designed for clinicians in specialty units to encourage them to develop clinical pathways, explore less costly options for treatment and identifying quality indicators. Many clinicians were inspired by this approach as a mechanism to translate management rationalism (technologies of power) into clinical practice and to maintain the professional power of clinicians.

I think if we try and sell the concepts and systems like casemix, purely on the pricing thing, then I think a lot of clinicians tune off. If we sell it though as a quality tool, this can give you indicative information in respect of xyz, length of stay, whatever it might be, that's probably better. The quality of your documentation, the value of your documentation. These are the problems. If your documentation is ratshit, for want of a better term, these are the consequences, not only financially, but in terms of whatever else happens in the hospital. It might be patient care at the end of the day. 2-1-1

Technologies of power featured most significantly. Each year participants’ emphasis on efficiency gains appeared to amplify in intensity such that the identity of a manager is inherently tied to their ability to economise. The number of beds reduced from 900 in the old hospital to 525 in the new hospital. In the clinical sphere participants almost single-mindedly pursue shorter lengths of stay. Technologies and surveillance systems were implemented for utilisation rates, waiting lists, day only procedures, pre-admission, clinical pathways, to name few amongst a myriad of strategies to get patients out of hospital. “And care needs to move back out to the community and the acute care sector has but one little blip in the continuum but because of the fact that we have so many resources, we have the lion's share of the money, we have the expertise and the ability and even though we might only be the little blip on the continuum, we have the responsibility to be a leader in pulling this stuff together. Because the resources aren't out in the community to do that”.2- 3-2 Note the power dynamics, the hospital retained control of the resources hence the community sector remains dependent on hospitals.

The mode of communication in the two previous quotes and in particular the use of semiotic technologies (rhetorical strategies) that speak of tools, technocratic bureaucracy in the guise of form filling, and application of
expertise are significant markers of the degree to which technology, formal methods are privileged.

The power of professionals became increasingly evident in the workforce planning over time. Whilst the non-clinical departments were expected to have major staff cuts, it was proposed that clinicians would be needed because the technology would be so advanced. For example, the new high tech kitchen could be run by 90 people where originally there were 200, and the pneumatic tube resulted in cuts in the messenger service.

"It's hard because it does mean making a very unpopular decision. No-one is going to say, you beauty, we've lost staff. And in a sense, the areas that are easier to do it in are the non-clinical areas because that's where technology has very clearly and obviously said, look, there is no need for this job any more, or this job can be done by half a person, rather than two. Email is a messenger service. Computers and all that has reduced admin support. Technology in the kitchen has reduced the number of staff required. They're very easy areas to see where the savings are. Not even see, but to prove that you don't need it. It's much more difficult in the clinical areas. Even if there is data to support the fact that we are over resourced in areas. And then you've got the discipline political environment on top of that." 5-1-5

Professional power was almost palpable as planning progressed. ‘Shroud waving’ was an interesting term used by one participant. It means that when a work practice change is mooted, clinicians argue that patients will die or there will be outbreaks of “super bugs” like VRE resistant to the most powerful antibiotics. Another participant discussed the difficulties associated with workforce planning in nursing: “it was the first time I've ever experienced horizontal violence. I never really understood what it was about”. There is evidently a relationship between technology and technocracy; they coexist as technologies of power. People are dehumanised and objectified, impersonal, almost mechanical responses are then made by the technocrats that attempt to maintain the privileged status of the technologies of production at the expense of humanity. This is a reflection of the technologies of power accessible to the clinical leaders (technocrats).

The IT department was restructured to form the Health Information Management Services (HIMS) in preparation for the new hospital. Here too professional power dominated technologies of production in the form of information: “HIMS had a big resurgence, refocus, but the same thing, you can’t get those clinicians to play with you, so they are willing – the clinicians have all the power and you can’t drill into their minds, and that might be why M's putting his coat on Dr S. Because Dr S is a clinician who understands quality and he does and understands information, so he may be using him to move forward, but I don’t have that much faith in DR S because he's got very bad interpersonal skills …. ” 5-2-4

In conclusion, this research revealed fascinating insights into role of technology during discontinuous change in this hospital. Techno-optimists revel in visions of the vast potential for improved health care through less invasive surgery, screening, vaccines, prosthetics, stem cell research and cloning to name few. All promoted through the media with an appetite for breakthroughs and discoveries (Fett 2000). Government reports, discussion papers and planning documents are peppered with the myth that technology is a driving force for change in health. It is dangerous to claim that medical technology has unambiguously contributed to better health outcomes and service delivery. On the contrary, the findings confer that technology is a contributing factor in the increase in, health expenditure, the expectations of
consumers and competition (Fuchs 1999, Murphy 1998). While some authors argue that technology increases efficiency and reduces costs, other studies have found no evidence to support this assertion (Harrison 1997). Interestingly this study found that economic rationalism and technological determinism operate in parallel. While technology is a product of science, economic rationalism is a product of the application of the ethos of science to scientific management and we argue that it is no accident that the two compliment each other in the workplace and exacerbate the dehumanisation of organizational responses to the unpredictable, unforeseen and unprepared for contingencies that are inevitably connected to the introduction of new technologies of production. Furthermore, the new building was proposed as an opportunity to change work practices and develop a completely new culture. However, over the five years of this research project the dominant scientific paradigm prevailed and a strong alliance between scientific management, technological determinism and clinical science was evident. This approach perpetuates a rationalist “scientific” approach to management in health services, which is reinforced by surveillance systems and knowledge technologies such as evidence based practice and quality management. These processes serve to increase the power of the clinical professions and reinforce the pre-eminent status of acute, clinical practice over other health services with relatively less dependence on technology. Technology that is developed for disease prevention such as vaccines can in fact be more efficacious and improve the health of populations.
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