Introduction*

A A D B L O K

The last few decades of the twentieth century witnessed a rapid development in information and communication technologies (ICT), which has contributed to such drastic economic, social, and cultural changes that they are commonly referred to as the "Information Revolution". This Information Revolution is believed by many to be so influential and comprehensive that it is bringing about an epochal rupture in global economic, social, cultural, and political history comparable to the previous major historical shifts of the Agrarian Revolution and the Industrial Revolution. Naturally, a development so pervasive has been analysed by a great number of scholars from various disciplines, among whom social theorists, in all their diversity, have been the most numerous. Here is not the place for even a concise overview of the rich variety of theorizing and analysis of the Information Revolution and the resulting Information Society,[1] but much of the theorization of the relationship between work and the most recent information revolution can still be traced to the initial statements about "postindustrial society", "de-industrialization" and "globalization".[2]

Fundamental to much of this work is the underlying question: is global society at large leaving the age of industrialism behind and entering an age of postindustrialism? Depending on the theoretical perspective, the terms

1. A very comprehensive and lucid overview of theories of the Information Revolution and the Information Society is given by Frank Webster, *Theories of the Information Society*, 2nd edn (London [etc.], 2002); for a critical overview from a distinctly neo-Marxist perspective see Nick Dyer-Witheford, *Cyber-Marx: Cycles and Circuits of Struggle in High-Technology Capitalism* (Urbana, IL [etc.], 1999); for a recent concise critical theoretical overview see François Fortier, *Virtuality Check: Power Relations and Alternative Strategies in the Information Society* (London [etc.], 2001).
2. Daniel Bell, *The Coming of Post-Industrial Society: A Venture in Social Forecasting* (New York, 1973); the classic study on deindustrialization is Barry Bluestone and B. Harrison, *The Deindustrialization of America: Plant Closings, Community Abandonment, and the Dismantling of Basic Industries* (New York, 1982); for a recent historical overview of the relation between deindustrialization and globalization, see Christopher Johnson, "Introduction: De-industrialization and Globalization", in Bert Altena and Marcel van der Linden (eds), *De-Industrialization: Social, Cultural, and Political Aspects*, *International Review of Social History*, Supplement 10 (Cambridge [etc.], 2002), pp. 3–33.

industrialism/postindustrialism can be substituted by modernism/post-modernism, Fordism/post-Fordism, industrial capitalism/informational capitalism, or industrialism/informationalism. Following Frank Webster,[3] theorists in this field may be divided into clearly separated camps: those who believe that the rapid technological developments in information and communication technology over the past decades are causing such drastic changes in modern capitalist society that history is indeed entering a distinct new phase, and we are therefore living through an epochal change; and those who stress elements of continuity in the technological, economic, and social developments which are generally labelled as the Information Revolution. On one side of the line Webster places, among others, theorists of postindustrialism (Daniel Bell and his many followers), of postmodernism (Jean Baudrillard, Mark Poster), and Manuel Castells, with his theory of the informational mode of capitalist development. On the other side, he includes neo-Marxists, such as Herbert Schiller; Anthony Giddens's theory of reflexive modernization; Jürgen Habermas's theory of the public sphere; and David Harvey's theory of flexible accumulation.

The consequences of the Information Revolution for labour have been an important theme in many of the theories and analyses that have been developed on both sides of the line between continuity and change. The initial utopian enthusiasm about "electronic cottages"[4] and the general idea that automation and ICTs would increasingly allow machines to take over unattractive, tedious labour soon found its dystopian backlash in the form of a fear of "electronic sweatshops", a "jobless future", the "end of work", a growing digital divide and an increasing contingency of jobs.[5] One the most influential analysts of the Information Revolution in the past decade to endorse this idea of a radical change is Manuel Castells, whose magnum opus, *The Information Age*, is no doubt among the most fundamental analyses. Castells gives the subject of work and labour relations ample attention: in the first volume of his trilogy, *The Rise of the Network Society* (1996), he devotes almost one-quarter of the book to

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3. Webster, *Theories of the Information Society*, p. 6.
4. Alvin Toffler, *The Third Wave* (New York, 1980).
5. Barbara Garson, *The Electronic Sweatshop: How Computers Are Transforming the Office of the Future into the Factory of the Past* (New York, 1988); Ursula Huws, *The New Homeworkers: New Technology and the Changing Location of White-Collar Work* (London, 1984); *idem*, "The Making of a Cybertariat? Virtual Work in a Real World", *The Socialist Register: A Survey of Moments and Ideas* (2001), pp. 1–23; Stanley Aronowitz and W. DiFazio, *The Jobless Future: Sci-Tech and the Dogma of Work* (Minneapolis, MN, 1994); Amy Sue Bix, *Inventing Ourselves Out of Jobs? America's Debate Over Technological Unemployment, 1929–1981* (Baltimore, MD, 2000); Jeremy Rifkin, *The End of Work: The Decline of the Global Labor Force and the Dawn of the Post-Market Era* (New York, 1995); Pippa Norris, *Digital Divide? Civic Engagement, Information Poverty, and the Internet Worldwide* (Cambridge, 2001); Richard S. Belous, *The Contingent Economy: The Growth of the Temporary, Part-Time and Subcontracted Workforce* (Washington DC, 1989).

"The Transformation of Work and Employment".[6] Aside from transformations in employment and occupational structure, Castells also analyses the transformations of labour itself. Flexibilization and social division seem to be inextricably connected with the rise of the new informational mode of development: "The prevailing model for labor in the new, information-based economy is that of a core labor force, formed by information-based managers and by [...] 'symbolic analysts', and a disposable labor force, that can be automated and/or hired/fired/offshored, depending upon market demand and labor costs."[7] According to Castells, it is not so much a question of social division of labour, but of "the disaggregation of labor",[8] an ongoing individualization of labour, which leads to an increasing weakening of international and national labour movements.

Castells's analysis can clearly be classified as one of the more pessimistic views on labour in the Information Revolution, but what he shares with many others analysts of the Information Revolution is the primacy he gives to technological development as the essence of the Information Revolution. In such analyses technological development, or rather technological progress, is conceived as an essentially autonomous process and the Information Revolution, thus conceived, is seen as an essentially technological revolution. This conception has become dominant in the conventional, "orthodox" discourse on the consequences of the rapid developments in ICTs, and has had a strong influence on popular understanding of the Information Revolution. At the same time, it has given rise to various criticisms, which regard Castells's analysis as being based on a form of technological reductionism or determinism.[9] Given this technological determinism, many analysts are more focused on the *consequences* of the Information Revolution for labour and labour relations, than on the *role* and *position* of labour in this process.

Another important analogy between Castells's theory and many other theories endorsing the idea of a historical rupture of the Information Revolution is the apparent lack of a longer-term historical perspective. The focus on technological development, in this case that of the microchip, personal computer, and digital network technologies, as the decisive force driving societal change has led to a, sometimes very explicit, lack of interest in any historical comparison.[10] Yet, to be able to make a critical assessment

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6. Manuel Castells, *The Rise of the Network Society*, vol. 1 of *The Information Age: Economy, Society and Culture* (London [etc.], 1996), pp. 201–326.
7. *Ibid.,* p. 272.
8. *Ibid*., p. 279.
9. Webster, *Theories of the Information Society*, p. 120.
10. Castells is quite explicit about this at the end of the third volume of his trilogy, when he indicates what his reaction is to the question of what is essentially so new about the developments he has analysed: "What is new about all this? Why is this a new world? I do believe

of the validity of the concept of revolutionary change brought about by the technological developments in the realm of information and communication, the longer-term historical dimensions of these developments must be taken into consideration. In other words: to be able to assess just how revolutionary this Information Revolution is, a distinct historical perspective seems indispensable.

This Supplement to the *International Review of Social History* is not, of course, the first to urge for a more historical perspective on the present-day Information Revolution. In recent historiography, a number of scholars have looked into a variety of historical roots of the present-day Information Revolution and Information Age, from the development of literacy, through the printing revolution, the scientific revolution, to the development of the postal system, and telegraph and telephone networks.[11] Daniel Headrick has argued that, whereas information is as old as mankind, throughout history there have been periods of sharp acceleration, or revolution, in the amount of information that people had access to and in the creation of information systems to deal with it: "The appearance of writing, the alphabet, double-entry book-keeping, the printing press, the telegraph, the transistor, and the computer – each has contributed mightily to the acceleration of information in their time. In short, there have been many information revolutions."[12] These revolutions have occurred both in the development of material technologies, such as the printing press, telegraph, and personal computers, and in the development of more abstract, immaterial information systems, such as were developed during the scientific revolution in the late seventeenth to the nineteenth centuries.[13]

However useful this attention to the historical roots of the present-day Information Revolution is, the main unit of analysis in most of this work remains either the information and information systems as such (for

that there is a new world emerging in this end of the millennium. In the three volumes of this book I have tried to provide information and ideas in support of this statement [...] *Yet, this is not the point I want to make.* My main statement is that it does not really matter if you believe that this world, or any of its features, is new or not. My analysis stands by itself. This is our world, the world of the Information Age. And this is my analysis of this world, which must be understood, used, judged by itself, by its capacity, or incapacity, to identify and explain the phenomena that we observe and experience, regardless of its newness." Manuel Castells, *End of Millennium*, vol. 3 of *The Information Age: Economy, Society and Culture* (Malden, MA [etc.], 1999), p. 356, fn. 1.

11. Asa Briggs and P. Burke, *A Social History of the Media: From Gutenberg to the Internet* (Oxford, 2002); Peter Burke, *A Social History of Knowledge: From Gutenberg to Diderot* (Cambridge, 2000); Adrian Johns, *The Nature of the Book: Print and Knowledge in the Making* (Chicago, IL [etc.], 1998); Daniel R. Headrick, *When Information Came of Age: Technologies of Knowledge in the Age of Reason and Revolution, 1700–1850* (New York [etc.], 2000); Michael E. Hobart and Z.S. Schiffman, *Information Ages: Literacy, Numeracy, and the Computer Revolution* (Baltimore, MD, 2000).

12. Headrick, *When Information Came of Age*, p. 8.

13. *Ibid.*

example, the development of the periodical press, encyclopaedias, and statistics) or the related technological infrastructure (such as the development of the postal system and the telegraph). If, in this respect, any attention is given to labour, it is focused mainly on the highly skilled "knowledge work" of inventors, innovators, and system-builders. The role and position of labour in these information revolutions has been mostly overlooked until now.

In his recent article "Virtual Webs, Physical Technologies, and Hidden Workers: The Spaces of Labor in Information Networks", one of the two editors of the present volume has argued that labour is almost by definition the least obvious aspect in information revolutions to analyse, where the unit of analysis in historical analyses hitherto has mostly been either technology or information.[14] Much of the labour involved in the development, maintenance, and production of information and communication technologies and networks has remained hidden by the focus on technological development, which has caused historians to look predominantly at the inventors, the successful entrepreneurs, the engineers or system-builders. The focus on information and its transmission, and, more particularly, on the growing importance, quantitatively and qualitatively, of information and communication in economic processes – both as a commodity and as an essential precondition for the functioning of increasingly complex production and administrative processes – has left the human labour involved in the production, transmission and usage of information on a daily basis largely underexposed. The major exception to this is the large body of recent work done on the position of women in the present-day Information Revolution.[15]

In order to fill what we see as a lacuna, we have taken labour as the central unit of analysis for this volume: it is from a distinctly social and historical understanding of both the role and position of labour in this

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14. Greg Downey, "Virtual Webs, Physical Technologies, and Hidden Workers: The Spaces of Labor in Information Networks", *Technology and Culture*, 42 (2001), pp. 209–235.

15. For examples of studies of the position of women and the role of women's work in the field of technology and engineering in the period before the development of the electronic computer, see fn. 70 of Aristotle Tympas's contribution to this volume; on the role of women in the early development of the electronic computer, see Jennifer S. Light, "When Computers Were Women", *Technology and Culture*, 40 (1999), pp. 455–483; for a recent overview of studies on women and contemporary information technology, see Linda Shult, *Information Technology and Women's Lives: A Bibliography* (Madison, WI, 1996); for an example of the numerous studies on the position of women vis-à-vis information technology in developing countries, see Swasti Mitter and S. Rowbotham (eds), *Women Encounter Information Technology: Perspectives of the Third World* (London [etc.], 1995); other examples include Carla S. Freeman, *High Tech and High Heels in the Global Economy: Women, Work, and Pink-Collar Identities in the Caribbean* (Durham, NC, 2000); and Juliet Webster, *Shaping Women's Work: Gender, Employment and Information Technology* (London [etc.], 1996). An example of a study in which "ordinary" labour does take centre stage is Gregory J. Downey, *Telegraph Messenger Boys: Labor, Technology and Geography, 1850–1950* (New York [etc.], 2002).

latest and earlier information revolutions, and of the consequences of these information revolutions for labour, in terms of social, spatial and temporal divisions, that this volume has been compiled. Mapping out a trajectory for this project, we have formulated a number of fundamental questions:

(1) What has been the role and position of human labour in the development of various information revolutions, where one might make a distinction at the level of the shopfloor (be it a clerk's desk, a typesetter's or printer's room, a telegraph office, telephone switchboard, or a high-tech office space)?

(2) How have the technologies and practices of these information revolutions in turn influenced work and labour relations, both informational work, and noninformational work?

(3) How have spatial and temporal divisions of labour changed together with new technology-enabled spatial and temporal flows of capital and commodities? In this respect, globalization can be considered to be an inextricable phenomenon of the increasing role of information technologies (or vice versa).

The contributions brought together here explore various forms of labour in relation to developing information and communication technologies during both this latest and earlier information revolutions. Both the role of various forms and divisions of labour in these developments and the consequences of these developments for labour are dealt with in this volume. The chronological scope is the twentieth century, with the exception of Eve Rosenhaft's contribution on a particular form of white-collar, clerical work in the emerging life-insurance funds in eighteenth-century Germany. The geographical focus is predominantly on the United States. This is a direct result of the increasing US dominance in information and communication technologies in the course of the twentieth century, a dominance which has, according to many analysts of the present-day Information Revolution, contributed considerably to US dominance in the world economy over the past century.[16]

To uncover both the role and position of labour in this last and in earlier information revolutions, and the consequences of these revolutions for labour, it is useful to look at the various ways labour is (or can become) involved with developing information and communication technologies. The following subdivision might prove useful:

(1) labour involved in the invention, development, construction and maintenance of the informational infrastructures of the present-day

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16. Castells, for instance, attributes the Soviet Union's failure from the 1950s onward to keep up economically with the US in large part to the fact that the Soviets missed the boat with the PC revolution; Castells, *End of Millennium*, pp. 26–37.

and earlier internetworks, such as postal, telegraph, telephone, and digital networks;[17]

(2) labour involved, in the context and structure of any one of these internetworks, in producing, using, transforming, and transmitting information;

(3) labour that is not directly involved in producing and reproducing information in the sense above, but which changes as a result of the development of information and communication technologies, particularly in the sense of being degraded or becoming redundant.

This division is schematic, and forms of labour might fall into the first two categories at the same time or develop from one category into another as a result of technological change and/or of changing social or cultural circumstances. In each of the essays in this collection, one or more of these forms of labour are dealt with.

In "Hands and Minds: Clerical Work in the First 'Information Society'", Eve Rosenhaft explores the careers of the German clerk, Anton Dies, and his successors, who were involved in the development and management of one of the survivors' pension funds that emerged in the middle of the eighteenth century. Rosenhaft situates her biographical study of these clerks in the context of a newly emerging information regime, in which governments in Germany and elsewhere in Europe attached increasing importance to collecting and processing data for administrative and governance purposes. At the same time, information came to play an increasing role in the development of mercantile capitalism. These developments led to the demand for a new information system,[18] in which the role and position of clerical work changed radically. Rosenhaft shows how the application of recently developed complex statistical techniques to generate information vital for commercial success in a high-risk commercial enterprise, the need to transmit this information, through advertisements, to the larger public while at the same time being subjected to demands of secrecy and scrutiny, and attacks from competitors aimed at personal reputations, all made for working conditions with occupational hazards comparable to the present-day dangers of repetitive strain injuries and burnout.

Another example of labour in an information revolution before this latest one is found in Deep Kanti Lahiri Choudhury's account of the Indian Telegraph General Strike of 1908. Choudhury's analysis of the strike in its larger context of a colonial state-owned telegraph industry with a racially divided labour force not only offers a nice comparison and contrast with previous work done on labour organizing and unrest in the

17. For the origins of the term "internetwork" see Downey, *Telegraph Messenger Boys*, p. 211, fn. 6.

18. Headrick, *When Information Came of Age*, pp. 9–11.

North American for-profit telegraph industry,[19] but also points to another interesting phenomenon: the ability (however short-lived) of information workers to use the information and communication technology and infrastructure, which they operate on a daily basis, for their own purposes in organizing and propagating a strike. Choudhury's sketch of what he labels "India's first virtual community" points ahead to present-day optimism among some pundits of this information revolution about the possibilities of achieving real democracy, if not even liberation, through the realization of the Internet's virtual promises.[20]

  Going back to a period when computers were still human,[21] Aristotle Tympas, in his contribution "Perpetually Laborious: Computing Electric Power Transmission before the Electronic Computer", explores the dependency on human computing labour to perform the necessary and increasingly complex computations for the development of electric power networks (itself a prerequisite for the electronic age that was yet to come) in the United States in the first decades of the twentieth century. Following on from recent work on the role of women in the development of the early electronic computers,[22] Tympas points to the tendency within the orthodox historiography of technology to mythologize the technical development and underexpose the human labour involved. Focusing on the contemporary technical literature, he shows how, paradoxically, the desire to eliminate what was perceived as a computing labour crisis by mechanizing computing through the development of new forms of (mechanical and electrical) analysers, only led to new, more complex networks, which in turn rendered the analysers obsolete and left the dependency on human computing labour (perceived of as a computing labour crisis) intact.

  These first three contributions look either at labour involved in producing and reproducing information infrastructures and information systems before our present electronic information age, or at labour producing information which exists in and through these infrastructures and systems on a daily basis. In Bernard Dubbeld's contribution, "Breaking the Buffalo: The Transformation of Stevedoring Work in Durban between 1970 and 1990", the focus is on labour becoming redundant in the present information age as a result of a technological development in transport inextricably connected with this contemporary Information Revolution: containerization. Dubbeld analyses the hard fate of the Durban stevedores, whose work became increasingly casualized,

19. See, in this respect, especially Downey, *Telegraph Messenger Boys*.
20. See, for example, Dyer-Witheford, *Cyber-Marx*, and Fortier, *Virtuality Check*.
21. Paul Ceruzzi, "When Computers Were Human", *Annals of the History of Computing*, 13 (1991), pp. 237–244.
22. Light, "When Computers Were Women".

marginalized, and ultimately redundant as the result of the interplay between the labour politics of a racial state, the far-reaching and often contradictory consequences of technological change, and the developments and fierce competition among the international ports and in the shipping industry under late twentieth-century, neoliberal capitalism. Contrasting the situation of the Durban stevedores with that of dock labourers and other industrial workers worldwide, Dubbeld argues that the generalizing term "globalization" does insufficient justice to the importance of local conditions and contingencies in shaping technological change and its impact on labour. The same might well apply to the use of that concomitant generalization of "informatization".

The impact of containerization and ICT is also explored in the contribution by Helen Sampson and Bin Wu, who focus on the work process on board ships in the global shipping industry and the changing position and working conditions of international seafarers. Using an ethnographic, micro approach, they demonstrate how a generalizing geographical theory – David Harvey's concepts of "turnover time of capital" and "time-space compression"[23] – may fruitfully be used to analyse the experiences of the modern international seafarers.

The last three case studies in this volume all focus on the historical and geographical core of the latest Information Revolution, the late twentieth-century United States. Nathan Ensmenger explores the emergence of the computer programmer as a central figure in an ongoing debate from the 1960s onward about the role of information technology in organizational transformation. Focusing on the conflict between the craft-centred practices of the computer programmers and the "scientifically" oriented management techniques of their corporate managers, he argues that the skills and expertise that computer programmers possessed transcended traditional boundaries between business knowledge and technical expertise. With that, programmers constituted a substantial challenge to established corporate hierarchies and power structures. The debate among industrial and governmental managers on the supposed existence and persistence of a "software crisis" from the early 1960s onward – itself an interesting parallel with the idea of a computing labour crisis as described by Tympas – and the seemingly unrelenting quest of these managers to develop a software development methodology that would finally eliminate corporate dependence on the craft knowledge of individual programmers, can best be understood, according to Ensmenger, in light of this struggle over workplace authority.

Chris Benner explores the activities of "guilds" and other occupational

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23. David Harvey, *The Condition of Postmodernity: An Enquiry into the Origins of Cultural Change* (Oxford [etc.], 1989).

communities, where skilled information technology workers in Silicon Valley, the digital Information Revolution's heartland, come together in order to share knowledge, improve career opportunities, and protect themselves from insecurity. Benner evaluates the effectiveness and the broader implications of these organizations for worker representation in the information economy. Given the rapidly changing skill requirements associated with the volatility of the information economy, these guild-like structures have a difficult time affecting labour supply or regulating standards in their occupations, and thus lack the monopoly strength that sustained their medieval and early modern antecedents. But, as the decline of workplace stability continues to undermine worksite-based representation, the attractiveness of these guild-type structures increases, and thus can be an important component of broader strategies aimed at building security for workers in the information economy.

Finally, Hector Postigo offers an intriguing story of the changing position and perception of volunteer and hobbyist work on the Internet. Against the background of the specific relationship volunteers and hobbyists historically have had with the evolution of the Net, with its idiosyncratic culture of virtuality and digital communitarism, Postigo shows how the understanding of labour, leisure, and volunteer and hobbyist labour became problematized, as the work of volunteer and hobbyists groups came to be harnessed by corporations. A number of America Online (AOL) volunteers who worked in chat-rooms, forums, and bulletin boards gradually became aware that their activities have made a shift from leisure to work and, therefore, some members of this group have started to demand compensation for their unwaged labour.

As the legal process around the claims of these AOL volunteers has still not been resolved, the story of this form of information labour connects this volume to topical issues, and with that, the history of labour in information revolutions as brought together in this volume turns full circle, from labour in an earlier era of revolutionary changes in information systems – the eighteenth century – to the present digital Information Revolution and the Internet. In the concluding contribution to this volume, the co-editor of this *IRSH* Supplement, Greg Downey, gives a commentary on the place of labour in the history and the existing historiography of information revolutions. Focusing on the US context, he analyses how the history of information-technology labour has been studied hitherto, particularly from within the fields of history of technology and human geography, and concludes that "overall the notion of 'information labor' as a historical unit of analysis is lacking any secondary synthesis or coherent body of theory", as it constantly remains hidden behind technology and/or information as units of analysis, and is often assumed to be technologically determined. The contributions to this volume, we hope, show that the history of information revolutions can be

fruitfully written with labour as a historical unit of analysis. Such an approach is useful, we believe, not only to uncover the role and position of labour in historical and contemporary manifestations of revolutionary developments in information and communication technologies, but also as a much needed critical perspective on the present-day Information Revolution.