BRILL

Historical Materialism 16 (2008) 227–232

historical materialism
research in critical marxist theory

www.brill.nl/hima

Historical-Critical Dictionary of Marxism

Innovation

A: at-tăgdīd. – G: Innovation. – F: innovation. R: innovacija. – S: innovación. C: gexin, chuangxin 革新、创新

Marx discusses both particular inventions and the broader evolution of the means and relations of production, as well as their 'revolutionising' or 'transformative' effects. However, while *Capital* Volume Two often mentions 'renewal', the specific concept of innovation only enters Marxist discourse in the context of twentieth-century debates over the existence and the character of long-term economic fluctuations, often referred to as **Kondratieff** cycles (which may encompass several 'normal' capitalist cycles of expansion and contraction). 'Innovation', seen as the condition for a new phase of long-term expansion, refers here to the complex of changes whereby a technological invention (be it a product or a process) is absorbed into current business practices. The development of innovations is, in this perspective, a routine aspect of capitalist development as a whole. For **Marx** and his successors, by contrast, the genesis and refinement of inventions not only includes this dimension (along with whatever short-run cyclical impact it might have), but is also linked to the possibility of epochal changes – if not in the entire mode of production, at least in its scope, its historically specific traits, and its ripeness for supersession.

1. **Marx**'s treatment of capitalist technology focuses above all on its objective of increasing productivity (i.e., output per unit of labour-time). In the critique of political economy, the development of productive forces is related to competition between individual capitalists. Individually, these capitalists continuously introduce more production methods and means of labour, in order to attain competitive advantages in the form of extra profit. Competitive pressure forces competitors to follow, thus regularly generating new standards of production. Nevertheless, innovations are not successfully introduced under all circumstances. If the additional costs for the implementation of improved machinery become greater than the wages saved by means of such machinery, the replacement of existing means of production becomes uneconomic from the perspective of capital. One can thus find the most advanced and the most primitive technologies applied simultaneously (*MECW* 35, 374 et sqq.) – if not in immediate proximity to one another, at least within the same regional or global economic order.

The actual innovations that **Marx** describes fall into two broad categories, corresponding roughly to our distinction between the routine and the epoch-making (depending on whether they do or do not 'modify the general technique of production' (**Mandel** 1980, 42)), but with a clear understanding that the two types are interdependent. Thus the steam engine, as an 'invention', dated from the late seventeenth century, but did not, in its original form, 'give rise to any industrial revolution. It was, on the contrary, the invention of machines that made a revolution in the form of steam engines necessary' (*MECW* 35, 375 et sq.). This complex evolution does not diminish the eventual significance of **Watt's** later, more sophisticated steam-engine as a 'prime mover', and thus as the single innovation that would epitomise capitalist industrialisation. But the links among different categories of innovation are equally crucial, reflecting as they do the enormous pressure that impinges on any phase of

DOI: 10.1163/156920608X315338

production or distribution that might be stuck at an earlier stage of development. Thus, 'machine spinning made machine weaving necessary', and so also did the wider 'revolution in modes of production of industry and agriculture' necessitate 'a revolution … in the means of communication and transport' (*MECW* 35, 388 et sq.).

A key question underlying this process is how one should distinguish innovations that serve primarily or exclusively the interests of capital from those which – whether immediately or only potentially – are of benefit to humanity as a whole. This distinction appears implicitly in the *Communist Manifesto*, which on the one hand speaks of the bourgeoisie's prodigious technological achievements, but on the other hand refers critically to its 'constant revolutionising of production' (*MECW* 6, 483), with the clear implication that the latter process, marked as it is by 'everlasting uncertainty and agitation', disregards human need. In the *German Ideology*, **Marx** and **Engels** declare that the development of the productive forces is the 'absolutely necessary practical premise' of communism, 'because without it want is merely made general, and with destitution the struggle for necessities and all the old shit would necessarily be reproduced' (*MECW* 5, 48; trans. modified). The duality between positive and negative aspects of innovation is clearly apparent in *Capital*. On the one hand, **Marx** criticises the Luddite movement as reflecting an immature consciousness, in which workers had not yet learned 'to distinguish between machinery and its employment by capital' (*MECW* 35, 430); on the other hand, he calls machinery 'the most powerful weapon for suppressing strikes', and suggests the importance of studying all those post-1830 inventions whose 'sole purpose' was that of 'supplying capital with weapons against the revolts of the working-class' (439).

Machinery is thus inescapably stamped, for **Marx**, by the purpose for which it was devised, but this link does not preclude its having a possible future role shaped by other forces. In this sense, a Marxian approach to innovation necessarily embraces not just new methods of producing goods or delivering services, but also changes in the mode and relations of production. Adapting machinery to such changed conditions might be considered a more advanced form of innovation than that which occurs at the behest of capital; in any case, it implies that the concept of innovation extends to matters of social organisation as well as to those of a narrowly technological nature.

2. Marxian research into technological innovation has by no means confined itself either to the period, or to the geographic core, of capitalist industrialisation (cf., e.g., **Needham** 1986–95). Such research has offered important correctives to the ideological stereotype which identifies innovation with capitalism and, more specifically, with the 'heroic' entrepreneur. In fact, for most of human history, innovation has reflected the work of anonymous peasants, artisans, warriors, and healers (cf. **White** 1962; **Landes** 1969, 101). Even under capitalism, the actual work of innovation can only in part be credited to the capitalists themselves, as business firms have drawn heavily on the 'in kind' subsidies offered by universities and the state (**Hilpert** 1992, 7). At the same time, capitalist innovation itself can be understood as a 'passive revolution' (**Gramsci**) against the resistances of the working class. **Negri** characterises it as 'a product, a compromise or a response, in short a constraint which derives from workers' antagonism. […] The more radical the innovation is, the more profound and powerful were the antagonistic proletarian forces, which have determined it, and therefore the more extreme was the force which capital had to put in motion to dominate them. Every innovation is a revolution which failed – but also one which was attempted' (1992, 80). What is specific to innovation under capitalism, then, is in part this anti-working-class aspect and in part the stimulus arising from competitive pressure, which forces it beyond what might be dictated by need and, in the process, giving it a distinctive and much-debated role in relation to economic trends.

2.1 The debate over the historical role of innovation dates from the early twentieth

century, and took on a significant political dimension in the aftermath of the Russian Revolution. The framework of this debate was the hypothesis of 'long waves' in capitalist development – an idea which originated in a study of agricultural crises by the Russian Marxist **Parvus** (A. Helphand), elaborated in a 1901 pamphlet entitled *Die Handelskrise und die Gewerkschaften* (cf. **Mandel** 1975, 122 et sq.). Long-wave theory became permanently associated with the name of N.D. **Kondratieff** (1892–1938), who formulated a cyclical profile of capitalist development, with turning points (transitions from declining to rising production) situated around 1789, 1849, and 1896 (**Kondratiev** 1998/1926, 31). Later writers (e.g., **Mandel** 1980, **Sundbo** 1998) have added a fourth wave beginning after 1945.

Innovation can be viewed as either endogenous or exogenous to such trends (**Rosenberg** & **Frischtak** 1986, 6 et sq.). In the 'endogenous' perspective, which was that of **Kondratieff** himself (1926, 49 et sqq.), innovation is only one of four sets of phenomena (the others being wars and revolutions, territorial expansion of the world market and increases in the gold supply) that together define the long-term evolution of the capitalist economy. In the contrasting 'exogenous' view, set forth by J.A. **Schumpeter**, the long 'Kondratieff' cycles are attributed above all to the impact of certain innovations, with particularly well-defined connections emerging for the 'second Kondratieff' (with railroadisation) and the third (with electrification) (**Schumpeter** 1939, 254 et sq.). Due to their historical orientation, both variants clashed with the dominant equilibrium theories, which were not able to grasp the dynamic of innovations because of their static conception of the economy. These theories understood competition also as price competition and not as competition over quality, markets and new products.

At the same time, neither **Schumpeter** nor **Kondratieff** identified with Marxism. **Schumpeter** defined the dynamic of capitalist innovation as a 'process of creative destruction', which continually revolutionises the economic structure from the inside, destroying the old structure and creating a new one. By implementing radical technical innovations, the capitalist entrepreneur enables long-term boom phases. Schumpeter distinguishes the innovation process into three phases: first there is invention, then innovation in the strict sense of the word (implementation of inventions in the economic process), then diffusion of innovation. Nevertheless, he is unable to uncover the preconditions of a successful process of innovation. His theory invokes a *deus ex machina*, explaining the accumulated occurrence of innovations with the ultimately contingent appearance of dynamic entrepreneur personalities (**Läpple** 1987, 65) or ingenious inventors.

Kondratieff, for his part, counterposed his cyclical theory to the view, widely diffused in the Marxism of the time, that capitalism was evolving toward a clearly identifiable and definitive breakdown. **Kondratieff**'s most prominent contemporary critic was **Trotsky**, who argued that in diagnosing 'the general condition of the capitalist organism', one had to reject cyclical presuppositions in favour of looking at 'the specific way in which it breathes, and the rate at which its pulse beats' (**Trotsky** 1921, 202). While **Trotsky** recognised the importance of long-term trends, he preferred to analyse them as 'curves of development' (200), whose various turning-points came at irregular intervals and were attributable to 'external' political events (**Day** 1976, 71). Most immediately, writing during a period of apparently great volatility, **Trotsky** could hardly relish the prospect of lost revolutionary opportunity that would most likely result from a cyclical recovery. Not until the post-World-War-Two capitalist expansion would this dynamic be reversed.

2.2 With the apparent restoration of capitalist stability after World War Two, the spectre of another long-term downturn once again gave cyclical analysis a subversive edge. It was under these conditions that Ernest **Mandel**, harking back to **Parvus**, moved to re-integrate long-wave theory with Marxism. Like **Trotsky** (but also in common with **Schumpeter**), **Mandel** rejects the 'endogenous' approach of trying to encompass all historical phenomena

within **Kondratieff**'s cyclical configurations; in addition, he rejects the concept of cycles in favour of 'waves', in order to emphasise the non-automatic character of the shift from 'depressive' to 'expansive' phases (**Mandel** 1992, 328). Unlike **Trotsky**, whose 'exogenous' benchmarks were principally social movements, wars, and revolutions (**Day** 1976, 72), **Mandel** places far greater emphasis on the phenomena of innovation. He identifies a 'second technological revolution' (associated with electric motors) as gestating during the 1873–93 depression and as engendering an 'accelerated accumulation of capital' between 1893 and 1914 (**Mandel** 1975, 188). He then focuses on the 'third technological revolution' of the post-1945 period (1975, ch. 6), among whose central characteristics he notes 'a permanent pressure to *accelerate technological innovation*' (1975, 192 and ch. 8).

It is within this framework that the propensity toward innovation, long heralded as the supreme creative attribute of capitalism, turns into an 'end in itself', increasingly divorced from any reference to human need or ecological constraints. Innovations then are weighed principally in terms of their profit-potential; the sole more specific criterion is that of control, i.e., enhancement of the power of management as the agent of capital (**Noble** 1984, 44 et sq.). Other concerns are secondary, and are subject to manipulation.

3. The concept of innovation, much like the concept of 'progress', has become largely identified, in everyday discourse, with its capitalist embodiment. The historic challenge for socialists has been to wrest the creative dimension of innovation free of its capitalist constraints, and to apply it to the extraordinarily difficult tasks of ending poverty, building community, and restoring biodiversity. It is important to keep in mind the twofold aspect of technology emphasised by **Marx**. The 'invention' is merely a device, an instrument; historic innovations, in **Marx**'s treatment, imply an entire system of relations (cf. **Wallis** 2000, 54). Issues of technology are thus at the same time social issues. Not all inventions are socially useful; many have had severe negative effects, whether intended, as in the case of military technology, or unintended, as in the case of the petrochemical industry (cf. **Commoner** 1971, ch. 9). Moreover, many inventions that might be socially useful (in the sense carefully defined by **Cooley** (1987, 154 et sqq.)) have not yet been generated, because of the absence of appropriate encouragement, whether in the form of political guidance, infrastructural support, or cultural attitudes. Certain goals whose pursuit has come to be identified with technological instruments (e.g., computers for education) might be better attained through social reorganisation, which itself, in its break with established assumptions, would constitute under present conditions perhaps the most important type of innovation. However, even if primacy is given to social reorganisation (as with literacy programs on the Cuban model (**Fagen** 1969)), implementation always involves decisions about how to use whatever material instruments might be available. Capitalism routinely entails a significant lag between the date of an invention and that of its corresponding 'innovation' (**Mensch** 1976, 85f). There is no reason why, under socialism, long-familiar devices cannot be appropriated in new ways (e.g., drawing on different energy-sources; being used and above all maintained collectively).

The twentieth-century record of socialist innovation is a mixed one. In the longest and most influential experience, that of the Soviet Union, innovation was notably constrained by 1) the pressure to industrialise fast, eschewing experimentation; 2) the continuing global prestige of capitalist technologies and products; 3) excessive bureaucratisation and centralisation; and 4) insufficient communication – or commonality of interests – between production managers and those responsible for innovation (who were institutionally separate) (**Berliner** 1976, ch. 4). Still, the officially 'public' (or more exactly, statal) character of technological knowledge could speed the diffusion of certain specific improvements (e.g., the continuous casting of steel (**Berliner**, 99)). What was lacking was not so much the capacity to conceive innovations, but rather the kind of

democratic process that would be required in order to link innovation – beyond short-term market signals – to society-wide needs (**Kotz** 2002).

The latter goal is becoming increasingly identified with ecologically-oriented planning (cf. **Burkett** 2003). This will require, in part, a turn away from capital- and energy-intensive strategies, in favour of 'thought- and knowledge-intensive' approaches, grounded in an understanding of natural processes (**Haila** & **Levins** 1992, 163). The destructive power of transnational restructuring under neoliberal capitalism makes searching for alternative social innovations more urgent than ever. The possibility of innovating along non-capitalist lines is suggested not only by pre-capitalist experience but also by the continued presence, even under capitalism, of non-capitalist drives, whether manifested by individual workers/artisans/artists, by co-operative enterprises or communities, by voluntary or state-sponsored public services, or by oppositional initiatives on the part of organised peasants or workers, including those in relatively hi-tech industry. A significant example of the latter was the 1975 initiative of the Lucas Aerospace workers (in Northern England) to revive a failed enterprise by devising new lines of production, in consultation with surrounding communities (**Cooley** 1987, ch. 7). Beyond such grassroots or sectoral initiatives, there are cases of working-class parties bringing innovative participatory practices into public-sector enterprises (as in Chile, 1970-73 (**Espinosa** & **Zimbalist** 1978)) and into local administration (Brazilian cities in the 1990s (**Baiocchi** 2003)). The creativity associated with such a movement is suggested in certain other moments of twentieth century socialism, including Chinese experiments in industrial organisation and in rural healthcare delivery (**Richman** 1969; **Horn** 1971), Cuban experiments in organic agriculture (**Levins** 2005), and Spanish anarchist practices of organising crossover labour-time between agriculture and other sectors (**Leval** 1975, 108). Historical awareness of such past achievements, if combined with careful theoretical work on new approaches to planning (e.g., **Devine** 2002; **Albert** 2003), could provide the grounding for a thoroughgoing socialist approach to innovation. Under the conditions of 'high-tech capitalism' (**Haug** 2003), research is required into the extent to which the rise of 'information work' and the partial overcoming of Taylorist divisions of labour associated with it could offer points of departure for the development of innovations that lead beyond the mode of regulation of neoliberalism (cf. **Jessop** 2002; **Hirsch** 2002).

Bibliography: M. Albert 2003, *Parecon (Participatory Economics): Life After Capitalism*, London; G. Baiocchi 2003, *Radicals in Power: The Workers' Party and Experiments in Urban Democracy in Brazil*, London; J.S. Berliner 1976, *The Innovation Decision in Soviet Industry*, Cambridge, MA.; P. Burkett 2003, 'Ecology and Marx's Vision of Communism', *Socialism and Democracy*, 34; B. Commoner 1971, *The Closing Circle: Nature, Man & Technology*, New York; M. Cooley 1987, *Architect or Bee: The Human Price of Technology*, London; R.B. Day 1976, 'The Theory of the Long Cycle: Kondratiev, Trotsky, Mandel', *New Left Review*, I/99; P. Devine (ed.) 2002, *Building Socialism Theoretically: Alternatives to Capitalism and the Invisible Hand* (special issue of *Science & Society* (66.1)); J. Espinosa & A. Zimbalist, 1978. *Economic Democracy: Workers' Participation in Chilean Industry, 1970–1973*, New York; R.R. Fagen 1969, *The Transformation of Political Culture in Cuba*, Stanford; Y. Haila & R. Levins, 1992, *Humanity and Nature: Ecology, Science and Society*, London; W.F. Haug 2003, *High-Tech-Kapitalismus. Analysen zu Produktionsweise, Arbeit, Sexualität, Krieg und Hegemonie*, Hamburg; U. Hilpert 1992, *State Policies and Techno-Industrial Innovation*, London; J. Hirsch 2002, *Herrschaft, Hegemonie und politische Alternativen*, Hamburg; J.S. Horn 1971, *Away with All Pests: An English Surgeon in People's China, 1954–1969*, New York; B. Jessop 2002, *The Future of the Capitalist State*, Cambridge; N.D. Kondratiev 1998 (1926), 'Long Cycles of Economic Conjuncture', in N. Makasheva et al. (eds.), *The Works of Nikolai D. Kondratiev*, London; D.M. Kotz 2002, 'Socialism and Innovation', *Science & Society*, 66.1; D. Landes 1969, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present*, Cambridge; D. Läpple 1987, 'Zur Diskussion über "Lange Wellen",

"Raumzyklen" und gesellschaftliche Restrukturierung', in W. Prigge (ed.), *Die Materialität des Städtischen*, Basel, 59-76; G. Leval 1975, *Collectives in the Spanish Revolution*, London; R. Levins 2005, 'How Cuba Is Going Ecological', Capitalism Nature Socialism 16.3 (September); E. Mandel 1975 (1972), *Late Capitalism*, London; E. Mandel 1980, *Long Waves of Capitalist Development*, Cambridge; E. Mandel 1992, 'The International Debate on Long Waves of Capitalist Development: An Intermediary Balance Sheet', in A. Kleinknecht et al. (eds.), *New Findings in Long-Wave Research*, Oxford; G. Mensch 1976, *Gemischtwirtschaftliche Innovationspraxis*, Göttingen; J. Needham 1986–95 (with C.A. Ronan). *The Shorter Science and Civilisation in China*, vols. 3–5, Cambridge; A. Negri 1992, 'Interpretation of the Class Situation Today: Methodological Aspects', in W. Bonefeld, R. Gunn and K. Psychopedis (eds.), *Open Marxism. Volume II – Theory and Practice*, London, 69–105; D. Noble 1984, *Forces of Production: A Social History of Industrial Automation*, Oxford; M. Revelli 1997, 'Vom "Fordismus" zum "Toyotismus"', in *Sozialismus*, 24. Jg., Supplement H. 4, 1–57; B.M. Richman 1969, *Industrial Society in Communist China*, New York; N. Rosenberg & C.R. Frischtak 1986, 'Technological Innovation and Long Waves', in C. Freeman (ed.), *Design, Innovation and Long Cycles in Economic Development*, London; J.A. Schumpeter 1939, *Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process*, New York; J. Sundbo 1998, *The Theory of Innovation: Entrepreneurs, Technology and Strategy*, Cheltenham; L.D. Trotsky 1972 (1921), 'Report on the World Economic Crisis and the New Tasks of The Communist International' (23 June), in Trotsky, *The First Five Years of the Communist International*, vol. 1, New York; V. Wallis 1999, '"Fortschritt" oder Fortschritt? Zur Definition sozialistischer Technologie', *Das Argument*, no. 230 (Engl. '"Progress" or Progress? Defining a Socialist Technology', *Socialism and Democracy*, no. 27 (2000)); L. White 1962, *Medieval Technology and Social Change*, Oxford.

Victor Wallis

collapse/breakdown theory, competition, conjuncture, crisis theories, cycles in the planned economy, destructive forces, development, development of productive forces, ecology, electrification, equilibrium theories, extra profit, high-tech industry, industrial revolution, information worker, labour organisation, long waves of the conjuncture, machinery, productive forces, productive forces/relations of production, productivity, profit, profit rate, progress, rationalisation, refuse of production, scientific-technical revolution, species being, technical progress, technological development.

Arbeitsorganisation, Destruktivkräfte, Elektrifizierung, Entwicklung, Exkremente der Produktion, Extraprofit, Fortschritt, Gattungswesen, Gleichgewichtstheorien, High-Tech-Industrie, industrielle Revolution, Informationsarbeiter, Konjunktur, Konkurrenz, Krisentheorien, lange Wellen der Konjunktur, Maschinerie, Ökologie, Produktivität, Produktivkräfte, Produktivkräfte/Produktionsverhältnisse, Produktivkraftentwicklung, Profit, Profitrate, Rationalisierung, Technikentwicklung, technischer Fortschritt, wissenschaftlich-technische Revolution, Zusammenbruchstheorie, Zyklen in der Planwirtschaft.