science technologies (mainframes, mini-computers, super-computers, microcomputers). Chapter 5 introduces software — the key driver of the information sector. Statistics tabled on revenues in the computing services industry reveal that software accounts for approximately 40 per cent, professional and bureau services 45 per cent and hardware 15 per cent. The final chapter in concerned with telecommunications and the ever-expanding networks which inter-link computers — the new infrastructure of information societies.

In the Preface, the author acknowledges that the book represents a snapshot of developments up to mid-1990. Consequently, the reader will find no material on broadband communications, multi-media and the like — such is the fate of books written on fast-moving subject areas. Also there is only a limited window to the future provided in this work, despite an explicit pointer in the subtitle. In those few areas where it does emerge, treatment is undertaken with the caution characteristically associated with the legal profession.

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Cyberspace: First Steps *edited by Michael Benedikt*
(MIT press, Cambridge, Mass., 1991), pp. vii + 436, $US24.95, ISBN 0-262-02327-X.

The dust jacket tells us that cyberspace, a term coined by William Gibson in his 1984 novel *Neuromancer,* is "an infinite artificial world where humans navigate in information-based space" and "the ultimate computer-human interface" — a world behind the computer screen as magical and marvellous as the one Alice discovered behind her looking glass. It is "both the strangest and most radically innovative of today's computer developments".

Because the world's economies have been gorging themselves on computer technology and analysts have had so much difficulty detecting the productivity gains, I decided to follow in Michael Benedikt's *First Steps* in the hope of some glimpses of this brave new world. The contributors he had gathered together represented computer science, architecture (Benedikt is Professor in the School of Architecture at the University of Texas at Austin), the visual arts, philosophy, anthropology and industry.

Dipping into later chapters before settling down to my reading task, I was encouraged by Tim McFadden, Altos Computer Systems, for whom a cyberspace "is not only just a hugely complex information network" that allows agents outside the network to communicate but also a "scene for societies of interacting

agents, which . . . permits humans to have points of view and roles in these societies'' (p.337).

Cyberspace is therefore ''an exercise in the outerboundaries of our understanding of the world as information'' and McFadden can contemplate a wide range of experience. In cyber-sweatshops, workers would act within a severely restricted and sensually impoverished world; or a more complicated, interdependent civilisation might permit many new social niches. The intermixing of ordinary world experience with cyberspace experience might make possible the playing out of thousands of times the possibilities that can be presented in the everyday world.

This seems rather like other technological utopias: all things are to be possible in the ''fully developed kind of cyberspace [which] does not yet exist outside of science fiction and the imagination of a few thousand people'' (p 123). But what will determine the actual mix of experience? What decision processes will exist? Who will exercise control? What protection do we need against the ''unprecedented barbarism'' of the global village and the ''harsh, nightmarish'', ''man-made information jungle'' (p. 77) already spreading out over the world? Appropriately, there is the Orwellian threat: ''With the thrill of free access to unlimited corridors of information comes the complementary threat of total organisation'' (p. 79).

These worries are accentuated when McFadden contends that ''cyberspace makes us confront in a more *technological* manner the problems of human experience'' (p. 337, emphasis added). Put this alongside his prediction that ''Experience will become a substance and a commodity'' (p.337), we might well wonder if ''the soft hail of electronics that is cyberspace'' (p. 3) holds promise of triumph over either the human predicament of decision or the economic realities of scarcity and maldistribution of income.

Being a consumer is one of the roles of the interacting agents so what will shopping in cyberspace be like? Will the consumer, in the words of Mary Jean Bowman, be ''servant, master or forgotten man''? Surely the consumer, empowered by this new technology with ''its myriad, unblinking video eyes'' (p. 2) will become master? To take this for granted is to ignore the limitations on what is known about consumer behaviour. Is the average consumer ignorant, an incompetent information-handler, or just unlucky? What does information justice mean in the cyberspace world? Will the cyber-sweatshop worker be able to match the cyber-excutive or the cyber-scientist when it comes to using his/her cyberdeck to get the best shopping bargains? Perhaps we should be asking if the sweatshop worker will even have a cyberdeck.

We need to probe also the seller side of the market story. What might cyberspace bring for the business firm? In a late chapter on Corporate Virtual Workspace — a chapter that suffers more than any other from the lack of economic perspective — Pruitt and Barrett consider some of these implications. The ''mot dramatic opportunity'' for a corporation is ''a dynamic and exciting public face'' (p.405). Limitless window-shopping by the masterful consumers simply enables companies to maintain a real-time data base of customer demands. The consumer appears to be still in need of some countervailing power back-up.

The greatest challenge to the company is thought to be in personnel management. The worker's PVW (Personal Virtual Workspace) i.e., the accumulated information, skills, and network of colleagues and contacts, is his/her most valuable economic asset (p.402). Assume zero cost of mobility

and expectations of high turnover are easily entertained. Rewards systems would have to be overhauled, with length-of-stay and non-disclosure contracts. Of course, the zero cost assumption will not be fulfilled: for example, any collection of PVWs will give rise to coordination problems and costs.

And there are other cost aspects that deserve much more attention than they are given in this book. Compatibility problem with PVWs and CVWs (Corporate Virtual Workspaces) loom large and will continue to do so, a suggestion for a cyberspace "green card" notwithstanding. There is the basic issue of "cognitive overload" (p.395). Consider too the eventual cost consequences of "vast data bases that constitute the culture's deposited wealth, every document is available, every recording is playable, and every picture is viewable" (p.2).

Do conditions favour the cyberspace corporation? Pruitt and Barret say, yes. Little start-up capital is required once a good profit opportunity has been detected (p.403); workers and their PVWs are mobile. To an extent this thinking is in line with the emerging economic growth theory orthodoxy that adds knowledge to the neoclassical capital and labour. Knowledge is embodied in the PVWs. However, a society needs to be able to organize for the use of knowledge and it does so through the continuing interactions made possible by organisation, the mysterious kind of capital that has rightly been dubbed the real wealth of nations.

Three other weaknesses might be noted. First, the role of organisation may provide a basis for even more massive economies of scale and scope than did the old-fashioned scale production conditions. Second, markets in information do not work very well and even the profit sharing on which this new kind of corporation supposedly rests may prove very difficult in practise — cyberspace entrepreneurs would do well to study the problems of Chinese joint ventures. Third, what happens on the property right front? If, as these authors imply, we are in only the early stages of the information age, the limitations on our ability to define clearly property rights in information must have an increasing impact.

Overall, in reading this attractively written and produced volume one should keep in mind the disclaimer in the Introduction: "Cyberspace — as described in this book — does not exist". It is very doubtful that it ever will; but equally the technological and economic pressures and the thinking about cyberspace reflected in these pages will together ensure that the future differs greatly from the past. Their interactions contribute to our knowledge and so to economic growth and institutional change.

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Feminism Confronts Technology *by Judy Wajcman*
(Allen and Unwin, North Sydney, 1991) pp.x + 184, $22.95, ISBN 1-86373-100-8.

The question of the relationship between technology, human beings, broader society and the tensions between them is undoubtedly complex. Wajcman attempts to analyse this relationship by examining the diverse feminist approaches to the question of technology and social change. Her book thus represents a