Book Reviews

What Machines Can't Do: Politics and Technology in the Industrial Enterprise *by Robert J Thomas* (University of California Press, Los Angeles and London, 1994), pp xviii + 314. $US 16.00. ISBN 0520 08131 5.

This is a book to be read, not just skimmed, because its attractions lie largely below the surface. The enigma of the main title is only partially resolved in the closing sentences of the last two chapters; they say, respectively and unsurprisingly, that machines can't author the future, and that they can't add the art of manufacturing to the science of production. (This last comment refers to Thomas' comparison of manufacturing with a performing art (p.258)). The list of contents suggests a careful uniformity imposed on the case studies by a consistent overlay of structure: in each case there is a description of the company and of the technology; then a discussion of choice between technologies and of choice within the technology; and finally a section on implementation. Forebodings of a survey and a number-crunching statistical analysis are intensified by two appendixes devoted to coding categories.

But the text is remarkably free of numbers — too much so, as I will complain later. What it does contain are concepts and ideas whose significance are quite unstatistical in nature. The goal of the research was not to test theories but to generate theory (p.274). Thomas says that choosing between technological possibilities involves three screens, a technical one, an economic one and one that is political or interest-based (p.83). His own interests lie so overwhelmingly in the third that he takes the first for granted and dismisses the second. Taking the first for granted turns out to be a conceptual flaw underlying his theoretical analysis, as I will show later. Regarding the second, he does admittedly give good reasons for his dismissal. A recurring theme is the non-importance in reality, as distinct from rhetoric, of the return on investment. The figures are "cooked" (p.208) or they are "really silly" (p.58) or even "outright lies" (p181). In one case, "finessing the ROI" was part of the strategy (p.59). In Thomas' analysis, the hard currency is not dollars but power.

It is a pity, I think, that he didn't include some figures on the costs of the projects, despite all the uncertainties that necessarily surround them. He had some figures, since he saw funding proposals, and they would have added a backbone of numeracy to the flesh of theory. In any case, the four companies from which the six case studies are taken remain anonymous, even through the veil of anonymity is not always impenetrably opaque. One of the very few dollar figures in the book is $US 27,000 for the cost of transcribing Thomas' interviews (p.264), and it reveals very clearly where the emphasis of the research lay.

Politics is interpreted by Thomas to mean the internal politics of the company. There is a minor exception in that collaboration with a customer plays a part in one case study, that of the aluminium company, but the politics of politicians and external lobby groups does not figure. Power and influence within the company are the pervasive elements in his analysis. Thus he says that in the aircraft company, "people do make airplanes, but at the same time they make jobs and careers, allies and enemies, monuments and epitaphs" (p.82). Significantly, he immediately adds that they also "invest tremendous energy in the attempt to give meaning to the work they do". The ambition of engineers to do "real engineering", meaning something creative, is another recurring theme. Often the enthusiasm for "real engineering"

turns out to be a mixed blessing from the point of view of the corporate balance sheet.

In the first case study, the introduction of a flexible machining system in the aircraft company, a proposal from the manufacturing R&D section won out from among a dozen competing proposals. Thomas' analysis shows that this initial success was due not only to polished presentation but also to the adroit political strategy that was used to organise support or placate resistance. Different tactics were used in three different organisational directions: outward, where there was bargaining with allied groups over the precise configuration of the system; downward, where a "user group" was formed in the shop where the system was to be housed; and upward, where support had to be obtained from the corporate management. In the end, however, the savings in terms of time or of labour, of "heads lost", were nowhere near as great as had been anticipated (pp.59-63).

The second case concerns a robotised assembly cell in the same aircraft company. It was a manifestation of the enthusiasm for robots which swept the USA in the early eighties and led to an initiative from top management. In the event, however, the cell turned out to be a solution seeking a problem: the need it was originally intended to meet was eliminated by redesign of the components concerned (p.75). In his unenthusiastic assessment of the outcome of this project, as in the previous case, Thomas perhaps underestimates the possible longer term benefits. Even if a company's first venture into these new technologies is not much of a success, the knowledge and experience gained may turn out to be valuable later on.

The third case, also from the aircraft company, concerns the introduction of shop-programmable machine tools. Technologically speaking it was unexciting, since the technology was available off the shelf, which led the R&D section to criticise the proposal as "myopic", but it enabled shop management "to regain a measure of control over their piece of the organisation" (p82).

The fourth case comes from a large but decentralised computer company and concerns the introduction of surface mount technology. Thomas characterises it as a successful social movement, comparing it with other movements such as the civil rights movement. The new technology served as the banner for the movement, which eventually forced the adoption of the technology on the corporation. It was the marked divergence between the official and unofficial stories that led Thomas to his diagnosis. Officially, a deceptively rational explanation was given for adopting the new technology despite its apparent cost disadvantage: "the answer is simple: our product specifications — driven by customers' needs — required it" (p97). Unofficially, however, the view from the trenches was that "independent development and advocacy efforts across the divisions forced a corporate response" (p.99).

Of the six cases the fifth is perhaps the least overtly political. The introduction of a continuous wire-making process in an aluminium company involved crossing boundaries to an extent hitherto unprecedented, not only within the company but also between the company and a customer. The idea of "crossing innovation boundaries" has been well accepted in Australia for some time, and it received official endorsement with the publication of a report carrying just that title (National Board of Employment, Education and Training, Commissioned Report No 26, November 1993).

The last and sixth case comes from the auto industry and is perhaps the most directly relevant to Australia. The description of the transitional state of the car component plant strikes an uncannily familiar chord. "For example, adjacent to a cluster of bright yellow and chrome machine tools stood decrepit lathes and punch presses leaking oil and clattering with noises that betrayed their age" (p.169). There were similar scenes in Melbourne and Geelong in the late eighties, and it was tempting to see them as the end of Fordist mass production and the heralding of a new era in which the workforce would be flexible, skilled and committed. We were, we thought, on the brink of the "second industrial divide" of Piore

and Sabel. Alas, sober reality has not quite matched those expectations. Thomas' book doesn't give much reassurance that a flexible, skilled and committed workforce has been achieved, although the status of manufacturing engineers has been raised (p.181).

As always with case studies, the crunch comes when the telling of interesting stories has to stop and some general conclusions have to be drawn. What Thomas has to say about technological determinism and social choice may perhaps be of interest in management circles — he was based in the Sloan School of Management at the Massachusetts Institute of Technology — but in philosophical circles it would not be seen as very original. His main contribution to general theory takes the form of what he calls the "power-process perspective". This perspective emphasises the importance of viewing technological change as an extended historical process, rather than merely taking a snapshot. His own case studies, however, cover quite sharply delimited episodes. Many managers in industry would take longer time horizons for granted, if not because of their own personal memories, then because of the institutional memories of their companies. It is through organisational learning that technological innovations which may seem to be failures in themselves sometimes turn out later to be critical ingredients in success stories.

Thomas presents his power-process perspective as a way to shed light on the coupling — or more accurately the range of possible couplings (p.20) — between the social and the technical systems of the company. I am not convinced, however, that his analysis is much of an advance on what was said earlier on this subject by Eric Trist. A serious flaw in Thomas' analysis is that he fails to grasp accurately the nature of technical systems. "Absent the ability to self-organise," he says, "technical systems can do only what they are commanded to do" (p.17). Here he gives a sadly mistaken answer to the question implicit in his main title. Machines can be every bit as unpredictable or cussed as humans, and, moreover, less amenable to persuasion by sweet reason, or to coaxing by incentives, or to coercion by *force majeure*. Treating change as a series of choices or decisions leaves out of account those outcomes which were nobody's choices or decisions. Nobody instance, decided or chose that technical problems should continue to plague the flexible machining system (p.63) or that, "at the end of this study, the robotics work cell had been bolted into the ground, but R&D personnel were still struggling to make the overall system work. Problems with pieces of the system continued to foul up the whole." Counter-instances such as these point to a conceptual defect underlying the claim (p.21) that technical systems must by their very nature be carriers of organisational objectives. Not only are they sometimes imperfect carriers, but further, they sometimes turn out to meet objectives other than those for which they were initially designed.

The stubborn fact remains that each of the cases seems to be largely *sui generis* and unique unto itself. Attempting to derive generalisations about the process of technological change is almost as hopeless as studying half a dozen episodes in history and trying to capture from them those laws of history that have eluded historians since they were so tantalisingly posited by Marx. Certainly the book is a powerful caution against uncritical belief in rational strategic planning of technological change, and that caution remains valid even if Thomas is not necessarily right when he argues that the politics is more difficult to foresee and to plan than the technology itself. In that respect it is a valuable contribution; and since I cannot match his stratospheric detachment from mere money matters, I add that its value includes being good value for money at the price.

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