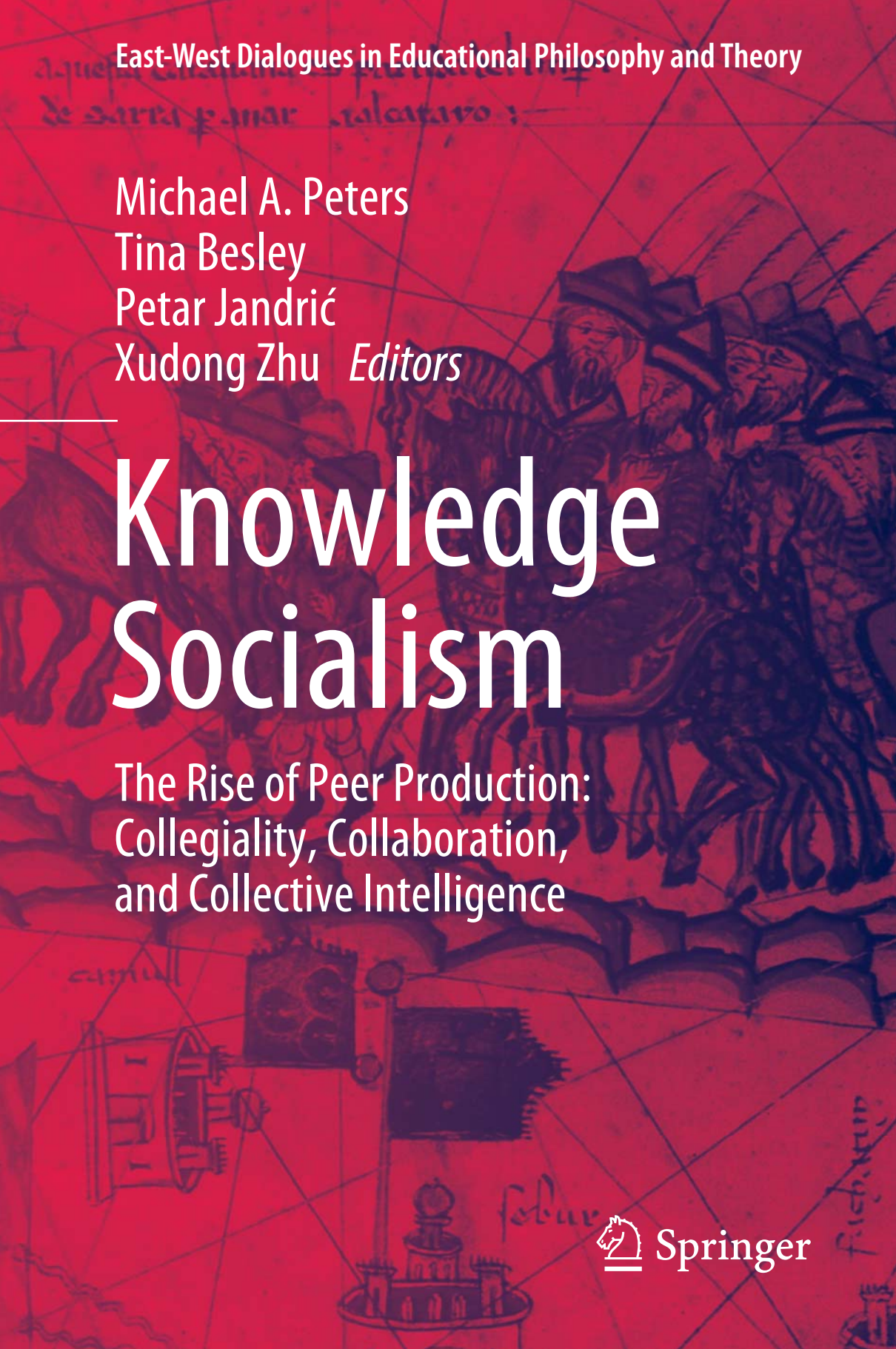
East-West Dialogues in Educational Philosophy and Theory

Michael A. Peters
Tina Besley
Petar Jandrić
Xudong Zhu *Editors*

# Knowledge Socialism

## The Rise of Peer Production: Collegiality, Collaboration, and Collective Intelligence



Springer

# East-West Dialogues in Educational Philosophy and Theory

This series, published by Beijing Normal University, is geared toward developing approaches to intercultural philosophy in education, especially in the Chinese and Western cultures. The first series of its kind produced by a Chinese university, it addresses open problems in the analysis and structure of the ethics of self-cultivation, clarifies the differences between respective cultures' approaches to philosophy, and equips readers to handle complex ideas in the context of moral education.

More information about this series at http://www.springer.com/series/16303

Michael A. Peters · Tina Besley · Petar Jandrić · Xudong Zhu
Editors

# Knowledge Socialism

## The Rise of Peer Production: Collegiality, Collaboration, and Collective Intelligence

Springer

*Editors*
Michael A. Peters
Faculty of Education
Beijing Normal University
Beijing, China

Tina Besley
Faculty of Education
Beijing Normal University
Beijing, China

Petar Jandrić
Department of Informatics and Computing
Zagreb University of Applied Sciences
Zagreb, Croatia

University of Wolverhampton
Wolverhampton, UK

Xudong Zhu
Faculty of Education
Beijing Normal University
Beijing, China

ISSN 2661-8753 ISSN 2661-8761 (electronic)
East-West Dialogues in Educational Philosophy and Theory
ISBN 978-981-13-8125-6 ISBN 978-981-13-8126-3 (eBook)
https://doi.org/10.1007/978-981-13-8126-3



This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

# Contents

# Contributors

**Sonja Arndt** University of Melbourne, Melbourne, Australia

**Daniel Badenhorst** University of Auckland, Auckland, New Zealand

**Ronald Barnett** University College London Institute of Education, London, UK

**Tina Besley** Beijing Normal University, Beijing, China

**D. M. Bothwell** Newcastle University, Newcastle, UK

**Derek R. Ford** DePauw University, Greencastle, IN, USA

**Steve Fuller** Department of Sociology, University of Warwick, Coventry, UK

**Andrew Gibbons** Auckland University of Technology, Auckland, New Zealand

**Liz Jackson** Hong Kong University, Pok Fu Lam, Hong Kong

**Petar Jandrić** Zagreb University of Applied Sciences, Zagreb, Croatia; University of Wolverhampton, Wolverhampton, UK

**David W. Kupferman** Minnesota State University, Moorhead, USA

**Pierre Lévy** University of Montréal, Montréal, Canada

**Timothy W. Luke** Virginia Polytechnic Institute and State University, Blacksburg, USA

**Greg William Misiaszek** Beijing Normal University, Beijing, China; Paulo Friere Institute UCLA, Los Angeles, USA

**John Morgan** University of Auckland, Auckland, New Zealand

**David Neilson** University of Waikato, Hamilton, New Zealand

**Mark Olssen** Department of Politics, University of Surrey, Guildford, UK

**Michael A. Peters** Beijing Normal University, Beijing, China

**Sharon Rider** Department of Philosophy, Uppsala University, Uppsala, Sweden

**P. A. Stewart** MIMA School of Art and Design, Teesside University, Middlesbrough, UK

**Marek Tesar** University of Auckland, Auckland, New Zealand

**Zhu Xudong** Beijing Normal University, Beijing, China

# Chapter 1
# Introduction


**Michael A. Peters, Tina Besley, Petar Jandrić, and Zhu Xudong**

## Introduction

We now live in the age of global 'knowledge economy' and 'knowledge capitalism.' According to Peters (2019), these terms 'have been used with increasing frequency since the 1990s as a way of describing the latest phase of capitalism in the process of global restructuring'. While the mainstream literature usually understands 'knowledge economy' and 'knowledge capitalism' as inevitable consequences of recent socio-technological developments, Peters explores the term

> *not as a term of approbation but as a disruptor*, as a term that first situates knowledge economy as 'knowledge capitalism' in an info-tech digital capitalist historical phase that signalled a profound structural transformation and that contained within it also other radical open possibilities that also enhanced free knowledge exchange and approximate conditions of 'knowledge socialism' based on collaboration, sharing and the peer economy. (Peters 2019)

In *Knowledge Socialism. The Rise of Peer Production: Collegiality, Collaboration, and Collective Intelligence*, knowledge socialism is viewed as the next stage in

M. A. Peters (✉) · T. Besley · Z. Xudong
Beijing Normal University, Beijing, China
e-mail: mpeters@bnu.edu.cn

T. Besley
e-mail: tbesley@bnu.edu.cn

Z. Xudong
e-mail: zhuxd@bnu.edu.cn

P. Jandrić (✉)
Zagreb University of Applied Sciences, Zagreb, Croatia
e-mail: pjandric@tvz.hr

University of Wolverhampton, Wolverhampton, UK



M. A. Peters et al. (eds.), *Knowledge Socialism*, East-West Dialogues in Educational Philosophy and Theory,
https://doi.org/10.1007/978-981-13-8126-3_1

development of knowledge-making and dissemination that disrupts the current stage of development of capitalism. Positioned in, against and beyond (Holloway 2016) 'knowledge economy' and 'knowledge capitalism,' knowledge socialism refers to a new global collectivist society that is coming online based on communal aspects of digital culture including sharing, cooperation, collaboration, peer production and collective intelligence.

As we wrote in the call for chapters for this book, aspects of knowledge socialism include, but are far from limited to, the following list of themes, sub-themes and approaches:

- the rise of peer production;
- the history of peer review;
- openness—open science, open access;
- the model of open knowledge production;
- cognitive capitalism;
- knowledge capitalism;
- knowledge cultures;
- forms of collegiality;
- creative labor versus human capitalism;
- collective intelligence;
- social innovation.

Elements on this list seem to have little in common; depending on personal interest, each and every one of us could supplement it with few more concepts. Listing numerous aspects of knowledge socialism (and perhaps even classifying them into clusters and taxonomies) is useful, because it provides us with important points of departure for our research. Looking beyond classification, however, we can notice that knowledge socialism is always somehow related to technology.

Here, we understand technology in the widest sense described by Ellul (1964) (we find Ellul's definition useful although we disagree with many other aspects of his philosophy). Taking the example of this book, technology is the assemblage of Internet infrastructure which enabled reviewers to read draft chapters and submit their comments; technology is the administrative back-end offered by our publishers; technology is writing and formatting standards applied to abstracts, keywords and references; and technology is the way this book looks and feels in readers' hands and/or on readers' screens. Looking beyond production, technology is the requirement that all chapters need to undergo a minimum of two anonymous peer reviews; our ethos that editors and authors should work in a collegial spirit of mutual support and help; and that the book publishes a mix of invited authors and authors who responded to our open calls.

Knowledge socialism described in this book is digitally enabled, but paraphrasing Heidegger (1962), the essence of knowledge socialism which produced this book is nothing digital. In the recent literature, this view to relationships between human beings and digital technologies has been described by the notion of the postdigital.

'The postdigital is hard to define; messy; unpredictable; digital and analog; technological and non-technological; biological and informational. The postdigital is both a rupture in our existing theories and their continuation.' (Jandrić et al. 2018) Knowledge socialism is a postdigital rupture and continuation of global 'knowledge economy' and 'knowledge capitalism', and chapters in this book explore a number of ways our collective digital tools have the power to create the intellectual commons and reshape our minds.

## Knowledge Socialism—History and Genealogy

The concept of knowledge socialism has emerged from the works of Michael Peters and Tina Besley over the past two decades. This is not to say that other people did not write about similar questions—Besley and Peters gladly acknowledge that their work has been influenced by numerous authors and approaches. However, the exact wording—knowledge socialism—has first been used in Peters' (2004) article 'Marxist Futures: Knowledge Socialism and the Academy'. Over the years, Peters and Besley have developed a number of related concepts such as knowledge cultures, radical openness and others. They would present these concepts as provocations or McLuhanist 'thought probes' (McLuhan 1964), gather authors around journal special issues and edited books and explore theoretical and practical implications of their provocations. These activities have been underlined by academic values such as openness and practically supported by Peters and Besley's engagement in academic publishing industry.

Alongside their thought probes, Besley and Peters have engaged in various practical projects. They started new publications such as the *Video Journal of Education and Pedagogy*,[1] which is arguably the first video journal in the humanities and social sciences, and the *Open Review of Educational Research*,[2] which experiments with novel forms of political economy of academic publishing, and others. They went even more experimental with projects such as The Editors' Collective,[3] which is a group of academics working on collective approaches to knowledge-making and dissemination. Recent developments from these groups, such as the 'Open Access meeting place for those interested the intersections of education, philosophy, technology, indigenous and identity issues, and the environment' called PESAAgora,[4] explore further practical opportunities for knowledge socialism as we write these words.

[1] See https://brill.com/view/journals/vjep/vjep-overview.xml. Accessed 1 May 2020.

[2] See https://www.tandfonline.com/loi/rrer20. Accessed 1 May 2020.

[3] See http://editorscollective.org.nz/. Accessed 1 May 2020.

[4] See https://pesaagora.com/comingsoon.html. Accessed 1 May 2020.

These theoretical and practical projects have set a theoretical background and accumulated a wealth of practical experience. Probably most importantly, they have built a large network of scholars who are interested in knowledge-making and dissemination and who are not afraid to experiment, individually and collectively, with novel forms of academic work. In the following sections, we will briefly describe Peters and Besley's concepts of knowledge cultures, radical openness and knowledge socialism which served as main theoretical influences for development of this book.

## *Knowledge Cultures*

In *Building Knowledge Cultures: Education and Development in the Age of Knowledge Capitalism*, Peters and Besley (2006) developed the notion of 'knowledge cultures' as a basis for understanding the possibilities of education and development in the age of knowledge capitalism. 'Knowledge cultures,' they argued, refers to the cultural preconditions in the new production of knowledge and their basis in shared practices, embodying preferred ways of doing things often developed over many generations. These practices also point to the way in which cultures have different repertoires of representational and non-representational forms of knowing. In the book, they discuss knowledge cultures in relation to claims for the new economy, as well as cultural economy and the politics of postmodernity. The book focuses on national policy constructions of the knowledge economy, 'fast knowledge' and the role of the so-called new pedagogy and social learning under these conditions. In that book, they included a postscript 'freedom and knowledge cultures' commenting on the shift from a metaphysics of production to one of the consumptions and the emergence of a knowledge global commons as the basis for a global civil society as yet unborn. Here, they were attempting to realize in outline the development of knowledge cultures based on non-proprietary modes of production and exchange.

Somewhat later, Michael Peters tried to work up this idea in terms of the promise of creativity giving the concept a reading by reference to emerging form of openness in a book called *Knowledge, Science and Knowledge Capitalism*:

> We live in the age of global science – but not, primarily, in the sense of 'universal knowledge' that has characterized the liberal metanarrative of 'free' science and the 'free society' since its early development in the Enlightenment. Today, an economic logic links science to national economic policy, while globalized multinational science dominates an environment where quality assurance replaces truth as the new regulative ideal. This book examines the nature of educational and science-based capitalism in its cybernetic, knowledge, algorithmic and bioinformational forms before turning to the emergence of the global science system and the promise of openness in the growth of international research collaboration, the development of the global knowledge commons and the rise of the open science economy. *Education, Science and Knowledge Capitalism* explores the nature of cognitive capitalism, the emerging mode of social production for public education and science and its promise for the democratization of knowledge. (Peters 2013a, b)

Since then, the concept of knowledge cultures has been developed in numerous publications (Peters and Jandrić 2015, 2018; Peters et al. 2018).

Knowledge cultures is a fundamental concept that Peters, Besley and others developed in opposition to the dualism of the knowledge economy and knowledge society, and they fleshed out a critical concept that carried normative content by focusing on epistemological notion of 'the community of inquiry' drawing from Wittgenstein, Dewey and Pierce that also implied an ethics of sharing and collaboration. These philosophers provided the resources for a social reading of knowledge that was consistent with Marxist reading of knowledge as being based in a set of social relations. The pragmatist emphasis of the 'community of inquiry' and especially Pierce's epistemology seems to provide a warrant for investigating 'knowledge socialism' as a historical program.

## *Radical Openness*

Michael Peters coined the concept of radical openness as a result of a series of published articles and books on the concept of openness (Peters and Britez 2008; Peters and Roberts 2011; Peters 2013a, b, 2014a, b). In particular, working with colleagues like Peter Roberts, Peters had tried to rework what they called 'the virtues of openness' linking it to the development of scientific communication, the reinvention of the public good and the constitution of the global knowledge commons (Peters and Roberts 2011). They put the case for the creation of a new set of rights in a transformed global context of the 'knowledge economy', that is, universal rights to knowledge and education. In this perspective, they argued that education needs to be reconsidered as a global public good, with the struggle for equality at its center. By charting various conceptual shifts, they had previously distinguished between three discourses of the 'knowledge economy': the 'learning economy', the 'creative economy', and the 'open knowledge economy', each with its specific conceptions of knowledge and economy (Peters 2010). In the face of neoliberalism, privatization of education and the monopolization of knowledge, they argued that the last of these three conceptions—the open knowledge economy—offers a way of reclaiming knowledge as a global public good and of viewing openness as an essential aspect of an emerging global knowledge commons that fosters open science and open education. Later on, these conclusions have been extended to the digital university (Peters and Jandrić 2018).

Now, we are at a stage where we can begin also to investigate links between creativity, the mode of production and the logic of public organizations. With the advent of the Internet, Web 2.0 technologies and user-generated cultures, new principles of radical openness have become the basis of innovative institutional forms that decentralize and democratize power relationships, promote access to knowledge and encourage symmetrical, horizontal peer learning relationships. In this context, radical openness is a complex code word that represents a change of philosophy and ethos, a set of interrelated and complex changes that transforms markets, the mode of production and consumption, and the underlying logic of our institutions. Peters argues that we need to examine the significance of peer governance, review and

collaboration as a basis for open institutions and open management philosophies. This form of openness has been theorized in different ways by Dewey, Pierce and Popper as a 'community of inquiry'—a set of values and philosophy committed to the ethic of criticism that offers means for transforming our institutions in what Antonio Negri and others call the age of 'cognitive capitalism'. Expressive and aesthetic labor ('creative labor') demands institutional structures for developing 'knowledge cultures' as 'flat hierarchies' that permit reciprocal academic exchanges as a new basis for public institutions.

Social processes and policies that foster openness as an overriding value as evidenced in the growth of open source, open access, open education and open science and their convergences that characterize global knowledge communities that transcend borders of the nation state. Openness seems also to suggest political transparency and the norms of open inquiry, indeed, even democracy itself as both the basis of the logic of inquiry and the dissemination of its results. Institutions are humanly devised; they set constraints and shape incentives: economic institutions such as property rights, or contract shape economic incentives, contracting possibilities and distribution; political institutions, including form of government, separation of powers and so on, shape political incentives and distribution of political power. Today, with the advent of the Internet and user-generated cultures, new principles of openness have become the basis of innovative institutional forms that decentralize and democratize power, access to knowledge and encourage peer learning relationships. Openness is a value and philosophy that also offers us a means for transforming our institutions.

## *Knowledge Socialism*

In early 2004, Peters defined knowledge socialism as follows:

> One form of new expression concerns what I call *knowledge socialism* to indicate the new struggles surrounding the politics of knowledge that directly involve the academy and I do not mean simply refer to the role of theory. I am referring to what has been called knowledge in the age of 'knowledge capitalism', a debate that increasingly turns on the economics of knowledge, the communicative turn, and the emerging international knowledge system where the politics of knowledge and information dominates. One issue concerns intellectual property, not only copyright, patents and trademarks, but also the emergence of international regimes of intellectual property rights, and the accompanying emphasis on human capital and embedded knowledge processes that now drive university management. (Peters 2004: 406)

In 2012, Peters pits the concept of knowledge socialism as an alternative to the currently dominant 'knowledge capitalism':

> Whereas knowledge capitalism focuses on the economics of knowledge, emphasizing human capital development, intellectual property regimes, and efficiency and profit maximization,

> knowledge socialism shifts emphasis towards recognition that knowledge and its value are ultimately rooted in social relations (Peters and Besley 2006). Knowledge socialism promotes the sociality of knowledge by providing mechanisms for a truly free exchange of ideas. Unlike knowledge capitalism, which relies on exclusivity—and thus scarcity—to drive innovation, the socialist alternative recognizes that exclusivity can also greatly limit innovation possibilities (see 'Introduction', Peters et al. 2009). Hence rather than relying on the market to serve as a catalyst for knowledge creation, knowledge socialism marshals public and private financial and administrative resources to advance knowledge for the public good. (Peters et al. 2012: 88)

Finally, in a 2019 editorial, Peters identifies publication paywalls as 'one of the biggest hurdles to openness' and writes:

> While Plan S and journal Open Access does not exhaust the concept of 'digital socialism' or even approximate to a political system, it does provide a massive watershed to academic publishing that threatens to destablize the market and the neoliberal idea of the university insofar as it impinges of the paradigm of intellectual property and checks the dominance of big publishers in the West that props up a hegemonic system of global journal knowledge. As for 'digital socialism' or 'post-capitalism' more broadly within academia, we might have to wait a while for the main revolution. (Peters 2019)

It is within this theoretical framework that this book develops the concept of knowledge socialism in 2020.

## Knowledge Socialism Today

This book is divided into three sections and a collectively written concluding chapter. The first section, 'Peer production and collective intelligence', explores the theory of knowledge socialism. The second section, 'The challenge of political economy', looks into politics and practice of knowledge socialism. The third section, 'Education for knowledge socialism', explores ways in which educational systems should respond to, and prepare people for, working in the age of knowledge socialism. The concluding chapter, 'The highway robber's road to Knowledge Socialism: A collective work on collective work', presents a collectively written commentary on the propositions and provocations raised in Michael Peters' concept of knowledge socialism and Peters' in-depth response.

### *Peer Production and Collective Intelligence*

In the first chapter, 'Toward a Theory of Knowledge Socialism: Cognitive Capitalism and the Fourth Knowledge Revolution', Michael A. Peters introduces the book by a retrospective view of a body of work under the title 'knowledge socialism'. Linking timeless philosophical principles with latest 5G technologies, Peters sets the scene for diverse views and approaches presented in the rest of the volume. The second chapter,

'Toward an epistemological mutation in the humanities and social sciences' by Pierre Lévy, contributes to the definition of a new 'digital enlightenment' and draws an epistemological–political project aimed at making knowledge creation operations transparent for the community of researchers in the social sciences and humanities. Tim Luke examines 'Perversity or Problems in The Rise of Peer Production: Collegiality, Collaboration, and Collective Intelligence', and maps some problems arising from the historical contradictions between 'knowledge socialism' and 'knowledge capitalism'. In 'Postdigital Knowledge Socialism', Petar Jandrić historicizes Peters' concept of knowledge socialism, situates it in the wider postdigital context and warns against repeating some well-known errors made by earlier generations of leftist scholars and practitioners. Finally, in 'General stupidity as a missing component of general intellect', Derek Ford re-examines the general intellect in order to develop a communist theory of writing which is more interested in the character of the act of rewriting, than in the content of writing.

## *The Challenge of Political Economy*

In 'Knowledge socialism purged of Marx: the return of organized capitalism', Steve Fuller argues that contemporary political economy of knowledge socialism needs to bury its Marxist heritage and focus to various 'utopian socialist' theories from Saint-Simon to Proudhon underlined by the Popperian tradition in the philosophy of science. In 'Knowledge socialism and a post-neoliberal model of development', David Neilson offers a democratic socialist critique of Hardin's 'Tragedy of the Commons' and links 'cosmopolitan democracy' with a 'world knowledge bank' as key features of a democratic socialist alternative to the neoliberal model of development. Mark Olssen and his 'The Rehabilitation of the Concept of Public Good: reappraising the attacks from liberalism and neoliberalism from a poststructuralist perspective' consider three twentieth-century attacks of the idea of the public good: from Social Choice Theory, from Public Choice Theory, and from twentieth-century political liberalism. In 'Going Public: Higher Education and the Democratization of Knowledge', Sharon Rider reaches further into the fundamentally public nature of knowledge and discusses the distribution of knowledge through the public exchange of ideas with an eye toward rethinking contemporary higher education as a democratic enterprise.

## *Education for Knowledge Socialism*

Ronald Barnett's 'The University and Knowledge Socialism: a strange juxtaposition' argues that the university and knowledge socialism constitute an odd couple; a couple with various tensions between them. In 'The prospects for knowledge socialism in one country?', John Morgan traces the sources of failure of British 'educational left'

to convincingly propose alternatives to the conservative educational discourse of the past forty years in his analyses of five distinctive strands of 'left' educational thought. Greg Misiaszek's 'Locating and diversifying modernity: Deconstructing knowledges to counter development for a few' uses the framings of knowledge socialism to problematize the relationships between education and 'development'. Dawn Bothwell and Paul Alexander Stewart's 'The reality of knowledge through the critique of art: collective digital tools and transgressing capital' considers knowledge socialism in relation to the production of the self in the digital age and adds a valuable artistic perspective to the volume.

## Some Preliminary Implications

This book's contributors tore Peters' idea of knowledge socialism into pieces, carefully analyzed each piece and then re-assembled analyzed pieces into something (at least slightly) different from Peters' original proposal. Authors used historical parallels, developed thought experiments, offered administrative and/or technical solutions, and engaged in other techniques of speculation. Peters' theory has endured this heavy barrage surprisingly well, and after almost two years of working on this edited volume, we feel that the concept of knowledge socialism has made a strong leap forward. We now know which parts of theory cause the most confusion, which parts of theory seem the least problematic and which aspects of practice require our dedicated attention.

Two decades ago, the first contours of knowledge socialism emerged in Michael Peters' mind. In interaction with his close circle of friends, Peters has developed this idea over multiple publications and contexts. However, it is only with this volume that the idea of knowledge socialism has reached beyond Peters' (admittedly incredibly wide) circle and has entered scientific mainstream. *Knowledge Socialism. The Rise of Peer Production: Collegiality, Collaboration, and Collective Intelligence* marks the end of the pioneering phase of knowledge socialism and offers foundations for in-depth, systematic studies in the field. Peters' theory has now grown up, and this book has launched it into the quest for pastures new and unexplored.

## References

Ellul, J. (1964). *The technological society*. New York: Random House.

Heidegger, M. (1962). *Being and time*. Germany: SCM Press.

Holloway, J. (2016). *In, against, and beyond capitalism: The San Francisco lectures*. Oakland, CA: PM Press/Kairos.

Jandrić, P., Knox, J., Besley, T., Ryberg, T., Suoranta, J., & Hayes, S. (2018). Postdigital science and education. *Educational Philosophy and Theory, 50*(10), 893–899. https://doi.org/10.1080/00131857.2018.1454000.

McLuhan, M. (1964). *Understanding media: The extensions of man*. New York: McGraw-Hill.

Peters, M. A., & Jandrić, P. (2015). Learning, creative col(labor)ation, and knowledge cultures. *Review of Contemporary Philosophy, 14,* 182–198.
Peters, M. A., & Jandrić, P. (2018). *The digital university: A dialogue and manifesto.* New York: Peter Lang.
Peters, M. A. (2004). Marxist Futures: Knowledge socialism and the academy'. *Policy Futures in Education, 2*(3–4), 435–438. https://doi.org/10.2304/pfie.2004.2.3.1.
Peters, M. A. (2013a). *Education, science and knowledge capitalism: Creativity and the promise of openness.* New York: Peter Lang.
Peters, M. A. (2014b). Radical openness: Towards a theory of co(labor)ation. In S. Weber, M. Göhlich, A. Schröer, & J. Schwarz (Eds.), *Organisation und das Neue. Organisation und Pädagogik, vol 15.* Wiesbaden: Springer.
Peters, M. A. (2019). Knowledge socialism: The rise of peer production—Collegiality, collaboration, and collective intelligence. *Educational Philosophy and Theory.* https://doi.org/10.1080/00131857.2019.1654375.
Peters, M. A. (2013b). The concept of radical openness and the new logic of the public. *Educational Philosophy and Theory, 45*(3), 239–242. https://doi.org/10.1080/00131857.2013.774521.
Peters, M. A., & Besley, T. (2006). *Building knowledge cultures: Education and development in the age of knowledge capitalism.* Lanham, MD: Rowman & Littlefield.
Peters, M. A., & Britez, R. (Eds.). (2008). *Open education and education for openness.* Rotterdam: Sense Publishers.
Peters, M. A., & Roberts, P. (2011). *The virtues of openness: Education, science and scholarship in a digital age.* Boulder, CO: Paradigm Publishers.
Peters, M. A., Besley, T., & Jandrić, P. (2018). Postdigital knowledge cultures and their politics. *ECNU Review of Education, 1*(2), 23–43. https://doi.org/10.30926/ecnuroe2018010202.
Peters, M. A. (2010). Three forms of the knowledge economy: Learning, creativity and openness. *British Journal of Educational Studies, 58*(1), 67–88. https://doi.org/10.1080/00071000903516452.
Peters, M. A. (2014a). Openness and the intellectual commons. *Open Review of Educational Research, 1*(1), 1–7. https://doi.org/10.1080/23265507.2014.984975.
Peters, M. A., Liu, T. C., & Ondercin, D. J. (2012). *The pedagogy of the open society: Knowledge and the governance of higher education.* Rotterdam: Sense.

**Michael A. Peters** is Distinguished Professor of Education at Beijing Normal University Faculty of Education PRC, and Emeritus Professor at the University of Illinois at Urbana–Champaign. He is the executive editor of *Educational Philosophy and Theory* and founding editor of ten international journals. His interests are in philosophy and education and he has written over one hundred and twenty books, including several books on Wittgenstein. He was made an Honorary Fellow of the Royal Society of NZ in 2010 and awarded honorary doctorates by State University of New York (SUNY) in 2012 and University of Aalborg in 2015. His recently published book is *Wittgenstein, Antifoundationalism, Technoscience and Philosophy of Education* (2020).

**Tina Besley** is Distinguished Professor of Education at Beijing Normal University Faculty of Education PRC, and past President of the Philosophy of Education Society of Australasia and the Association of Visual Pedagogies. She is Deputy Editor of *Educational Philosophy and Theory* and the author twelve books and many articles.

**Petar Jandrić** is Professor at the Zagreb University of Applied Sciences, Croatia and Visiting Professor at University of Wolverhampton, UK. His previous academic affiliations include Croatian Academic and Research Network, National e-Science Center at the University of Edinburgh, Glasgow School of Art, and Cass School of Education at the University of East London. Petar's

background is in physics, education and information science, and his research interests are situated at the post-disciplinary intersections between technologies, pedagogies and the society, and research methodologies of his choice are inter-, trans-, and anti-disciplinarity. He is Editor-in-Chief of *Postdigital Science and Education* journal and book series. Personal Web site: http://petarjandric.com/.

**Xudong Zhu** is Professor and General Secretary of Teacher Education Experts Committee of Ministry of Education (MOE), Dean of Faculty of Education at Beijing Normal University, Director of the Center for Teacher Education Research (CTER), Vice-General Secretary and Executive Director of the National Teacher Education Society, one of the Social Sciences Hundred Engineering People in the New Century in Beijing, participant in the first batch of 'A Group of Four' Talents in Beijing, and a senior visiting scholar of Fulbright Program at University of Maryland. Prof. Zhu's areas of research include Teacher Education, Comparative Education, Foreign Education History and others. He has published more than ten books, eighty papers and has edited four series.

# Part I
# Peer Production and Collective Intelligence

# Chapter 2
# Towards a Theory of Knowledge Socialism: Cognitive Capitalism and the Fourth Knowledge Revolution


**Michael A. Peters**

## Introduction: Re-visiting the Neoliberal Knowledge Economy

In a world where income is being decoupled from education and work, and neoliberal capitalism has led to an increasing concentration of wealth (Piketty 2014), it is likely that social and educational inequalities will accelerate and proliferate when equality and excellence dominate Western educational policy agendas. Peter and Bröckling (2017) argue that equality and excellence constitute the hegemonic discourses of 'economisation' within the German education system, a thesis that has useful applications to education systems elsewhere. Equality of opportunity is increasingly seen in neoliberal terms as that designed to utilise the full limits of human capital. In higher education, 'excellence' serves to introduce a logic of competition for educating the elite. Peter and Bröckling (2017) adopt a theoretical approach from Foucault's governmentiality and Luhmann's systems theory to discuss how mechanisms of exclusion and inclusion operate in schooling and university education sectors. As they suggest:

> Equality and excellence appear, at least superficially, as opposing and mutually exclusive orientations; one either supports the promotion of the elite and a competitive understanding of education, or one supports collective learning and the equal right to education for all - *tertium non datur*. (Peter and Bröckling 2017) (italics from the original)

They trace these antagonisms to a basic model of rationality that drives the global educational discourse where discourses of excellence and equality get cashed out in neoliberal market terms and can be understood in by reference to neoliberal governmentality. Specifically, embracing political discourse theory they argue: 'equality and excellence represent models for two opposing hegemonic projects in

M. A. Peters (✉)
Beijing Normal University, Beijing, China
e-mail: mpeters@bnu.edu.cn



M. A. Peters et al. (eds.), *Knowledge Socialism*, East-West Dialogues in Educational Philosophy and Theory,
https://doi.org/10.1007/978-981-13-8126-3_2

the German education system, which nonetheless meet within a transnational framework of economic competition'. They demonstrate how the mobilisation of a concept of excellence is anchored in the qualitative improvement of education seen as human capital and learning for the 'information age' and how education has become decisive for competitiveness in a world where 'productivity is based on the creation, distribution and use of knowledge'.

The economisation of education has taken place through the progressive amalgamation of discourse threads to form the 'knowledge economy' based on new endogenous growth theory developed by Romer and others in the 1990s and adopted and popularised by the OECD soon after. The OECD's formulation became the dominant neoliberal discourse that blended elements from earlier management, sociological, and economic studies and recast education, effectively, from a welfare right concerned with equality of opportunity to the central theory of human capital development. As neoliberal policies followed notions of school choice, vouchers and privatisation with the marketisation of education, the liberal rhetoric of equality of opportunity faded away, surviving intact only at the primary school level. In the hard-core neoliberal states, the educational inequalities soon began to increase under system that decentralised state control and decision making to the local level in a form of institutional autonomy that had the effect of benefitting schools from 'rich' areas and diminishing those from 'poor' areas.

I have been interested in Foucault's reading of neoliberalism and its application to discourses of the knowledge economy for some years now. In 2001, I published a paper that reviewed and critiqued national education policy constructions of the knowledge economy (Peters 2001). Referencing the post-war consensus that increasing emerged with the likes of economists, futurists, and sociologists, different threads of a *blended* discourse by Drucker, Machlup, Porter and Thurow, I charted the ruling paradigm the economics and productivity of knowledge had become the only source of comparative advantage commenting that many western governments had begun the process of restructuring their national education systems and redesigning the interface between universities and business-based neoliberal theories of human capital, public choice, and new public management.

In this context, I made reference to the discourse of the 'future of work' citing Charles Handy's work in the 1980s to signal the end of full employment and the redesign of education to cope with increased job mobility and multiple careers. By 'knowledge economy', I stressed the main characteristics of received mainstream discourse that focused on (1) economics of abundance; (2) the annihilation of distance; (3) the de-territorialisation of the state; (4) the importance of local knowledge; and (5) investment in human capital. In the following section, I teased out several separate discourses from economics, management theory, futurology and sociology can be identified as having contributed to shaping the present policy narrative of the 'knowledge economy' including: The economics of information and knowledge (Marschak, Machlup, Becker, Friedman, Buchanan and Tullock, Romer); New management theory and knowledge managerialism; Sociology of the

labour process; Sociology of knowledge and education; Futurology, futures research, forecasting, foresight studies; and, Communications and information technology theory.

I suggested that these are clearly disparate disciplines 'fields and discourses that operate with different assumptions, employ different methodologies and reach different and sometimes opposing conclusions. The art of policy scholarship is intended, in part, to gain awareness of these different strands as they influence policy narratives, to disentangle them and comment upon inconsistencies.' (Peters 2001) These discourses came from across the political spectrum and the blended discourse often represented wholesale conceptual 'borrowings' without proper attributions.

In the rest of the paper, I attempted to define the discourse of the knowledge economy by investigating three examples of national policy constructions in the UK, Scotland, and NZ, all of which were strong examples of policy discourses aimed at the economisation of education. In the final section and in those early days, I made clear that I was not in principle against the concept of the knowledge economy at least as it fits within the social democratic tradition that posits an economy as subordinate to the state and the question of sovereignty. I argued the notion of the 'knowledge society' provides grounds for both the *reinvention of education as a welfare right* and the recognition of knowledge rights as a basis for social inclusion and informed citizenship. This view can be contrasted with that of the 'knowledge economy' as simply an ideological extension of the neoliberal paradigm of globalisation, where the term stands for a 'stripped down' functionalist view of education in service of the multinational information capital. I was influenced by Stiglitz's argument for knowledge as a *global public good*—a discourse that appeared at the end of the 1990s. In my critique, I challenged the easy accommodation between 'knowledge' and 'information' and returned to the question of employment and 'knowledge workers' by reference to Rifkin's (1998) 'end of work' analysis of the US economy and the threat of automation in the shift from industrial to knowledge capitalism transforming the West into 'workless worlds', where only an elite technical labour force will find jobs.

If you remember, Rifkin's educational solution was to expand education's role in civil society as an arena for job creation and social-service provision in the coming century. I made reference to André Gorz and indicated that '[i]n the Hegelian and Marxist senses, the nature of work is tied up not only with "practico- sensory activity", but with *poiesis* and self-creation' (Peters 2001: 16) (italics from the original). Returning to Foucault, I emphasised how the formation, circulation and utilisation of knowledge in the late twentieth century had become a fundamental problem and followed Foucault who compared the accumulation of knowledge to that of capital (in nineteenth century capitalism). He asserted that at this juncture—in the age of the knowledge economy—it is now impossible to pursue the question of knowledge separately from the question of capital. Surely this early statement by Foucault made in conversation with the Italian Marxist Duccio Trombadori in 1978 is an instantiation of his concept of power-knowledge (*le savoir-pouvoir*): modern power is based knowledge and reproduces it; both share dynamic and unstable systemic characteristics as relational, ubiquitous, and productive (Foucault 1980). The central

feature of political economy in the twentieth century was the formation, circulation, and utilisation of knowledge rather than that of capital and its dialectic of capital-labour. Through his later studies of neoliberalism, Foucault foresaw the importance of the centrality of knowledge for radical political economy and indicated a pathway to understand the further 'technologicisation' of an emerging single interconnected planetary system of global knowledge for the first time in human history.

That paper was published over eighteen years ago and has been well cited (over 250 times). Now it is old hat. Over the intervening years, I have followed through on many of these themes in a variety of papers and books that extend and depart from the original arguments, emphasising my concerns for technological unemployment, especially as regards youth and searching for viable social democratic alternatives. In subsequent work, I have employed an approach using Foucault's work on neoliberal governmentality. Foucault gave his famous lectures on neoliberalism as a form of biopolitics in 1979 just as Margaret Thatcher came to power, focusing on Becker and human capital theory as the most advanced form of neoliberalism. Foucault died in 1984 and capitalism has kept on changing, teetering from one crisis to another—the crisis of productivity, the global financial crisis of 2008, the crisis of political legitimation following the socialisation of bank failures and austerity politics. Foucault, it might be observed, did not have much to say about capitalism per se as an international system accept except through glancing comments and his interpretation of neoliberalism—nevertheless, a major contribution. Certainly, Foucault did not anticipate the formalisation, mathematicisation, and compression that took place under processes of financialisation in what I have termed 'algorithmic capitalism,' sometimes also referred to as 'platform capitalism' or 'high frequency trading' (Peters 2017a, b), nor did he envisage the development of the concept of 'cognitive capitalism' based on his work and Marx's 'Fragment of Machines' that with the autonomist school in Italy under Negri, Virno and Lazzarato. I have attempted to develop this attempt to marry Marx and Foucault in the field of education by focusing on the question of digital labour (Peters and Bulut 2011).

## The Discourse of Cognitive Capitalism

Cognitive capitalism is the culmination and most systematic statement to date of the Italian *autonomista* of an outline of an economic theory of a form of capitalism superceding industrial capitalism. Boutang (2012) working with his colleagues in Paris around the journal, he established in 2012 called *Multitudes*, build on the work Antonio Negri, Paolo Virno, Christian Marazzi, Andrea Fumagalli, and others in the Italian autonomist school to focus on cognitive and 'immaterial' labour (Lazzarato 1996), after Marx's 'Fragment on Machines' (in Marx 1978). Theorists of cognitive capitalism claim that a fundamental shift occurs in capitalism based on physical resources to knowledge and brain power as both input and output, signalling a break with Fordism and a historically new stage of capitalism. *Postoperaismo* is

an empirical based understanding of changes in production and the shift to 'immaterial labour' characterises the growing significance of the service sector, creative industries, and so-called knowledge economy. Pitts paints what now seems a familiar scenario based on this interpretation (in order to contest this reading suggesting it overlooks the persistence of social relations):

> The 'Fragment on Machines' (1973, 704-706) is a small section of his *Grundrisse*, the notebooks for what would later become Capital (1976). In it, Marx presents a future scenario where the use of machines and knowledge in production expands. Production revolves more around knowledge than physical effort. Machines liberate humans from labour, and the role of direct labour time in life shrinks to a minimum. Free time proliferates. The divorce of labour time from exchange value sparks capitalist crisis. But this technological leap brings about the possibility of a social development on a massive scale. Freed from physical subordination to the means of production, workers grow intellectually and cooperatively. This freely generated 'general intellect' reinserts itself, uncoerced, into production as fixed capital. The worker is incorporated only at a distance, rather than as a constituent part of the capital relation. The potential for an incipient communism arises. (Pitts 2017: 4)

I have no difficulty in holding with advocates of *postoperaismo* that 'the technological leap' may lead to 'social development' and even to a kind of 'socialisation of thought' but I have difficulty in accepting that this socialisation all points the same way or that it leads to the potential for communism based on 'freely-generated general intellect' especially when in face of technological unemployment, the notion of 'worker' and 'labour' is radically redefined.

If we accept the shift at face value, it highlights significant consequences for education and digital labour (Peters and Bulut 2011) and for the future shape of a sharing and participative economy based on education and learning considered in the broadest sense. At the same time, deep learning has come of age (developing well after *postoperaismo*). The rapid development of machines that can learn without explicit program instruction have experienced accelerated success in the last five years surpassing technical expectations. In combination with 'big data' analytics, deep learning perhaps best represented in Google's DeepMind and IBM's 'Watson', has defeated the best international chess and go players and make an unsurpassed contribution to cancer research (Peters 2017a, b). Deep learning, a branch of artificial intelligence, threatens to accelerate the automation of work and the concomitant process of technological unemployment at a time in contemporary history when youth employment has reached record post-war levels. A frequently cited Oxford study drawing upon recent advances in machine learning (ML) and mobile robotics (MR) estimates that 45 per cent of America's occupations will be automated within the next 20 years (Frey and Osborne 2017). In a world where income is being decoupled from education and work, and neoliberal capitalism has led to an increasing concentration of wealth (Piketty 2014), it is likely that social and educational inequalities will accelerate and proliferate when equality and excellence dominate Western educational policy agendas.

There have been many attempts in the post-war era to characterise the future of capitalism from sociological work focused on postindustrialism as both a critique of industrialism and a prediction of economic shifts based on the centrality of theoretical knowledge (e.g. Bell, Touraine, Toffler) to more recent conceptualisations of

the 'information' (e.g. Porat) and 'knowledge economy' (e.g. Drucker, Machlup, Romer). 'Cognitive capitalism' (CC) is a Marxist-inspired critique of the knowledge economy that has a debt to endogenous growth theory. This paradigm or hypothesis focuses on how the shift to knowledge as a factor of production and its characterisation in terms of cognitive activity transforms the labour/capital relationship. CC draws our attention to labour-process models that technologically extend human communication and realise the creation of value through the production of knowledge and other symbolic goods, increasingly organised in terms of large data networks.

I have pursued this topic in a number of publications on 'knowledge capitalism' (Peters and Besley 2006), 'knowledge socialism' (Peters 2004), the 'creative economy' (Araya and Peters 2010; Peters et al. 2009), 'cognitive capitalism' (Peters and Bulut 2011), 'open knowledge' and 'open science economy' (Peters 2009), 'financialisation' and 'finance capitalism' (Peters and Besley 2013) and 'radical openness' (Peters 2014a, b; Peters and Jandrić 2018a, b) that tries to develop an explicit recognition of the ways in which these shifts and forces reconfigure education at all levels at the centre of the knowledge economy and labour increasingly as the source of creative value. This is the kind of description I offered in my edited book with Ergin Bulut, *Cognitive Capitalism, Education and the Question of Digital Labour*:

> 'Cognitive capitalism' is a general term that has become significant in the discourse analysing a new form of capitalism sometimes called the third phase of capitalism, after the earlier phases of mercantile and industrial capitalism, where the accumulation process is centred on immaterial assets utilising immaterial or digital labour processes and production of symbolic goods and experiences. It is a term that focuses on the socio-economic changes ushered in with the Internet as platform and new Web 2.0 technologies that have impacted the mode of production and the nature of labour.
>
> The core of cognitive capitalism is centred on digital labour processes that produce digital products cheaply utilising new information and communications technologies that are protected through intellectual property rights regimes which are increasingly subjected to interventions and negotiations of the nation states around the world. (Peters and Bulut 2011)

I am not concerned to defend this notion here, nor to comment on its Marxist origins and sometimes heavily romantic versions that lay stress on processes of collective intelligence, open science, and social innovation all of which I have indicated as ways to reclaim the public dimensions of knowledge (e.g. Peters 2013a, b). Neither am I concerned to acknowledge the ways in which CC underplayed the cultural dimension or the relational and affective aspects of the new capitalism (Peters 2019). In this paper, I want mainly to comment on the relation of CC to what I call 'the epoch of digital reason' (Peters 2016) and, in particular, the critical relationship between 'deep learning' and what is called 'technological unemployment' (Peters et al. 2019).

If the infinite substitution of labour is the driving motif of the transformation of labour in the shift from industrial to postindustrial forms of capitalism with its waves of automation based on robotisation, then 'deep learning' can be considered the key metaphor in the transformation of knowledge into data and information, and machine learning that can augment and replace human knowledge production systems with

algorithms and large data sets. We might say that the infinite substitution principle of labour first into mechanised assembly plants and later robot manufacturing, duplicates the process for mental labour especially in the digital realm. In short, what is the impact of artificial intelligence on employment? The current anxiety seems well placed and we have been warned about the 'jobless future' not just for routine manual and cognitive jobs but also for non-routine 'creative' and highly skilled jobs.

The empirical analysis reveals a more complex picture where AI automation redefines employment and may even create some jobs. Autonomous vehicle or driverless cars may in fact disestablish many job types in transport while creating a few to cope with accidents and emergencies. Certainly, the scale and rate of job creation will be affected. More importantly, automation and the generalised 'decline of labour' seem to pose huge questions for education, labour politics, unions, and welfare. Capital no longer needs labour in the way it required the mass of unskilled labour, even at offshore cheap rates, that characterised early stages of industrial capitalism or its globalisation in the post-war period as jobs migrated East. Even skilled tasks now can be handled by robots at diminishing cost levels at 24/7 fully automated plants. We saw second wave automation of the service sector in the 1980s when white collar office jobs began disappearing and the ATM machine was first introduced in 1969 as part of the early process of financialisation. The digitisation of finance that among other things led to the automation of equity markets and the phenomenon of high-frequency trading represented a third wave automation associated with global finance capitalism coming to fruition in the early 2000s. The fourth wave automation of knowledge and research develop quickly with the growth of 'platform capitalism', the rise of algorithmic-based knowledge capitalism with the rise of search, big publishing, and metrics industries. Deep learning as an aspect of AI that has recently experienced a period of accelerated development and break-through technologies are the latest phase of automation that has the capacity to automate and augment human cognition.[1]

## Deep Learning and the Final Stage of Automation

Goodfellow et al. (2016) who wrote the first textbook on deep learning, comment: 'The true challenge to artificial intelligence proved to be solving the tasks that are easy for people to perform but hard for people to describe formally—problems that we solve intuitively, that feel automatic, like recognising spoken words or faces in images.' Their solution is

[1] A special report in The Economist in 2016 treats this as a question for the *delivery* of education through MOOCs and new 'adaptive-learning' start-ups in order to create AI learning systems that are more personalised, flexible, inclusive, and engaging. See http://www.economist.com/news/special-report/21700760-artificial-intelligence-will-have-implications-policymakers-education-welfare-and. Accessed 1 August 2020.

> to allow computers to learn from experience and understand the world in terms of a hierarchy of concepts, with each concept defined in terms of its relation to simpler concepts. By gathering knowledge from experience, this approach avoids the need for human operators to formally specify all of the knowledge that the computer needs. The hierarchy of concepts allows the computer to learn complicated concepts by building them out of simpler ones. (Goodfellow et al. 2016)

Goodfellow, Bengio, and Courville identify three waves of development of deep learning: deep learning known as cybernetics in the 1940s–1960s appeared with biological theories of learning; deep learning known as connectionism in the 1980s–1990s that used 'back-propagation' to train neural network with multiple layers, and the current resurgence under the name deep learning beginning in 2006 and only appearing in book form in 2016. They argue that the current deep learning approach to AI goes beyond the neuroscientific perspective applying 'machine learning frameworks that are not necessarily neurally inspired'. Deep learning, then, is 'a type of machine learning, a technique that allows computer systems to improve with experience and data' (Goodfellow et al. 2016).

Morris et al. (2017) report on the remarkable 'take-off' of artificial intelligence and with the resurgence also the return of the *machinery question* posed almost 200 years ago in the context of the Industrial Revolution. They note the upbeat analysis of mainstream press in 2016 and document the publication of several US and UK reports that suggest not only that 'AI has arrived' but also offers 'huge potential for more efficient and effective business and government.[2] The economists cited welcome AI for productivity gains. They ask '[w]hat triggered this remarkable resurgence of AI?' and they answer:

> All evidence points to an interesting convergence of recent advances in machine learning (ML), big data, and graphics processing units (GPUs). A particular aspect of ML—called deep learning using artificial neural networks—received a hardware boost a few years ago from GPUs, which made the supervised learning from large amounts of visual data practical. (Morris et al. 2017: 407)

The popularity of ML, they note, has been enhanced by machines out-performing human in areas taken to be prime examples of human intelligence: 'In 1997, IBM's Deep Blue beat Garry Kasparov in chess, and in 2011, IBM's Watson won against two of Jeopardy's greatest champions. More recently, in March 2016, Google's AlphaGo defeated Lee Sedol, one of the best players in the game of Go' (Morris et al. 2017: 407). Following this popular success, as Morris et al. (2017) note the private sector took up the challenge. They note, in particular, that IBM developed its cognitive computing in the form of their system called Watson, a DeepQA system capable of answering questions in a natural language.[3] The Watson website[4] makes the

[2]See 'Artificial intelligence: opportunities and implications for the future of decision making' G.S.O., https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/566075/gs-16-19-artificial-intelligence-ai-report.pdf . Accessed 1 August 2020.

[3]See David Ferrucci, Dan Cerutti and Ken Jennings on IBM's Watson at Singularity Summit 2011, https://www.youtube.com/watch?v=oFMeBId7vIM. Accessed 1 August 2020.

[4]See https://www.ibm.com/watson/. Accessed 1 August 2020.

following claim: 'Watson can understand all forms of data, interact naturally with people, and learn and reason, at scale.' And it also talks of 'transforming learning experience with Watson' taking personalised learning to a new level: 'We are transforming the learning experience through personalisation. Cognitive solutions that understand, reason and learn help educators gain insights into learning styles, preferences, and aptitude of every student. The results are holistic learning paths, for every learner, through their lifelong learning journey.'

Already firms are talking about transforming the learning experience through personalisation with purported 'cognitive solutions' that understand, reason, and learn help educators gain insights into individual student learning styles and preferences. IBM's Watson Enlight[5] is a planning tool to support teachers with curated, personalised learning content, and activities to align with each student's needs. The IBM Whitepaper (2016) claims that '[d]ata-driven cognitive technologies will enable personalised education and improve outcomes for students, educators and administrators'.[6] Another prominent example is DeepMind that advertises itself in terms of artificial intelligence research 'developing programs that can learn to solve any complex problem without needing to be taught how'.[7] One of the current developments focuses on the realm beyond *automation* to explore the advanced engineering of *autonomous systems* already is exploring how these systems will learn to adapt to new and unforeseen circumstances.

In terms of the labour market US experts are split between whether AI will displace more jobs than it creates with evidence suggesting that any jobs created will be those in STEM that complements AI. Lee (2016), a top White House science advisor, estimates that automated vehicles could threaten or alter 2.2 million to 3.1 million existing US jobs. As Obama claimed before the recent US election: 'The next wave of economic dislocations won't come from over- seas. It will come from the relentless pace of automation that makes a lot of good middle-class jobs obsolete.' (in Rotman 2016: 92) It is clear that the comparative advantage of human forms of labour will be eroded as ML and deep learning systems become more sophisticated and more intelligent taking over and/or augmenting jobs in libraries, research, teaching, law and other tertiary sector and creative forms of employment that require a learning component and have previously been seen to be impervious to automation. In particular, the widespread development for 'cognitive computing', deep learning, and autonomous learning systems through applications and by start-ups strikes at the very heart of the so-called 'knowledge economy', or 'cognitive capitalism' where such systems are already able to augment and, in some cases, replace jobs in the engine room of 'knowledge capitalism'.

[5] See https://www.ibm.com/watson/education. Accessed 1 August 2020.

[6] See https://public.dhe.ibm.com/common/ssi/ecm/ed/en/edw03008gben/EDW03008GBEN.PDF. Accessed 1 August 2020.

[7] See https://deepmind.com/about. Accessed 1 August 2020.