

Introduction

Labour and technology: Reflecting on a century of debate in the *International Labour Review*

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Abstract. *The aim of this Centenary Issue is to assess a century of debates about the relationships between labour and technology as reflected in various relevant articles in the International Labour Review. The recent wave of interest in sociotechnical change and its implications for the future of work has led numerous commentators to claim that we are on the brink of unprecedented and seismic change. The 14 articles selected for this issue were published between 1925 and 2020 and provide a timely reflection on foundational debates that continue to resonate today.*

Keywords: *labour, technology, automation, information and communication technologies (ICTs), employment relations, job quality, decent work, future of work.*

1. The two main strands in the debate on labour and technology

The articles selected for this Centenary Issue on technology and employment of the *International Labour Review* (ILR) highlight two main strands in the debates. The first strand relates to the impact of technology on workplace transformation and workplace relations and its perceived potential to drive change. The second strand concerns the wider implications of technological

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development for achieving and maintaining sufficient employment and decent work. Both of these themes link to the work of the ILO. Studies of the impact of technology on workplaces and job quality provide vital contextual information on the ILO's role in setting labour standards and on its engagement through its tripartite organization with both employer groups and trade unions. Likewise, studies exploring how technology may be providing opportunities for, but also generating barriers to, the securing of sufficient employment and decent work can provide a critical resource for the ILO in its development of the goal of decent work as a key route to greater welfare and development.

The two strands identified have particular salience for contemporary debates because of intensifying interest in the future of technology and employment. Many of the selected articles also engage in projective speculation that, with hindsight, can be seen to have been off beam. This is in the nature of the debates on technology, which almost always engage in futurology. By including past attempts to predict the future, this Centenary Issue offers both salutary messages about how seriously the current predictions should be taken and interesting insights into the key issues of concern at the time of writing.

The relevance of historical debate to contemporary contexts is clearly demonstrated in our first selected article, by Miriam Cherry (2020), a law professor at Saint Louis University in the United States of America. She makes a strong case for the reopening of the ILO archives to examine earlier debates around technology and the future of work, placing particular emphasis on those that took place in the 1960s within the ILO in order to link these “thoughtful diagnoses” with analogous concerns of the present. What is striking, in her view, are the similarities between the deliberations in the 1960s and current debates, not only in the underlying fears of technological displacement and unemployment, but also in the policy proposals discussed. The latter included shorter working hours to share out the benefits of productivity and maintain employment; the development of new sources of income support beyond wages if technological unemployment were to significantly increase (a precursor to the present-day discussion of universal basic incomes); and the securing of an appropriate sharing of productivity gains with the workforce. What was missing from the discussions in the 1960s was any significant consideration of issues of gender and diversity or any premonition of the serious decline in the role of unions and collective bargaining in protecting the interests of workers in periods of technological change.

2. Technology and work transformation

Dismantling the assumption that technology alone will drive workplace transformation has been a recurring theme in the ILR. While this debate has been revitalized of late, especially with regard to developments of artificial intelligence (AI) technologies, the selected articles show considered evaluation and reflection, much of which is relevant to the current context. In some respects, these historical articles seem less receptive to the allure of widespread technology-driven change, even when speculating on future effects, than do contemporary authors such as Frey and Osborne (2017) and Susskind (2020).

That contemporary debates on the implications of automation for the future of work represent a resurgence of the old, as opposed to the new, is evident in the article on the social aspects of automation by H. de Bivort (1955), an ILO official. First, he points to the opposing positions, also found today, that perceive new technologies as being either revolutionary or evolutionary. Drawing largely on evidence from the manufacturing sector in the United States, he argues against regarding automation as synonymous with technical change and maintains that there is unlikely to be a “tidal wave” of automation. In contrast, he points to the fact that “thousands of technological advances are constantly being made in industry that have nothing to do with automation” (de Bivort, 470). Worker participation and joint consultation are recommended, particularly to support working-time reduction and income maintenance as well as to provide protection for any displaced employees, including opportunities for skill upgrading and retraining. The article ends with a call to keep automation “in its place”, as a support to human labour rather than a means to displace or dispense with it.

The next article, by Karl-H. Ebel (1989), also an ILO official, builds on an earlier ILR publication (Ebel 1985) and continues the argument for a more human-centred approach to technological change. In “Manning the Unmanned Factory”, he focuses on computer-integrated manufacturing and asks whether it has the potential to introduce far-reaching qualitative changes. The key issue is identified as the dominance of the “technocentric” approach and the relative neglect of the growing movement in Europe that is described as the “human-centred approach” (Ebel 1989, 536). These approaches, according to Ebel, are not necessarily mutually exclusive, though one of them may predominate. For Ebel, the technocentric perspective – which aims to replace “unpredictable” and “troublesome” human labour with computers in a quest for the unmanned factory – contains an “essential flaw”: disregard for the highly skilled workers who keep systems running, enabling continuous operation of production, despite the challenges and risks associated with the implementation of complex technology (Ebel, 537). As a proponent of the human-centred approach, he claims that this approach could have extensive influence and could include unions, government programmes and socially responsible engineers. However, Badham (1991) takes issue both with Ebel’s depiction of the technocentric/human-centred binary and with its ability to capture the complexity of working conditions. For Badham, national variations in technological innovation and cultures of production are likely to have far more impact on technology design and implementation than are the two contrasting perspectives on technology. Ebel’s claims that human-centred approaches could be the main driving force behind wider change are deemed “somewhat misleading”, since such approaches generally focus on the retention of high-skilled work and pay little attention to broader employee influence on the workplace environment (Badham, 387). Badham argues instead for an “extended industrial relations approach”, which would enable worker representatives to influence broader socio-economic conditions (389). The human-centred approaches, although providing a welcome alternative to technocentricity, have attracted widespread criticism of their overly optimistic

claims. Nevertheless, these early accounts stand in sharp contrast to current speculation portending automation and system-wide job loss.

In 1960, Ida Russakoff Hoos, an American sociologist, took issue with discussions of automation for their use of conjecture and speculation and their preponderant focus on factory work. By contrast, her article offers qualitative evidence of the impact of the growing adoption of new technology (specifically, electronic data processing) on the prospects for clerical workers, who, at the time, accounted for one in seven of the US labour force. Her analysis shows that the supposition that new technology would lead to job upgrading had largely failed to deliver, office work having become more akin to factory work. Technical change had led to increasing centralization, with job displacement and dislocation, as well as to downgrading and a reduction of promotion opportunities. These changes were particularly harsh for older workers. Hoos's contribution lies in her emphasis on the conflicting interests of capital and labour, the former focusing on economic benefits while neglecting the social costs borne by labour. Her concern that clerical jobs were under threat of imminent redundancy turned out in reality to be more complex, since administrative roles have expanded through the growth of the service sector. Nevertheless, her study is prophetic with regard to the deskilling of white-collar work. European research into the effects of computerization (1995–2015) demonstrates that information and communication technologies (ICTs) have tended to replace routine tasks while complementing (or not affecting) creative and social tasks (Biselo and Fernández-Macías 2016). Among the tasks and occupations remaining, digitalization has led to significant increases in repetitiveness and standardization, usually by recourse to online or automated processes that entail lower-paid, lower-quality jobs.

The influence of digitalization on the experience of white-collar work was captured 30 years later in the article by Vittorio Di Martino and Linda Wirth (1990), two ILO officials, who discuss the benefits and risks associated with teleworking. By 1990, telework had been operational for around a decade, and claims had been made that it was bringing a transformation of white-collar work. Yet teleworking had failed to spread as rapidly as forecasts had suggested. Di Martino and Wirth account for the lack of uptake as partly resulting from technological constraints, as well as from managerial anxieties over maintaining centralized control. In practice, teleworking at that time was seen as a perk for the already privileged (Felstead et al. 2002). In fact, despite progress in reducing the technological constraints on teleworking, until the coronavirus pandemic saw the relocation en masse of white-collar workers to the home in 2020, adoption had remained limited. In the United Kingdom of Great Britain and Northern Ireland, for example, teleworking was only undertaken by around 5 per cent of the workforce in 2019 (ONS 2020). Current concerns about the “future of the office” and the shift to remote working suggest that we may see another rehash of these debates (see ILO 2020).

In 1994, the consequences of the growth of white-collar work were theorized by Manuel Castells and Yuko Aoyama (1994), sociology professor and PhD student, respectively, at the University of California at Berkeley. Their

article precedes the publication of Castells's highly influential Information Age trilogy, which comprises *The Rise of the Network Society* (1996), *The Power of Identity* (1997) and *The End of the Millennium* (1998). Castells and Aoyama (1994, 26) argue that the post-industrialism debate inadequately elucidated the changing economic structures in the twentieth century because of its failure to account for the "truly revolutionary nature of new information technologies". They propose a shift to what they call "informationalism": "a specific form of social and technical organization of production and management in which the potential of knowledge- and information-based productivity can be realized through the application of new information technologies" (Castells and Aoyama, 7). This approach is reflected in Soete's (2001) later arguments in another contribution to the ILR, according to which the main change resulting from ICTs lay in the codification of tacit knowledge and the potential for ensuing transformation in the form of the "new economy". Castells and Aoyama highlight the influence of different national institutional contexts by examining employment change by variety of service activity in G7 countries during the period of 1920–90. Two different informational models emerge. A service economy model (United States, United Kingdom, Canada) characterized by an entirely new employment structure consisting of different service activities; and an info-industrial model (Japan and Germany) that retains a relatively high level of manufacturing with a concomitant growth in services to support industry. The authors also claim that there is a trend towards a higher proportion of information-processing employment overall, including an expansion of the managerial category.

Undoubtedly, informationalism and the associated concepts of knowledge work, the new economy and the network society have had significant influence, yet this field of research has been subject to extensive critique. The areas of contestation include the validity of the epochal shift argument, the underpinning technological determinism and the assumption that new technologies will define socio-economic change. In contrast, the article by Jill Rubery and Damian Grimshaw (2001) – at that time professor and lecturer, respectively, at The University of Manchester – challenges the seemingly inevitable outcomes of technology-driven work transformation by depicting a range of future scenarios, both optimistic and pessimistic, which provide a framework for exploring contradictory tendencies. By examining the interaction of new technology and other forces shaping employment, including industrial relations, skill systems and gender and household relations, the authors argue that outcomes are a reflection of political choice: "Technology is only one factor in the process of change, but the ways in which we develop technology now may of course constrain future choices" (Rubery and Grimshaw, 175). In their detailed unravelling of the potential impact of new technology on job quality, they investigate three dimensions: employment relations and employment protection; time and work autonomy; and skills and careers. The most important contribution of the article lies in the recognition that new technologies cannot lead to positive outcomes without addressing labour market systems and institutions that enable decent work.

3. Technology and achieving sufficient employment and decent work

The interrelations between technology and the ability of economies to deliver the goals of both sufficient and decent work are key to the overall mission of the ILO and a point of focus for the ILR. The issue of technological unemployment has re-emerged in current debates, along with renewed interest in whether now is the time to restart the stalled historical movement towards a shorter standard working week and/or day. The issue of choice of technique that dominated development economics debates from the 1950s is also now taking on greater relevance, despite the ubiquity of ICT technologies, as we grapple with both ensuring the availability of decent work for all and transitioning towards a low-carbon economy.

Two selected articles from the earlier decades of the ILR – Milhaud (1925) and Burtle (1957) – reveal continuities but also some stark differences in the expected impacts of technological progress. The first article reports on a major four-year ILO survey of industrial production, led by Edgard Milhaud, previously a professor at the University of Geneva, who was later appointed Chief of the General Investigations Section of the ILO. The survey generated an extensive report, but this specific article focuses on the impact of the eight-hour day, the subject of the first ILO Convention in 1919. This Convention legitimated and extended the movement that emerged at the end of the First World War for an eight-hour day and 48-hour week, driven by worker unrest and fuelled, in part, by fears of technological unemployment. The eight-hour day was mandated for industrial employment in several European countries; however, it was also adopted in numerous companies in the United Kingdom and the United States, neither of which mandated the change or ratified the Convention. Milhaud documents in fascinating detail how firms achieved gains rather than losses in daily output through three main mechanisms: mechanization, work organization efficiencies (including job and workplace redesign) and work intensification. This last productivity boost was achieved through eight effective hours of work and increased workforce commitment, since shorter hours improved employment relations. This evidence validated the ILO's newly established role in setting labour standards, demonstrating the potential for mutual benefits to workers and the economy from stimulating productivity gains facilitated by technical progress (defined to include not only better machines but also smarter management and work systems).

The 1957 article by James Burtle, an economist in the ILO's Economic Division, also considers how favourable changes to working conditions may speed up and smooth the automation process, again providing mutual benefits. Burtle believed that a 1955 collective agreement in the Ford Motor Company in the United States was the start of a new era of wage guarantee funds and shorter working hours. These measures, he argued, would reduce wage loss for laid-off workers and allay workers' fears over technological displacement, while increasing family time and leisure. The article is a classic illustration of how predicted futures tend to veer way off course. The United States, instead of driving international progress in employment standards, experienced the

combined impact of weakened trade unions and neoclassical economic policies, which made it notorious among developed economies for its low welfare support, excessively long working hours and short holidays. As Cherry (2020) points out, one development not foreseen by the ILO in the 1960s was the erosion of collective bargaining, the critical mechanism for protecting workers' interests in the context of technical change. Burtle (1957) ends by speculating on the possibility of a dual jobs system, whereby all jobs would require four hours of work per day. Men would divide their day between two jobs, one automated and another non-automated; automation's productivity gains would thereby be shared among the male labour force. This system might also extend to women, as one four-hour job could be managed alongside their domestic responsibilities. This period piece of futurology confirms our inability to predict the future, yet, by imagining a dual job system, Burtle extended the debate at the time beyond its focus on an exclusively male workforce.

The article by Guy Standing, an ILO economist now well regarded for his work on the precariat, is different in style and ambition. Standing's (1984) article provides a wide-ranging sweep through economic theories of technological unemployment and is just one of a series of articles by him that review different forms of unemployment. He rejects the more axiomatic approaches of economists who exclude the possibility of technological unemployment provided that markets find their equilibrium. In contrast, he only dismisses so-called "technological unemployment" when the problem lies in deficient aggregate demand. By recognizing that structural and political factors may give rise to non-frictional short- and long-term technological unemployment, the article bridges economic theorizing and concrete experiences of technological change at the firm, sector or regional level. Its strength lies in its breadth. Standing starts by considering the different economic perspectives, from classical to Keynesian to neoclassical, on potential causes, including underinvestment, fixed factor ratios and sticky factor prices. The article then extends beyond the standard structural problem of workforce skills to include industrial structure. Cyclical and long-wave (Marxist and Schumpeterian) explanations of patterns of technological progress are then reviewed. Finally, the article extends beyond typical closed economy analyses to grapple with technology's role in international trade surpluses and the new international division of labour.

For Standing, technological unemployment is a real phenomenon that cannot be reduced to simplistic analyses of either labour displacement – as in current debates on the future of work – or of the use of inappropriate technology for factor endowments. A key question in development economics was whether the adoption of techniques that were too capital intensive was curtailing growth and welfare in developing countries with "surplus" labour. While economic theorists debated the thorny issues of maximizing surpluses, investment rates and the role of factor prices if capital–labour ratios were embedded in fixed capital investments, the ILR debates expanded on the complexities encountered in practice in the choice of technique in developing country contexts. For example, ILO economists Keith Marsden in 1970 and Susumu Watanabe in 1980 considered the need for complementarities between

production techniques and the context in which they are implemented; highly capital-intensive projects may be inappropriate not only when there is surplus labour but also when the size of the market is limited, distribution systems are fragmented and the use of imports and foreign exchange is constrained.

The 1983 article by Frances Stewart – a development economics professor at Oxford University and a leading contributor to the alternative technologies debates – has been chosen to represent this rich vein of work on choice of technique. It extends beyond the standard concerns of micro-economists by arguing for the centrality of political feasibility. As most projects produce gainers and losers, changing power relations may be required to effect progressive change. Imaginative solutions are also necessary, as in the example provided: imported tractors may be replaced by labour-using locally produced tractors that could satisfy the powerful large landowners (provided that complementary credit and tax changes were made) and support employment, while also generating spillover development impacts. For Stewart, government's main roles are to shape the environment to guide micro-level decision-makers towards appropriate investments. Government should also consider expanding the influence of micro-level decision-makers, for example by boosting the role of small firms or limiting the scope of the more powerful decision-makers through requiring foreign investors to engage in local sourcing.

The 1983 contribution by Iftikhar Ahmed, an ILO development economist, extends the complexities further by highlighting the invisible and often unpaid role played by women in adjusting to the consequences of technological choices. Ahmed argues that rural women are overburdened with family and home production tasks, but that investment decisions relating to cash crops and to men's tasks and activities tend not to consider the implications for women's lives and labour. Incentivizing the development of cash crops may well lead to women having to grow family food on poorer soil, resulting in harder work and nutritional deficiencies. Likewise, new technologies may expand men's productivity in "sex-sequential" production processes (for example, allowing them to produce more palm nuts), while simple mechanical aids to support women's processing of the expanded crop yield may be absent (Ahmed, 497). While the use of technology to reduce women's unpaid labour is underdeveloped, women also face risks of displacement from their traditional sources of cash income if men take over these activities when new technologies result in moves towards larger-scale production and distribution systems. In some cultural contexts, problems emerge if technological changes make it difficult for work to be done from home. Constraints on their public roles may prevent women from continuing to work in their current occupation or sector. In addition, women are often denied land rights and associated access to credit, which may restrict their capacity to take up new opportunities that require either land or some investment. The message is that technology developers need to understand and take account of these complex effects if they are to design appropriate technologies. This may seem to be a tall order if the majority of developers are men; then again, this sensitive, multilayered analysis of the gender division of labour is provided by a male economist from Bangladesh.

The final selected article on the choice of technique debate is by Ed Steinmueller, professor at the Science Policy Research Unit, University of Sussex. He argues that the development of ICTs throws into question many underlying assumptions in the debate about the choice of technique. Crucially, ICTs could enable “leapfrogging” over earlier stages of fixed capital and human capability accumulation and organizational development (Steinmueller 2001, 194). These technologies, with their low capital and start-up costs, thus open up opportunities in low-income countries for self-taught entrepreneurs and make it possible to reduce distributional problems by virtue of high value-to-weight ratios and the ready availability of global networks. Above all, Steinmueller (208) sees ICTs as providing “the tools with which people entirely restructure the ways in which they interact”, opening up “new approaches to the social and physical world”. Technology is thus expanding potential opportunities for innovative solutions rather than reducing choices, in contrast to the approach taken in current debates about the future of work. For Steinmueller, barriers to development are still likely, owing to low absorptive capacities, difficulties in developing both upstream and downstream integration, and lack of complementary infrastructure. Of greatest concern are the foreseen problems posed by the increasingly monopolistic power of US technology giants and the associated intellectual property barriers to innovation. Despite the opportunities for development presented by ICTs, the dilemmas about how to chart a path for development in an unequal world remain. Fast-forward to 2021, and someone writing today might well point out how digital labour platforms may be stifling development by luring the over-skilled to menial tasks through Western-based higher earnings opportunities (see ILO 2021, 141, which indicates that some 73 per cent of platform workers in developing countries had tertiary qualifications over the 2017–20 period).

Undoubtedly, the debate about choice of technique persists and has gained renewed force with both the climate crisis and the anticipated acceleration of AI. The key question remains how to shape investment decisions so that they take account of sustainability objectives, whether it be achieving inclusive growth, maximizing employment or ensuring the future of the planet. Technologies embed both capital–labour ratios and carbon footprints, but a dilemma remains over whether to focus on greening the next generation of technology or on rediscovering localized production and distribution systems based on supposedly “obsolete” technologies.

To conclude this review of 100 years of debate on technology and employment in the ILR, we turn to the 2019 article by Giovanni Dosi and Maria Enrica Virgillito, professor and assistant professor, respectively, of economics at Scuola Superiore Sant’Anna, Pisa. Their article updates the discussion through its focus on the dual trends towards AI and big data analysis, and by identifying how the “rentification” of capitalism is likely to shape the use of these technologies in the future. As Cherry (2020) notes, the earlier ILO-based contributions on the future of work did not anticipate the use of technology to facilitate the fissuring of workplaces, the growth of bogus self-employment and the fragmentation of tasks through platforms. These technologically enabled changes are less likely to be contested, owing to the erosion of trade union

power, although alternative forms of organizing and resistance are emerging. Dosi and Virgillito (2019, 594) seek to challenge the predominance of technical determinism by arguing that “the long-term patterns of the future will be shaped by the socio-economic structure, power relations and policies of the present”. For these authors, we are at a pivotal point, facing critical choices between, on the one hand, domination by a techno-feudal elite together with the continued “rentification” of capitalism and, on the other hand, the initiation of policy action that moves societies towards either progressive capitalism or a Marxian post-capitalist future. The paradigm shift, they argue, lies not in the impact of AI and automation but in the use of big data to control the social sphere. The future is not determined by the intrinsic nature of new technologies, and so they call for public policy to “recover its ability not only to regulate but also to mould the strategies of private actors” (Dosi and Virgillito, 621) to enable a focus on human-enhancing, instead of human-replacing, innovations.

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