

earned their passage: no contribution is less than competent. In the setting for which they were designed, all presumably worked extremely well. Everybody seems to have enjoyed themselves. But it is difficult to see what the collection might offer to a wider readership. The specialist will learn nothing new, and the newcomer will require a more coherent coverage of the field.

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On the Right Lines? The Limits of Technological Innovation, by Stephen Potter.

(Frances Pinter, London, 1987) pp. x + 208, ISBN 0-86187-580-X.

High speed train travel is part of the story of man's quest for ever greater mobility. Engineers improve existing systems and invent new ones, for use on land, sea and in the air. Economic realities sift the various improvements and frequently, but not always (e.g. the Concorde), reject those which cannot justify the costs associated with their introduction. Stephen Potter goes further than this popular view of developments, allowing the reader many insights into the problems associated with the actual process of innovation.

Primarily concerned with British Rail's development of various versions of the High Speed Train, Potter also uses examples from Japan, France, Germany, Italy and the United States to give perspective to, and support his main arguments. The successfully introduced trains with higher speeds, with the exception of the French TGV, were essentially evolutionary developments, taking existing technology towards its inherent limits. The British Advanced Passenger Train (APT), which never came into general service, was not a further refinement of existing technology, but "... a research-based, scientific approach to rail innovation ..." (p. 46). It thus encountered problems not met in the past, where research was normally conducted as a service to departments with a particular testing task or problem.

The radical rather than evolutionary approach to the development of the APT was seen by some engineers as a threat to their professional reputation, their status and methods of working. Requests for APT work received low priority, so that everything became a protracted process. Some key people left. Reorganisation of the APT team in 1982/83 improved matters, but came too late. The social, political and economic climate had changed. A combination of recession and a free market philosophy which increased competition from transport substitutes, meant that a concept appropriate for 1973 was no longer relevant (p. 142).

Other parts of the story, however, suggest that it is perhaps doubtful whether it ever was "relevant". While the author seems at times to deplore the intrusion of commercial/economic considerations, he is careful to point out that there are commercial limits to increased mobility, e.g. that there are diminishing returns so far as increments in speed are concerned. Even the

longest intercity route in the United Kingdom cannot yield increases in speeds which would increase revenue more than costs. The "maximum commercial speed" (p. 148) is clearly much lower than the maximum speed which is technically possible.

There are important lessons to be learned. The special case of the Japanese fast train "...has little to say to the world today", because "...it was unable to adapt to political and economic situations other than those prevailing when it was conceived" (p. 174). The French TGV approach of upgrading a whole network by providing a high quality new link is more promising. Qualities other than speed, such as comfort and reliability, also seem to offer better commercial opportunities.

Potter explains the greater acceptability of the evolutionary approach by the difficulties posed by the great expense of the necessary changes to the track. This applies not only to railways. "The existence of a well-developed infrastructure or product support system makes the entry of a rival based on a different infrastructure difficult or impossible, even though the technology of that rival may be superior to the existing product" (p. 189). Relatively minor technological advances are insufficient to overcome this infrastructure hurdle.

Nevertheless, all was not lost. Many of the innovations intended for the APT have been and will continue to be, adapted for use in conventional railways. A more radical approach to R and D may prove its worth in this manner. It is also shown that the managerial constraints to innovation were, and probably still are, not adequately appreciated. Not only technical, but also managerial expertise, is necessary for a successful innovation. The dominance of engineers results in a technology-led approach which tends to discourage alternative, non-technical, options. Once this is recognised, complementary technical, organisational and marketing innovations become possible. The marketing possibilities of a technical improvement must not be ignored.

If there is one criticism of what is an informative and well-written book, it is that insufficient attention is paid to the developments of non-rail transport substitutes. Rail developments would certainly be viewed in a different commercial light if the motor vehicle, as a carrier of people and goods, with great flexibility and convenience, had not existed. The commercial viability of railway developments depends primarily on what road transport can do, except in some specialised areas of bulk carriage and in the urban passenger area where lack of adequate road space constrains further road transport development.

The book contains a great deal of factual information, as well as pursuing its main thread of innovative activity in railways. Setting the problems so often met in theory in a railway framework makes it easier to get the message across: inventing a better mousetrap is not necessarily useful, especially if it costs more to develop and produce than the value of benefits from its introduction. The analogy is not very good, because mousetraps do not require expensive, specialised infrastructure. Adding that problem is important, since piece-meal improvements to mousetraps are just as feasible as radical innovations, but this is not so for railways and other outputs heavily dependent on specialised infrastructure. Reaching the technological limits of existing track is quite different from what is possible by radical changes to vehicles and track.

The book can be read and enjoyed not only by those interested in technological innovations, but also by anyone interested in railway

developments generally, perhaps even by anyone interested in railways as such. The illustrations and figures are most appropriate, and directed at what is sometimes called the intelligent layman. There is thus no need to be a railway specialist, or economic historian, to be able to benefit from this well told story.

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The Australian Wool Supply Pipeline, Technology and Marketing Logistics: Low Cost Alternatives, by *Peter Cassidy, Ian Toft and Owen McCarthy*. (Brisbane College of Advanced Education, Brisbane, 1986) pp. 104, ISBN 0 86856 6446.

This is not an easy book to read, but it is worth the effort for those interested in the rigorous, applied analysis of processing and transport flows, and anyone with a real commitment to improved efficiency in the Australian wool industry. At a time when wool prices are booming, efficiency considerations are inclined to lose their force to an extent. But it is in boom times that profits are available to invest in capital and improved technology to aid competitiveness in future, and with that in mind, the findings of this volume are timely.

The novelty of the study lies as much as anything in the focus of its attention: not the business of producing wool, upon which so much research effort has **already** been expended, but instead, the efficiency with which it is marketed. This focus is not only novel in connection with wool industry research, but is also quite unusual in connection with the theoretical study of productivity and technological change more generally.

Prospective readers should not infer from this that the study is about the characteristics of wool and its saleability in various markets, the focus of other research in wool marketing. Rather, the authors have addressed the problem of devising a number of low-cost, distribution systems for Australian wool by integrating the processes of assembly, packaging, transport and shipping. As must be apparent from such a description, the central task of the work was to look to spatial equilibrium analysis for models which could allow alternative outcomes to be considered for the entire system of wool distribution in Australia. The set of models over which the authors had to exercise their choice included activity models, approaches based on dynamic programming, and modified transportation and transshipment formulations. In the end a transshipment formulation of a transportation linear programming model was adopted to provide the analytical framework, and was put to work on the basis of 59 supply regions from which wool flowed through 12 possible regional centres and to six possible ports.

This, then, is the framework within which the analysis is conducted. But what are the alternatives broached? Put broadly, the study asks questions about where, and by what methods, the interdependent operations of packaging, handling and transport should take place in order to maximise net