Its explanatory power, however, is limited by the concept of culture on which it is based. Without a greater sensitivity to the dynamism, the diversity and the conflicts within "traditional cultures", it is impossible to understand why the cultural impact of modern technology has varied so greatly from one society to another; why some cultural systems have succeeded and others failed in aligning to its demands; and why the creative and destructive effects of technological change have been so unevenly distributed throughout the modern world. And without a greater emphasis on the liberating as well as the enslaving potential of contemporary technology, it is difficult to suggest a plausible means of escape from our destiny in a technologically-determined tragedy.

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Taming the Tyrant: The First 100 Years of Australia's International Telecommunications Services *by Edgar Harcourt*
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Inevitably, the history of Australia's telecommunications links with the outside world is, in part, a history of the entire international telecommunications network. As such, it is of interest to anyone concerned with telecommunications and with the application and organisation of new technology. There are seven principal themes of Harcourt's history: the origins of the first international telegraph connection, attempts to reduce perceived monopoly power of the private cable company, the advent of international wireless communication and the consequent reorganisation of Commonwealth telecommunications, nationalisation and division of the private system at the end of the Second World War, the arrival of submarine telephony in the 1950s, of satellites in the 1960s and the position of the Overseas Telecommunications Commission (OTC) itself in relation to the Post Office and competition in the home market.

A necessary condition for Australia's first international telecommunications connection was the experimentation with submarine telegraph cables that culminated in the Atlantic line of 1866. Additional preconditions were the British government's commitment to a telegraph link with India (encouraged by the Mutiny) and the conquest by telegraph of the vast expanses of Australia that separated the major population centres from the north, where a cable was most likely to be landed. Early in 1862, the British government formed in Bombay an Indo-European Telegraph department to join the Indian telegraph system with the European network, which by then extended as far east as Baghdad and Teheran. The Australian colonies were incapable of adopting a uniform international cable policy, for each hoped to gain revenue from international through-traffic and not itself have to pay Australian transit charges. Before the land line was completed, the Telegraph Construction and Maintenance Company's (Telcon) ships arrived at Darwin and on 7 November 1871 landed the shore end of the cable. Twelve days later the other end arrived at Banjuwangi in Java. Then the submarine connection failed and remained silent when, on 22 August, the South Australian overland cable was completed. At the beginning of 1880 a

duplicate cable to Port Darwin, for which the four colonies were obliged to pay an annual subsidy of £32,400, became operational.

The international telegraph reduced from three months to perhaps twenty hours (at first a message had to be retransmitted at eighteen intermediate stations), the time necessary to communicate with Britain. But immediately the second theme, the level of the tariff charged by the private monopoly company, became a contentious issue. This monopoly was broken in 1902 by an alternative state-financed Pacific telegraph cable, partly under the stimulus of Empire security. Defeated in their attempt to gain the landing for the first international cable, Queensland was determined to break the international communications monoploy of John Pender's Eastern Extension Company. Their opportunity arrived when the Société Française des Telegraphes Sous-marins indicated it would be prepared to provide and operate a cable from Queensland to New Caledonia for a relatively small subsidy. The French company was also prepared to extend the cable to Fiji and Samoa, providing a substantial proportion of a Pacific link between Canada and Australia. The first stage, between Queensland and New Caledonia, was laid in 1893. Although it was unwilling to put up any money for an alternative route, the British government objected to an Empire Pacific cable passing through a foreign territory. Thanks to Joseph Chamberlain and the Pacific Cable Board (a consortium of Empire governments established in 1898), the Imperial government eventually became more accommodating. The cable agreement for completion in two years was signed in 1900, by which time the Boer War was giving greater urgency to Imperial communications.

The third theme is the emergence of wireless communication in the early years of the twentieth century, which not only threatened any remaining cable monopolies, but more importantly for their government and private shareholders, undermined their financial viability. During the inter-war years, therefore, a form of Commonwealth telecommunication organisation, that co-ordinated radio and cable communications, was established under private ownership. Long distance radiotelephony became a practicality during the late 1920s. Australian wireless station construction began with Telefunken equipment in 1910, but progress was slow. In 1913 the Marconi and Telefunken companies, which had come to terms in Europe the previous year, formed Amalgamated Wireless (Australasia) Ltd (AWA) for their Australian operations. Fisk, the managing director of AWA, in 1918 demonstrated direct radio contact with Marconi's Welsh station.

Marconi's original system had been long wave and used high power. His experiments in 1924 showed that short wave beam wireless would be more efficient for long distance commercial point-to-point telegraph and telephone services. Beam wireless emerged just in time to rescue the Australian government's partnership with AWA. Australia wanted the wireless service to compete with cable, Britain wanted it as a complement. The Pacific Cable Board lost £55,000 in revenue during the first seven months of wireless competition in 1927. Sixty-five per cent of all Eastern and Eastern Extension traffic was lost to wireless. Threatened by nationalisation, Marconi and the Eastern Telegraph Companies agreed in 1928 to merge their respective wireless and cable interests into a new company, Imperial and International Communications (IIC) formed in 1929. IIC would also buy the government-owned cables of the Pacific Cable Board and lease British Post Office beam stations. In 1938, the British government exchanged these stations for shares in the company, Cable and Wireless.

The fourth theme, state ownership of external telecommunications facilities, appeared on the political agenda with the Labor government of 1940 and

culminated in the formation of the Overseas Telecommunications Commission (OTC) in 1946. American entry to the war with Pearl Harbour temporarily solved the contentious issue of direct radiotelegraph links with America. However, Cable and Wireless expressed its concern about effects on the integrity of the Commonwealth telecommunications system and hoped that the links would be abandoned after the war. Instead, Cable and Wireless's assets were nationalised on the 1944 recommendation of the Commonwealth Communications Council. The Australian *Overseas Telecommunications Act 1946* constituted the OTC to acquire AWA's radiotelecommunication assets and Cable and Wireless's Australian assets.

This nationalisation and dismemberment of the unitary Cable and Wireless initiated a continuing element of Australian international telecommunications, controversy over the rules for 'wayleave payments'. The new organisation of Commonwealth telecommunications immediately ran into the problem of cost allocation of shared facilities. Different rules led to different distributions of net revenue. Australia calculated that the first proposal of the post-war regime would leave OTC with a deficit.

The entire Commonwealth telecommunications arrangement discriminated against non-Commonwealth countries to the chagrin of the United States and to the inconvenience of some Commonwealth countries, including Australia. In November 1959, Japan became only the second non-Commonwealth member, after Portugese Timor, with which Australia had a direct radiocommunication link. Japanese traffic with Australia was OTC's largest international telegraph stream. Radiotelegraphy had been the basis for new competition with cable telegraphy. Advances in undersea repeater technology during the 1950s introduced submarine cable telephony, the fifth theme, to compete with established radio telephony. The Atlantic telephone cable opened on 25 September 1956 and quickly proved more profitable than expected. With forecasts of traffic expanding beyond capacity on three main routes covered by the Commonwealth Telecommunications Board, one of which was South Africa to Australia, the new technology arrived just in time to be incorporated in expansions of carrying capacity. More expensive than increased capacity on these three routes was the Pacific cable, COMPAC. Even so, COMPAC was eventually laid, becoming operational at the end of 1963, because of the threat posed by an ATT link with Japan and Singapore, which excluded Australia. COMPAC so improved the quality of the service that outward telephone traffic to Britain and Europe within a few months was two and a half times that carried by radio.

In the following decade satellite transmission, the sixth theme, opened a new range of possibilites and threats to the established order. Goaded by the launching of the Sputniks in 1957, the Americans began a national research effort led by NASA, which had the valuable consequence of placing geo-stationary telecommunications satellites in space in the mid 1960s. Britain saw the possibility of using its military Blue Streak rocket as the first stage of a composite European launcher. But Commonwealth satellite communications did not proceed on the basis of the British missile because the American lead in 1962 was judged too great and the British were not prepared to support Blue Streak for defence purposes.

In July 1962, ATT's experimental satellite, TELSTAR, successfully relayed voice and television transmissions across the Atlantic to Britain and France. In August the US Congress passed a *Communications Satellite Act* which stated that it was the policy of the US to establish, in conjunction and in co-operation

with other countries as expeditiously as practicable, a commercial communications satellite system as part of an improved global communications network. The Act authorised the creation of a private Communications Satellite Corporation (COMSAT) under presidential direction, State Department supervision of international negotiations, and FCC regulation. The international commercial satellite consortium came to be called INTELSAT and, in April 1965, placed in orbit over the Atlantic the Early Bird satellite.

Finally, the organisation of OTC was not set in stone by the 1946 Act. Internal Australian negotiations over participation in the satellite consortium provided an opportunity for the Post Office to question the desirability of OTC's independent existence. OTC survived and Australia was eventually allocated 2.75 per cent of the investment share in the consortium, a proportion that give it a seat on the managing committee. OTC in the later 1960s was interested in attaining public corporation status, with equity owned by the government. The Commission was therefore delighted when the *Overseas Telecommunication Act* was accordingly amended in 1971. The Whitlam government's Commission of Enquiry into the Post Office provided another opportunity for the Post Office to advocate absorbing the OTC. Senate defeated the government's proposal to merge the newly created Telecom and OTC, but the boards nontheless interlocked. Since then, the issue of competition has come to be uppermost, especially between OTC and AUSSAT, the Australian domestic satellite owner.

Harcourt writes this history on the basis of a very substantial volume of primary sources, including OTC files and archives, those of AWA and Telecom Australia, Commonwealth Cable Management Committee minutes and papers, Australian archives and those of Cable and Wireless (although he does not give footnote references to them). His presentation is chronological and narrative rather then thematic and analytical. For that reason, I often found events, interesting as they were, hard to follow. In the first half of the book, a few more maps and diagrams might have aided the exposition.

A variety of questions about the significance of events occurred to me as I read and I regretted that they were not answered in the text. Judgements, which are rather few, tend to be based upon only implicit theorising or evidence. Pender, the owner of the Australian external telecommunication connection in the nineteenth century, is represented, by and large, as an unscrupulous exploiter. Arguably, much of his behaviour could be explained by the structure of costs in the cable service industry which made competition unsustainable. Comparative indicators of performance would have been helpful to assess whether the privately owned Cable and Wireless interwar regime delivered poor results relative to the state arrangements after 1945, controlling for the very different economic environments. A great deal of space is taken up with reporting the lengthy, detailed and often inconclusive wrangling of internatonal committees. I would have much appreciated a consideration of the possibility that the introduction of new technology may have been unnecessarily delayed by these bodies, or established technology underutilised.

Synthesising international telecommunications history over the last 140 years from Australia's point of view is a vast undertaking. It is made practicable only because a number of secondary sources have already attempted to deal with some of the issues of concern to this history. Reference to Moyal's recent history of Australian domestic telecommunications[1] and to Ahvenainen's account of nineteenth century international telegraphy[2] would have eased Harcourt's task and provided some hypotheses on which he might have commented.

Harcourt worked for the OTC for 25 years and his volume is supported by OTC. On their behalf Allen and Unwin have produced a very elegant book. Co-operation between OTC and Harcourt has allowed the world access to a unique body of material. The weight of research which underlies Harcourt's study will ensure that it remains an important reference in the field of international telecommunications for many years.

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The Organisational Implications of Computer Technology for Professional Work
by Stephen E. Little
(Gower Publishing, Aldershot, 1988) pp. xvii + 199, cloth $39.50, ISBN 0 566 05454 X

As the area of application of information technology (IT) spreads from less mundane aspects of our existence into areas previously regarded as esoteric, specialised or sacrosanct, questions are raised about the nature of the technology, its impact on routine existence and the extent to which the technology has developed from a tool to become a determining factor of contemporary life.

Stephen Little's book is one of several recent publications aimed at illuminating these issues, but rather than merely seeking to offer a grand sweep across such areas of concern, he concentrates for the most part on a specific profession and the incorporation, acceptance, and adoption of a particular technological form. His focus is the architecture profession; the technology, computer aided design (CAD), more specifically computer aided architectural design (CAAD).

This focus, however, is extended in the opening four chapters to cover a wider range of issues including organisational theory, the nature of professional ideology and cultural assumptions, an overview of the foundation of the post-war welfare consensus in the UK, and the role of power in organisational structure and process. This would amount to a major project for a text in theoretical social science, let alone as an extended introduction. So it is not too surprising that one is left bemused, and not quite as enlightened as perhaps the author would wish his readership to be in order to progress to the next sections.

The overall aim of the opening chapters is to lay the basis for a model which will be employed in the analysis of the case studies which constitute the major portion of the text. Unfortunately, the scope, shape and basis of the model is difficult to extract from the arguments of the first four chapters. A bewildering array of authorities and references is introduced, not always with the effect of clarifying the direction in which the overall argument is progressing. A number of figures and diagrams are included, but if anything I found them unhelpful