

Review Article

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The images of technology abound — from *i*-gadgets, to office technology, to factory robots, and new architectural designs appearing in industrial and developing countries around the world. Its impact on organisations is reviewed in *New Technology @ Work* which covers a wide range of literature. The book primarily centres on the effects of computer-based technologies, or broadly ICTs, for organisations and work (p. xi) in several industries and countries. The authors discuss the organisational, political, and institutional features of changes in technology over the last couple of decades, rather than providing an analysis of the nature of technology/ies, or a more detailed examination of work. Indeed, *the* central theme is the contingent effects on technology in organisations of local and wider political contestation, institutional forms and state policy. The book's main contribution lies in a broad review of a range of debates and in its assembling of what the writers term a 'political materialist' perspective, in examining technology at work.

The book's nine chapters fall into three general categories — theoretical approaches and frameworks (chs 1–2); studies of technologies in specific industries, covering manufacturing, call centres, white collar work, management, professions, and distributed work (chs 3–6); and an analysis of the institutional context and conclusion (chs 7–9). Accordingly, the theoretical framing of the book is located at two levels — the organisational, and the institutional. The first parts of the book primarily focus on organisational features and the latter part on the institutional context. However, the institutional context is never far from the discussion throughout.

The authors initially review a sweeping array of literature on technology, spanning more than fifty years, and identify four broad types of theoretical approaches. Using a two dimensional matrix (based on the axes of 'variables addressed', and 'theoretical focus', see Fig 2.1, p. 15) they usefully cluster many theoretical perspectives into the resulting four types — viz., technological determinist; management of technology (MOT); political materialist, and; social constructivist. The authors seek to develop a 'political materialist' theoretical framework — built from its roots in labour process theory, and augmented by 'recognising the importance of processes of social construction that shape the impact and experience of technology at the organizational level' (p. 40). As noted, the organisation level is strongly complemented by the consideration of

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context — as they write, '[o]ur approach seeks to locate technological change and the labour process in the context of institutional ensembles that operate at sectoral, national, international and global levels' (p. 41). This approach is applied through the book by drawing on the literature on national innovation systems, as well as similar literatures, and by deploying the well-known distinction between 'country-level', 'coordinated' and 'competitive' ideal types in most chapters.

Given the book's focus and length, each chapter is necessarily delimited to selected aspects of the topic. Thus, in addressing manufacturing management (ch. 3), the focus is on medium-high, high, and new technologies. Clerical and office work (ch. 4) is addressed primarily through issues around call centres. Managerial and professional work (ch. 5) is discussed through a focus on the effects of ICT on how management and computer professionals manage, while discussion on new forms of work organisation (ch. 6) centres on the nature and extent of telework and its effects. As noted earlier, the focus of the latter chapters is on the macro-institutional environment of changing technology. Accordingly, the review of new patterns of institutional relationships (ch. 7) addresses globalisation, primarily the rise of 'financialisation', and the role of MNCs in production, trade and technology. The discussion of the evolving national technological systems (ch. 8) outlines differences in the effects of co-ordinated and competitive system types. The final chapter (ch. 9) focuses on broader sectoral changes — primarily the rise of services — and the types of jobs that ICT and knowledge work create.

New Technology @ Work has several strengths. Its consistent and critical evaluation of debates and claims adroitly separates rhetoric from reality, and debunks many misguided myths. The writers stress caution in approaching many overstated claims emerging from the orthodox, critical, and populist literatures. These claims range around globalisation, knowledge work, technoglobalism, the creative class, and the knowledge economy. If anything, the book's persistent critique of modish ideas deflects the authors in developing more persuasive alternatives. Importantly, however, they resolutely argue that technology has no independent causal features (beyond the effects of its physicality). Rather, it is chronically embedded in 'institutional ensembles' (p. 41), centring on broadly defined political contestation and outcomes. This view is consistently elaborated — for example, 'technology is a *facilitator rather than a driver* of change' (p. 99, emphasis added). It culminates in the conclusion that 'the debate about new technology at work is that these elements [interests, collective presentation, and so on] of *political decision making* are not arranged serendipitously, but are part of an ongoing process of change ... [which] constrain future choices and ... set a trajectory for the workplace of the future' (p. 190, emphasis added).

Nevertheless, the political materialist perspective has some curious omissions. The initial exposition of the theoretical matrix (ch. 2) omits 'economic/s' along the 'theoretical focus' axis. Thus, both perspectives — of 'orthodox' productivity and the more 'critical' capital logic — are theoretically neutralised.

Put another way, the orthodox view is cast as technological determinist, and the critical view — primarily labour process theory — is cast as a political theory. Yet arguably, labour process theory is systemically based on an economic theory — that of value creation — notwithstanding Braverman's 'self-imposed limitation to the "objective" content of class' (Braverman 1974: 27), and similar limitations in subsequent additions to the labour process corpus. By seeking to avoid any essentialist economic architecture, the materialism of the economic dimensions of organising is compromised. Hence, the writers are led to see management decisions as an amalgam of management and organisation theory, strategic choice, and (politically driven) institutionalist path dependency (eg. p. 15). To be sure, the approach admits economic *interests* in decisions, but political materialism struggles to register even this and its particular causal effects. The hoary influence of economic determination 'in the last instance' thus remains in a shadowy form.

These theoretical effects make the argument problematic in places. In examining manufacturing (in ch 3), little is said about key economic drivers of technology and change. Two matters are illustrative — robotic technology, and new management techniques. In discussing the former in the context of flexibility in manufacturing, the authors highlight current patterns of technology adoption (up to circa 2002). The only tabular data presented in chapter three (Table 3.1, p. 49) suggest that coordinated system countries (especially Japan, Germany, and Italy) have five to eight times as many robots in manufacturing as do competitive systems (US, UK, Australia). However, these differential ratios actually fall significantly in vehicle manufacturing, and crucially *disappear* for new multiple axis industrial robots. Indeed, the US leads the world (94 per cent) in this field, closely followed by the UK (86.9 per cent) and Sweden (91.6 per cent), with rates more than twice those in Japan (43 per cent), and fifty percent higher than Germany or Italy. Thus it is hard to sustain the suggestion that the US lags behind Europe in robotics and FMS, particularly when the argument relies on research that is more than twenty years old. So, what *is* happening in this field?

From its earlier roots in radio-controlled equipment (dating back to the 1890s), robotic technology was invented in the US and the UK in the 1940s and '50s. George Devol's magnetic control device emerged in 1946 (patented in 1952), and his Programmed Article Transfer technology followed in 1954 (patented in 1961). The first patent for robot design was issued to British inventor Cyril Kenneth in 1957 (Nor and Rajan 1994). Concurrently, the prototype Numerically Controlled machine emerged in 1952, based on John Parsons' conception in 1948 (Shin 1994). The multiple axis or articulated robot was similarly invented in the US — associated with Victor Scheinman. Slow initial take up, largely reflecting the sunk *costs* of other technology, the timing of robotic technology, and the undeveloped robot market (currently estimated to be US\$19 billion globally, see IFR 2009), would seem to be very important. These issues are not mentioned in the book. Moreover, US markets, especially in car manufacture, did support advanced, albeit standardised, industrial machinery usage at the time (the US

was the largest car market in the world from the 1920s to the 2000s) — and this manufacture included the use of robots.

In short, the implications are that robot *costs* in car making were high and the need for robots low — in the US in the first ‘mass phase’ of the market. Lower cost products and quality were the paths to capital accumulation and higher profits in the US. This model was extended to Europe, as US firms expanded from the 1960s. Later entrants in car manufacturing (especially Japan) adopted the robotic equipment that had become cheaper from the 1970s onwards, and resulted in improved efficiency and quality. However, as the Table 3 data show, the robotic technology in Japan is *now* relatively ‘standardised’ (with more machines but the lowest proportion of multi-axis ones). Stagnating Japanese manufacturing from the 1990s — including in car firms — finds its robotic technology is also standardised, and increasingly dated. In short, a more persuasive argument would point to robotic capabilities, costs, market structure, and the robotic *industry development* itself.

The second illustration is drawn from the presentation of the relationship between new management techniques and new technology (see pp. 47, 54–55, 57–58, 111, 189). Several of the techniques cited — such as TQM, JIT, and business process — now stretch back thirty years or more. Indeed, they are not new in themselves, for like robotic technology, many of these techniques have long been available to management — contingent on *cost* and *scale* — as well as on management fashion and political conditions. For example, lying behind many ‘new’ techniques is the statistical control chart — developed in the 1920s by engineer Walter Shewhart, while he was at Western Electric, before moving to the new Bell Laboratories in 1925 (see Shewhart 1925, 1931). Implementation of statistical process control was expensive, with these costs only falling appreciably after World War Two, but even then remaining relatively high. The economic stagflation emerging in the 1970s saw flexibility/control costs *fall* as the computer industry expanded. Moreover, early research (eg. Sorge et al 1983) showed at the time that ‘microelectronics’ was quickly making small scale production more viable for expanding markets in Britain *and* in Germany — that is, in *both* competitive and coordinated systems.

Arguably, industrial capitalist production — and the technology/techniques it develops, deploys and destroys — has a cyclical and ‘leap-frog’ character — a relatively uneven development, in which *time* and *location* play key roles. States, policy and politics operate in these contexts. In addition, large volumes of manufacturing industry have re-located to countries outside the OECD, and the coordinated/competitive couplet. Questions thus emerge about the adequacy of the typology. A significant index is that energy consumption of *non*-OECD countries now surpasses that in the OECD for the first time.

Summarising, this book carefully considers a wide variety of literature on work organisations and political and institutional context of technology adoption. The authors conclude that shifts in sectoral employment are centrally related to changing technologies. In particular they note the ‘hour-glass effect’: technological change has generated both better jobs, but also even more routinised jobs (eg. pp. 180–1, 186–9). National systems have different strengths

and weaknesses, with coordinated systems better able to distribute economic benefits (pp. 179 *ff.*). Not surprisingly, the themes emerging from the literature addressed by the writers skew the development of the 'political materialism' framework more to politics than to (economic) materialism. Despite its strengths, the book thereby overlooks, perhaps, some cogent features in the development of technology, and misses an opportunity for building a more integrated theory.

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