increases. Other possible explanations such as long term declines in agricultural and mineral prices, or a decline in total hours worked relative to the entire population, are not even mentioned. Second, they downplay the contribution R & D and education can make to productivity increases. In my view, autonomous increases in R & D and human capital can initiate significant productivity increases and economic growth. Finally, they underestimate the importance of economies of scale. I do not share their faith in the dynamic competitiveness of small firms. It is well documented that many Australian industries are fragmented with too many firms producing uneconomic levels of output under the protective cover of tariffs, quotas and other legislation. The extent of economies of scale should be determined by competitive forces and not by government policies. As the authors would probably agree, whether economies of scale are exhausted with one or 100 domestic firms does not matter as long as potential or actual competition, both domestic and foreign, is allowed to check any abuses of economic power.

The authors have made a lively and interesting contribution to analysis of productivity in Australia. Unlike most discussions, theirs is neither technical nor abstract, but is perceptive and provocative. Although the book may be faulted by some for its lack of analytical rigour, it offers many useful insights into the causes and solutions of a major, though neglected, problem in the Australian economy.

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Telecommunications in the Information Age: A Nontechnical Primer on the New Technologies, *Second Edition by Loy A. Singleton*
(Ballinger Publishing Company, Cambridge, Massachusetts, 1986: first published 1983) pp.x + 256, US$52.95, ISBN 0-88730-098-7.

Telecommunications in the Information Age is a general compendium on modern technologies for the delivery and distribution of video images and other information service. This revised edition, appearing in print after a relatively short span of three years since the first one, attests to the fluidity of several mutually reinforcing trends shaping the telecommunications landscape of post-industrial societies in general and the United States (US) 'information economy' in particular.

The currently revised volume is not only necessitated by innovations which make hitherto infeasible technologies the practical realities of modern telecommunications, but also by entrepreneurial initiatives pertaining to the timely exploitation of commercial opportunities and, more importantly, by regulatory changes which delineate the ground rules for the operation of existing services or the introduction of new ones. The recent developments that are ostensibly covered by Singleton include: (i) the passage of the *Cable Communications Act* in 1984 which requires large cable systems (with 36 or more channels) to provide commercial leasing of channels by third parties; (ii) a 1985 Federal Appeals Court decision which overruled the Federal Communications Commission's (FCC) signal-carriage requirements (the

"must carry" rule) placed on cable operators; (iii) the ascent of multichannel multipoint distribution services (MDS) since 1983; (iv) the explosive growth of video cassette recorders (VCRs) and home satellite dish sales; and (v) slowdowns in the subscription television (STV), direct broadcasting satellite (DBS), pay cable, and home computer industries.

True to the function declared in its secondary title, *Telecommunications in the Information Age* is an easily digestible and condensed guide to the 'alphabet soup' of technologies and services (to wit, CATV, DBS, LPTV, MDS, SMATV, STV, VCR) that are fast becoming established items on the telecommunications menu of an information economy. This primer, as it properly should, is relatively jargon-free and well-written with no presumption of any detailed technical knowledge on the reader's part. The main body of the text is organised in succinct topical chapters, each of which addresses a particular new telecommunications technology or medium. The topics covered range from prosaic variants of the technology for distributing video programming (e.g., CATV, DBS, MDS and STV) and information (*viz.*, Videotext and Teletext) to the somewhat less familiar but intriguing configurations for electronic signal delivery on an extensive scale (e.g., telecommuting and portable telecommunications). Some of these technologies are not truly 'new' technologies *per se* but only extensions of existing ones. DBS, MDS and STV are, for example, merely alternative forms of television broadcasting. In the case of DBS, television signals are broadcast from platforms on geostationary satellites instead of conventional terrestrial antennae. The delivery of television programming by MDS consists of broadcasting over frequency bands that were previously unavailable for regulatory reasons. On the other hand, STV makes use of existing VHF or UHF channels to broadcast scrambled signals. This form of television is, however, 'new' in an economic sense: the advertiser-mediated relationship between viewer and broadcaster is replaced by a more direct economic relationship between subscriber of broadcaster.

A background section begins each chapter with a short historical essay of how and when the technology in question was developed. This is followed by a brief but functional narration of how the technology works in practice. Although both these sections may have very little to offer to the technically-inclined or well-versed reader, the less-informed student of telecommunications technologies should find them sufficiently enlightening. Examples of practical and commercial applications of the technology are given in the third section of each chapter. Most of these illustrative examples are based on the US experience, except for those instances where applications of the technology there have lagged behind other countries, e.g., the development of national videotext systems in UK, France, Canada and Japan. The last section of each chapter (presented under the heading of 'Forecast') is devoted to an appraisal of upcoming developments within the industry, as well as the consequent socio-economic and regulatory predicaments that are likely to emerge.

Cross-references are frequently employed in the chapters so that readers may pursue topics that are interrelated, either in terms of technological capabilities or regulatory developments. This pedagogic device also serves as a reminder of the progressive convergence of modern telecommunications technologies. The book also contains a glossary of telecommunications

terminology and a bibliography organised under the same topics as those covered in the main body of the text. The latter is particularly useful for those readers who wish to flesh out Singleton's brief, and sometimes hasty, presentation of topics in the text.

Given the rapid pace of events in the field, the materials in the 'Forecast' sections of the book are arguably the most relevant for students of telecommunications matters. Although Singleton can be credited for highlighting a number of important questions in these sections, he has evidently sacrificed content for breadth of coverage. It would be, of course, unreasonable to expect in-depth analyses of broad socio-economic topics between the covers of a primer. Nevertheless, a short chapter which deals exclusively and systematically with some of the more important ones would have been desirable. Singleton's own observation that technological feasibility is circumscribed by both economic and political considerations underscores the need of such a chapter. Some of the topics which I think are deserving of more attention include: (i) the effect of market competition on the evolution of new services, and (ii) the economic implications of technological complementarity and substitutability.

After an initial run of successes, STV services in the US have faltered in the face of direct competition from CATV. This has led to the general belief that STV is nothing more than just a transitional method of delivering pay-programming. The initial high expectations for other modes of program delivery, such as MDS and SMATV, have also declined in view of a faster than anticipated penetration of cable into major urban markets. The long-term prospects of these services is now seen to depend on the ability of new market entrants to create specialized niches among an increasingly segmented viewing audience. These two examples beg the question of how intra-media competition will continue to shape the evolution of new services in the market for pay-programming.

Most of the new technologies can be characterized by differences in the form, i.e., configuration, of service delivery. This raises the interesting question regarding the extent to which new technologies can be complementary to or substituted for existing ones. The recording technology of VCR, for example, was initially regarded as complementary to existing broadcasting services because of its use for purposes of time-shifting and library purposes. With the proliferation of movie-rental outlets, the VCR is now considered a major technology in the physical distribution of programming. Because of its ability to deliver the same bundle of services as that provided by pay-programming operators, e.g., the showing of receently released movies uninterrupted by commercials, the VCR has also emerged as a substitute for CATV services. This dual feature of the VCR technology has at least one obvious economic implication, *viz,* an intensification of the market rivalry between conventional broadcasters and CATV operators. There is no doubt that similar effects can be discerned among other forms of new telecommunications technologies.

Singleton's lack of attention to substantive analysis does not detract from the usefulness of this primer as a reference book. The novice in telecommunications technologies will be well-served by this readable and all-inclusive guide. Although the hard-nosed specialist will have to look elsewhere for more complete treatments of topical areas, there is no denying the

advantage of having a single volume which lucidly describes the background, applications and trends of new telecommunications technologies.

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Trade Wars: The High Technology Scandal of the 1980s, *by Kevin Cahill* (W.H. Allen, London, 1986) pp.202, £12.95, ISBN 0-491-03095-9.

At 10 a.m. on 17 July 1985, the responsible British mininster reported to Committee Room 12 in the House of Commons for a meeting of the Fifth Standing Committee on Statutory Instruments etc; Export of Goods (Control) Order 1985. The crowd blocking the corridor outside surprised the minister; an aide explained that a recent newspaper story, of which the minister was unaware, probably accounted for the unusual degree of interest: the British Attorney General had just declared US export control policy to be an unwarranted encroachment on UK jurisdiction and contrary to international law. The incident encapsulates nicely the message of *Trade Wars:* US export controls are rather more important than many of those in authority would have us believe.

Ever since the Cold War, the Western Allies have deemed it prudent to deny the Soviet Bloc items of strategic importance. They co-ordinate this effort through a low profile committee in Paris called CoCom, a body which has no official existence, but which brings together nearly all the NATO allies and Japan to decide what the Russians may, and may not, have. Domestic legislation in each participating country gives force to CoCom proscriptions. The system may be curious, but hardly enough to provide meat for the thriller Kevin Cahill has written. Its excitement and intrigue are derived from the efforts the Americans are making to enforce their own unilateral export controls on their allies. These now extend well beyond battlefield hardware and include not just a massive range of modern high technology. Now multilateral decisions to deny the Russians guns and bombers are one thing: unilateral efforts by the Americans to prevent high technology information flowing to the East from any source whatsoever are quite another. Information is tricky stuff and history is littered with failed attempts to control its flow. There is, though, apparently more to this particular attempt than inevitable failure; according to Cahill, there is conspiracy afoot. For the allies, the real importance of US export controls is that they are an illegal means to an ignominious end.

Kevin Cahill is a journalist and one that is quite obsessed with the issues raised by American export controls. As he is also probably the most knowledgable person on the subject, at least outside the citadels of power in Washington, it is well worth delving into the reasoning behind the obsession. Cahill believes that the American government is exploiting export controls to undermine the independence of Western nations, to make them as tributary to the United States as the Warsaw Pact nations are to Russia. This is being achieved by making claims on the sovereignty which the allies are too myopic, too unaware and too pusillanimous to withstand. That is the strategy: the tactic is to encourage American high technology firms to take actions to