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Rethinking lifelong learning in the 'fourth industrial revolution'

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David James, Sahara Sadik and Phillip Brown

Abstract

Two key discourses of our time, lifelong learning (LLL) and the fourth industrial revolution (4IR), have been inextricably linked to offer a compelling narrative of the coupling of education models and technological change to enable individual empowerment, social inclusion, and a shared prosperity. This article takes an analytical view, examining the development and use of each concept and identifying how they have come to be brought together. We suggest that despite fundamental flaws, the 4IR has given a new impetus to ideas about lifelong learning that are broader than the individual employment-focused conceptualisation that has dominated in recent times. We then offer a discussion of the nature a progressive conceptualisation of lifelong learning which might respond in a more authentic and realistic way to key changes in the nature of work, life, social and economic activity, and indeed more fundamental issues for humanity.

Keywords: lifelong learning | fourth industrial revolution | digital transformation | future of work

Introduction

It is a widely believed that lifelong learning has come of age in the fourth industrial revolution (hereafter '4IR), where the accelerated pace of change in the economy and wider society make it necessary for people to learn throughout their lives. It's a narrative that speaks to aspirations of social inclusion and shared prosperity at a time of rapid technological change in which the egregious inequalities of the day are viewed as a temporary aberration evident in earlier industrial revolutions (Haldane, 2018). Here, the fourth industrial revolution comes together with lifelong learning to offer a model for individual empowerment, democratic participation, and a route to tackling rampant social inequality. Together, they suggest inclusive objectives for social progress with concrete recommendations for policy action developed by powerful international bodies such as the World Economic Forum (WEF), International Labour Organisation (ILO) and the Organisation for Economic Cooperation and Development (OECD). These recommendations often provide the political legitimacy for national policy innovation, such as guiding the design of lifelong learning systems.

We can think of the 4IR and lifelong learning as conceptual lenses shaping mental representations, interpretations, and simplifications of reality (Bruner, 1996). They represent ways of making meaning and of making sense of the social world. At the

same time, they are dynamic, shifting, and contested concepts, and at any one-time, certain versions gain in prominence. Prevailing ideas about lifelong learning and the 4IR reflect much more than the current state of evidence and rational argument: they also reflect powerful interests, and are mediated by corporate, state, and international institutions, including the mass media, combinations of which may drive the direction of policy in educational or related reforms, and/or enter accepted wisdom or 'common sense' thinking.

Importantly, the concepts of the 4IR and lifelong learning did not develop in tandem. In the UK, the term 'lifelong learning' is rare in policy discourse before the 1980s, though adult education had become well established throughout the 20th century. Although local government gained a statutory responsibility for technical adult education in 1902, adult education was 'supported primarily by non-governmental organisations, such as the Worker's Educational Association, trade unions, a number of influential universities…' (Hodgson, 2001: 6). A major report in 1919 (Ministry of Reconstruction, 1919) championed citizenship education for adults alongside the study of such things as literature and science (Merricks, 2001). Against this backdrop the rise of the concept of 'lifelong learning' from the late 1970s denotes 'a move by successive national governments to mould all parts of the education and training system more closely into a framework…to promote economic growth and to combat economic recession, increasing international competition and fluctuating employment trends' (Hodgson, 2000: 6). In contrast, the concept of a 4IR is much more recent, related to the development and proliferation of Artificial Intelligence (AI) and related digital technologies (Brynjolfsson and McAfee, 2004; Schwab, 2017; Susskind & Susskind, 2015). That lifelong learning is seen to play a key role in the fourth industrial revolution is unsurprising, but *how* the concepts are brought together is a very important matter, for academic analysis, policy action and evaluation, but also for anyone interested in what will shape the future relationship between education, work, and the quality of life.

The chapter begins by outlining the concept of the 4IR, illustrating how its appeal as an idea depends on the presentation of three different elements as if they were automatically and inevitably linked. We also draw upon recent international work illustrating that governmental strategies which are connected to the 4IR have a narrow set of core concerns which on the whole downplay socio-economic inequalities or matters like climate change. We then revisit the longer-standing concept of lifelong learning. We discuss how the concepts of 4IR, and lifelong learning interact, focusing on the way in which these two concepts are brought together. We go on to outline promising avenues for developing a progressive conceptualisation of lifelong learning that might underpin policy, practice, and research.

The fourth industrial revolution: rapid technological change, economic innovation and human progress

The concept of a 4IR is a powerful one that demands attention as it generates both excitement and anxiety. It is a 'techno-infused vision of the future' which has 'come to dominate global discussions at both the government and corporate level, as evidenced by the multitude of think tank…national…and intergovernmental…strategies that in recent years have made increasing reference to this concept' (Trauth-Goik, 2020:2).

As is well-known, a key underpinning of the concept was the German 'Industrie 4.0', introduced at a major industrial technology trade show, the Hannover Messe Fair in 2011. A number of projects followed under the auspices and sponsorship of the World Economic Forum (WEF), culminating in the publication and promulgation of a wider ranging vision of a 4IR by WEF chair Klaus Schwab (Schwab, 2017). The vision is often expressed in momentous terms, e.g.:

> 'Of the many diverse and fascinating challenges we face today, the most intense and important is how to understand and shape the new technology revolution, which entails nothing less than a transformation of humankind…In its scale, scope and complexity, what I consider to be the fourth industrial revolution is unlike anything humankind has experienced before' (Schwab, 2017: 1)

and

> 'The scale and breadth of the unfolding technological revolution will usher in economic, social and cultural changes of such phenomenal proportions that they are almost impossible to envisage' (ibid: 28)

The power of the idea is, however, much more than rhetorical. In order to begin to understand its spread, traction and significance we first need to appreciate how the idea of the 4IR usually combines three main elements:

- *Element 1: The identification of rapid technological development, some of it in unprecedented forms.* There is a wide-ranging acknowledgement of rapid shifts in various digital technologies and their inter-relationships in a world that is increasingly interconnected, demonstrating how these shifts are changing economic and social activity in fundamental ways, including the generation of new forms of value;

- *Element 2: The assertion of a developmental/historical narrative* which confidently positions these rapid technological shifts in the historical development of human civilisation, the more recent periods of which are presented as a sequence of industrial revolutions, with a strong implication of technological determinism and an inevitability in the direction of social progress;

- *Element 3: The statement of a set of values and propositions about appropriate responses*, the clearest of which is the assertion that if it is allowed and enabled to innovate, (usually private) business and industry will provide solutions to major contemporary global problems and will make possible a world in which the lives and prospects of many will improve. This entails temporary adjustments of job destruction and polarisation in the labour market that society has to manage, seen as a necessary part of economic innovation.

The first element is the least contentious, and there is no shortage of examples which can convincingly demonstrate it across many fields of activity. Indeed, although they vary in enthusiasm, most accounts of the 4IR include illustrations of recent, rapid or ongoing change in areas such as the internet of things (IoT), artificial intelligence (AI), machine learning (ML), cyber-physical systems (CPS), robotics, big data, and genetic engineering.

However, the danger here is that the compelling evidence of this first element is taken to support the other two, which are much more open to question. For example, with regard to the second and third elements, Avis argues that across a range of documents produced by consultants and business organisations about the 4IR, there is an oversimplification of current industrial activity which ignores the many different forms it already takes (Avis, 2018: 351). Avis argues that this gives a false credence to the claim that the 4IR heralds a radical transformation to a qualitatively different set of practices: it also ignores the fact that some important changes have been in train for a long time, such as in the use of flexible working.

Avis also questions the absence of serious consideration, in 4IR discourse, of social relations, including the distribution of power. Schwab's account occasionally speaks of the need for a collective response to the 4IR, but it is one that appears sociologically naïve. For example, he says: 'The reality of disruption and the inevitability of the impact it will have on *us* does not mean *we* are powerless in the face of it. It is *our* responsibility to ensure that *we* establish a set of common values…(Schwab, 2017: 13, emphases added). Given the radical and momentous nature of the changes discussed, it matters a great deal to whom the 'our' and 'we' refers: who exactly has this 'responsibility to establish a set of common values'?. As we have already indicated, the third element of the 4IR concept suggests that it is the values of industrial and business innovation that must prevail.

There is empirical evidence that supports this interpretation. Trauth-Goik (2020) offers a discourse analysis of six national and intergovernmental strategies, namely: *Industrie 4.0* (Germany); the *Japan Revitalisation Strategy*; the EU's *Horizon 2020*; *Advanced Manufacturing Beyond the Production Line* (Australia); *Made in China* 2025; *Accelerating US Advanced Manufacturing*. All of these were published within five years of 2011, and all make reference to either Industrie 4.0 or the 4IR. Whilst the strategies differ in terms of emphasis (for example, one from the USA has an emphasis

on advanced manufacturing, whilst that from Japan has an emphasis on AI and robotics), they share a fundamental logic, having in common a:

> '…narrow lens of innovation and competitiveness through which the prospect of technological convergence is appraised, thereby revealing the underlying assumptions and motives of leading classes located within the existing market economy…the 4th IR is presented as an opportunity to upgrade existing business ideologies and structures, rather than as an opportunity to address the inequalities these structures propagate…during a time of unprecedented technological advancement and convergence, the focus is on system *maintenance* rather than *transcendence*' (Trauth-Goik, 2020: 12, original emphasis).

It is of note that Schwab (2017) paid some attention to societal issues that the 4IR was likely to exacerbate, such as inequality, risks to large segments of the middle class, environmental impacts and radical changes in the nature of work. Schwab (2017) concedes that 'The fourth industrial revolution seems to be creating fewer jobs in new industries than previous revolutions' (p.39), but also observes that 'It has always been the case that technological innovation destroys some jobs, which it replaces in turn with new ones in a different activity and possibly in another place' (p.38). In other words, the (global) market will eventually sort things out. It is thus no surprise that matters of technological unemployment and underemployment have a very low profile in most of the six strategies examined by Trauth-Goik (2020). In fact, the strategies demonstrate a clear and core hierarchy of terms, with 'innovation' the most prominent cluster, followed by 'industry', then 'business'. Collectively, the strategies did not make much use of terms falling into a 'jobs/careers/employment' cluster, though this did differ between them, being a particular focus of the *Japan Revitalisation Strategy,* where a concern with job retention and employment has been a feature of:

> '…consecutive Japanese strategies, including that of 'Society 5.0', a concept introduced by the Abe administration in April 2016…(which) promotes a vision of an ideal techno-society informed by a "a new social consensus"…Society 5.0 presents the most human-centred strategy aimed a charting the shifting landscape of the future, exhibiting the Japanese government's attempt at balancing the needs of citizens versus capital' (Trauth-Goik, 2020: 13-14).

Trauth-Goik went on to analyse the strategy documents using keyword clusters derived from a range of goals in the 2030 UN Agenda for Sustainable Development, concerning such matters as poverty eradication, healthy lives, education and lifelong learning, productive employment and decent work, inequality, climate change, and access to justice. The outcome suggests that none of these matters took precedence over what was mentioned above as the 'clear and core hierarchy' of innovation, industry and business. Some references were made to technological contributions towards problems of pollution and climate change, and to facilitating long-term

education and lifelong learning. However, reducing poverty and inequality only appeared in one of the six strategies, i.e. *Horizon 2020.*

The analysis presented by Trauth-Goik shows why we need to approach the 4IR discourse with great caution, remaining wary of the purported congruence between the three elements that we have identified. For Trauth-Goik, the 4IR is 'exclusionary' and it fosters a 'one-dimensional and business-oriented view of the future' (:17) in which the interests of humanity are seen as best served by business and industry. Arguably, what we have termed the third element of the 4IR reprises a familiar line of reasoning from neoliberal economics, separating business and market competition from other realms of life and insisting on the primacy of economic growth from which everyone will benefit[1]. Here however, there is a further step: 'In endeavouring to keep separate the interests of business and wider society…the 4IR discourse invites innovation and creativity which is demonstrably misaligned with the long-term interests of the species and planet (Martorana & Smith, 2018)' (Trauth-Goik 2020: 17). Trauth-Goik goes on to provide some early pointers to an alternative, involving revisiting the origins of the word 'technology'.

Thus, the 4IR discourse has been subject to critique, though perhaps not as much as might be expected. Peters (2017) questions the historical narrative (the second element of the 4IR discourse) which categorises a whole raft of contemporary change as 'industrial', showing how the parallel with earlier rapid industrial change is over-drawn. He argues that the contemporary period does have a distinctive logic which is realising a 'single planetary technical system that enables access to global markets in instantaneous real time'. The system 'becomes dynamic and transformative demonstrating the properties of chaotic and complex systems that also increase volatility, interconnectivity and unpredictability. This is in part the consequence of the digital logic that drives the single technical system of "algorithmic capitalism"' (Peters, 2017: 3).

We suggest that the 4IR narrative is seductive precisely because it deliberately and rhetorically conflates the three elements we have described. Rapid and radical developments in digital technology are coupled with the creation of an illusion of both inevitability and a profound powerlessness in the face of technologically driven change. Disaggregating these elements is therefore much more than a conceptual nicety because it can help policymakers and others to work out where to focus their energies and attention whilst also reminding them that – as with all aspects of technologically-related change through history - there are always choices to be made and questions of value at stake in how technological affordances play out.

In the next section, we offer a brief account of the development of lifelong learning before turning to consider how the two concepts are currently and potentially related. A final section considers implications for rethinking lifelong learning so that if offers a more positive engagement with the 4IR.

Lifelong learning: economic, personal and democratic participation

By the late 1990s, many western governments had made a concept of lifelong learning central to their education and training policy, driven mainly by a human capital rationale and a focus on skills upgrading to remain competitive in the increasingly deregulated global market economy (Brown, Lauder and Cheung, 2020). Lifelong learning was typically portrayed as a vehicle for increasing opportunity and social mobility, or as a more general panacea for wider social problems. Transnational organisations including UNESCO, OECD and EU, all pointed to the growing importance of lifelong learning and the need for national strategies to be developed. UNESCO's *Learning to Be* (Faure, Herrera & Kaddoura, 1972) and the European Commission's *Learning: The Treasure Within* (Delors, 1996), were both prominent. The latter outlined four 'pillars' of learning to know, learning to do, learning to be, and learning to live together that continues to influence policy discussions of lifelong learning.

However, such all-encompassing concepts of lifelong learning are also inherently difficult to use as a guide to national public policy and institutional reform, for three reasons. Firstly, the policy objectives that follow:

> '…often deal with "soft", intangible and complex issues – notably learning rather than education, for example…[and]…they involve a broad and diverse range of actors, including large numbers of individual citizens and a variety of policy agencies rather than a single department (Field 2000, :249-50).

Secondly, 'lifelong learning' has often been presented as self-evidently good (who could argue that learning opportunities are a bad thing?). Because it can be interpreted in quite different ways, there are few collision points or disagreements that might produce the perception that it is an 'empty signifier' (Laclau, 1996). It has at times been conceived as a panacea: in the UK lifelong learning was expected to 'improve educational standards, national competitiveness, wealth creation, personal well-being, social cohesion, citizenship and the quality of life' (Robertson, quoted in Coffield 2000 :32).

Thirdly, and closely related to the above, we would argue that concepts of lifelong learning are *necessarily composite,* in that they are attempts to hold together a number of divergent strands, interests and agendas which are sometimes in tension with one another. Coffield, who led a large UK research programme focused on this area, identified a non-exhaustive list of ten different 'models of a learning society', each of which reflected a different purpose or core concern (Coffield, 2000). In the account that follows, we signal a three-way division which appears to be particularly useful for grasping development, change and possibility in the realm of lifelong learning.

An example of the inherent limitations of an abstract definition of lifelong learning at both the international and national level is offered by Biesta's (2006) work, based on

a critical reading of supra-national policy documents from UNESCO, OECD and the European Union. The policy recommendations from these bodies do not *determine* national policies, but have a strong influence in agenda-setting, benchmarking, and international comparison. Examining key documents over time, Biesta identifies a fundamental shift at the level of the values that the organisations convey through lifelong learning, and presents a convincing argument that this shift contributed to the rise of a 'learning economy' discourse and a move away from 'learning to be' towards 'learning to be productive and employable':

> 'Whereas in the past lifelong learning was seen as a personal good and as an inherent aspect of democratic life, today lifelong learning is increasingly understood in terms of the formation of human capital and as an investment in economic development. This transformation is not only visible at the level of policy; it also has had a strong impact on the learning opportunities made available to adults, partly through a redefinition of what counts as legitimate or 'useful' learning and partly as a result of the reduction of funding for those forms of learning that are considered not to be of any economic value' (Biesta, 2006 :169)

Biesta identifies a key turning-point in the form of the 2000 European Council's Lisbon Strategy and its goal to make Europe 'the most competitive and dynamic knowledge-based economy in the world' (Van der Pas[2], 2001, cited in Biesta 2006: 171). In addition to its demonstration of the malleability of lifelong learning policy, Biesta's analysis follows Aspin & Chapman (2001) in pointing to its composite nature. There are three dimensions which, whilst they vary greatly in importance and visibility, are generally persistent components, namely: (a) lifelong learning for economic progress and development; (b) lifelong learning for personal development; and (c) lifelong learning for social inclusiveness and democratic understanding and activity. Biesta adopts these 'economic', 'personal' and 'democratic' dimensions for a triangular model, demonstrating that whilst all three do feature in major supra-national declarations, the more recent of these give increasing primacy to the economic dimension: economic growth has become *intrinsically valued* in the way that earlier documents positioned the valuing of democracy (e.g. Faure, Herrera & Kaddoura, 1972) or social inclusion and social cohesion (e.g. OECD, 1997).

Accompanying this general shift in what is valued is an increasing individualisation of responsibility in lifelong learning and a 'reversal of rights and duties'. Where once the state may have seen itself as having a duty to provide or orchestrate opportunities and resources,

> '…it seems that lifelong learning has increasingly become a duty for which individuals need to take responsibility, while it has become the right of the state to demand of all its citizens that they continuously engage in learning so as to keep up with the demands of the global economy. Not to be engaged in some form of 'useful' learning no longer seems to be an option…' (Biesta, 2006: 176)

At a national level, some of the research on lifelong learning also reveals the difficulties of maintaining a workable balance between the 'economic', 'personal' and 'democratic' dimensions, especially when lifelong learning policy is introduced alongside institutions and cultures that are already 'bedded in'. In the UK, for example, political enthusiasm for lifelong learning put it at the very centre of government economic policy in the late 1990s. The vision (e.g. Department for Education and Employment, 1998) encompassed a broad range of goals but with a primary focus on the economic. Extensive reform of the school sector was driven by human capital thinking and the needs of what was characterised as a 'knowledge' economy (Brown, Lauder and Ashton, 2011). Reflecting a narrow view of education as investment in the productive capacity of individuals, this had entailed an aggressive promotion of school choice and diversity to drive up standards and raise achievements. Subsequent assessments of the achievements and disappointments of lifelong learning point to a clash of purposes. Hargreaves (2004) came to the view that school-centred policies did not contribute effectively to key purposes of lifelong learning, such as learning how to learn and the development of generic skills. Schuller and Watson's more thoroughgoing assessment pointed to the failure of 'a system which achieves its immediate objectives of raising young people's qualifications yet leaves them without an appetite to carry on learning'. They added that '(t)oo many leave school without basic skills or any qualifications, and therefore without the foundation for subsequent learning…Having these fundamental competences is arguably more important than achieving a minimum number of subject certificates' (Schuller & Watson, 2009 :49). It seems that the priority given to raising school examination outcomes in the name of economic productivity is a major reason that a holistic and progressive vision of lifelong learning did not persist and flourish in England.

A further national example shows how the tensions remain visible even where a conceptually strong form of lifelong learning pertains with ongoing and explicit political support. In Singapore, Tan (2017: 280) suggests the well-eastablished *SkillsFuture* policy programme is underpinned by three 'models', namely 'the skills growth model, the personal development model and the social learning model' which are close to the 'economic', 'personal' and 'democratic' dimensions discussed above. The skills growth model has a focus on enhancing skills for greater economic prosperity and draws upon human capital thinking. The personal development model includes 'individual self-fulfilment in all spheres of life', harking back to long established theory and practice in adult learning. The social learning model 'underlines the role of institutions of trust and cooperation as the means to bring about not just economic progress but also social equity' (ibid). Having identified these, Tan arrives at the view that a 'triadic' concept of lifelong learning seeks to integrate the diversity of aims in each of these models. Her view is that although the major investment in Singapore is 'primarily driven by economic considerations' (:281), at the same time a broad vision of lifelong learning is retained.

However, Tan's major contribution is to outline challenges that frustrate the 'successful promotion of lifelong learning through the SkillsFuture movement in Singapore' (:283). Three in particular are identified, namely: the sociocultural preference for academic rather than vocational education; a lack of a strong culture that underscores not just skills but also the habits of mind needed for lifelong learning; and the dominant ideology of pragmatism. An important parallel with the UK is apparent here: features, beliefs and expectations of an established schooling system work against the vision of lifelong learning that is encapsulated in SkillsFuture. The widespread preference for academic rather than vocational learning is bound up with beliefs about academic qualifications and especially, university degrees being a necessary and sufficient basis for a secure future. Tan alludes to the historical basis for this perception in the narrowly selective access to elite schools and universities of the immediate post-independence period.

As with the UK example above, whilst the specificities of the case are important and distinctive, it also illustrates something of the tensions between the strands of a lifelong learning vision, and also how, despite rhetoric to the contrary, institutional systems and cultures of schooling can be in conflict with the goals of lifelong learning. This is a point underlined by Gleason (2018) in her overview of Singapore's higher education system and recent university reforms under *SkillsFuture* and the *Smart Nation* initiative. While *SkillsFuture* seeks to make lifelong learning educational opportunities available to the broad Singaporean workforce, the *Smart Nation* initiative seeks to support the pervasive adoption of digital and smart technologies (Singapore Government 2021a & 2021b). The Government's *Report of the Committee on the Future Economy* (Singapore Government, 2017) explicitly addressed responses to the fourth industrial revolution. As we would expect, these included system changes to support upskilling and more flexible provision (such as an increased use of short 'stackable' modular programmes). More surprising is that the tension with established institutionalised schooling is acknowledged. Goals that are more 'cultural' included reducing the expectation upon students 'to seek the highest possible academic attainment as young as possible' and instead encouraging them 'to learn and acquire new skills throughout their lives' (Gleason, 2018: 154).

Broad shifts in what is valued in declarations about lifelong learning, along with shifts in what is promoted, incentivised, funded and so forth, give rise to new questions about motivations for learning. Biesta asks why individuals would want to engage in learning 'if decisions about the content, purpose and direction of one's learning are beyond one's own control'? (Biesta 2006: 176). While Biesta is right to suggest that grand economic visions (such as that in the Lisbon agenda) are not likely to motivate most individuals, we would add that there is no shortage of other motivations where people are afraid of losing their jobs in conditions of job scarcity (Brown, Lauder and Cheung, 2020). In the next section we turn to consider such inter-relations between 4IR-inspired agendas and lifelong learning.

The fourth industrial revolution and lifelong learning

Thus far, we have argued that the concept of a 4IR, at least in its original and influential formulations, contains three elements, and that the first, with its focus on advances in digital innovation, does not necessarily give credence to the second and third which are much more contentious. We have also argued that the concept of lifelong learning is helpfully approached as a composite of three strands or dimensions which vary in relative strength and are in some tension with each other, and that the prominence given to these dimensions has changed over time. We now turn to consider the implications of the dominant policy narrative of the 4IR for existing accounts of lifelong learning. Our core questions here are: (a) in what ways have there been attempts to bring the two concepts together?, and (b) in what further ways might the two concepts be brought together? Our primary interest is in exploring the possibilities and prospects for progressive lifelong learning policy which facilitates positive societal responses to the changing nature of work, production, consumption and social life, that come with rapid economic, technological and social developments.

Whilst Schwab (2017) did not refer directly to lifelong learning when he outlined his grand narrative of the 4IR, he did refer to the development of education models to enable the development of human capabilities to support human-machine complementarity:

> 'In thinking about the automation and the phenomenon of substitution, we should resist the temptation to engage in polarized thinking about the impact of technology on employment and the future of work. As Frey and Osborne's work shows, it is almost inevitable that the fourth industrial revolution will have a major impact on labour markets and workplaces around the world. But this does not mean that we face a man-versus-machine dilemma…*leaders need to prepare workforces and develop education models to work with, and alongside, increasingly capable, connected and intelligent machines*.' (Schwab, 2017 :43, emphases added)

This view is a variant of a longer-standing portrayal of a race between education and technology (Goldin & Katz, 2008) in which society must invest in an education system, including lifelong learning, to enable workers to adjust to the disruption brought about by rapid technological change, in this instance preparing them with longer-term skills and traits that machines cannot replace (Levy & Murnane, 2013). Clearly, this line of reasoning takes us beyond any simple idea of upskilling individuals for new and specific forms of work, focusing to some extent on mechanisms, capacities and potential.

Whereas governments and individuals have been the traditional targets for policy recommendations to build lifelong learning systems, the World Economic Forum (2018) has called for the creation of a broader ecosystem to support lifelong learning, retraining and upskilling, in which businesses have an important part to play:

> ‘To prevent an undesirable, lose-lose scenario—technological change accompanied by talent shortages, mass unemployment and growing inequality—it is critical that businesses take an active role in supporting their existing workforces through reskilling and upskilling, that individuals take a proactive approach to their own lifelong learning and that governments create an enabling environment, rapidly and creatively, to assist in these efforts’.

And:

> Our analysis indicates that, to date, many employers’ retraining and upskilling efforts remain focused on a narrow set of current highly skilled, highly-valued employees. However, in order to truly rise to the challenge of formulating a winning workforce strategy for the Fourth Industrial Revolution, businesses will need to recognize human capital investment as an asset rather than a liability. This is particularly imperative because there is a virtuous cycle between new technologies and upskilling. New technology adoption drives business growth, new job creation and augmentation of existing jobs, provided it can fully leverage the talents of a motivated and agile workforce who are equipped with futureproof skills to take advantage of new opportunities through continuous retraining and upskilling. (WEF, 2018 :v)

The OECD takes the ‘system’ idea further through developing a ‘dashboard’ comparing the future-readiness of countries’ adult learning systems, similarly pointing to the vision of rapid technological change that require workers to be provided support in terms of how skills and careers are to be maintained:

> Globalisation, technological progress and demographic change are having a profound impact on the world of work. These mega-trends are affecting the number and quality of jobs that are available, how they are carried out and the skills that workers will need in the future to succeed in the labour market…Adult learning systems have a key role to play in enabling individuals to keep their skills continuously updated to stay employed and/or find new jobs. In most countries, failure to develop and maintain skills that are relevant to labour market needs has translated in recruitment difficulties for employers, coexisting with individuals struggling to find jobs matching their skills. Such imbalances are costly for the individual, employers and society as a whole. (OECD, 2019: 1)

Like WEF, the OECD highlights an important role for employers:

> A large share of adult learning takes place in the workplace, not least because this is where adults spend a lot of their time. Further, employers have an interest in keeping the skills of their employees up to date, so that they can introduce

> new technologies and work-organisation methods and stay competitive. (OECD, 2019: 1)

These declarations are an important and authoritative source for those concerned with formulating or updating lifelong learning policy. However, a more critical perspective is required if we wish to understand their prospects for success. The recent work of Means (2019) considers dominant characterisations of the relationship between 4IR and lifelong learning via what he terms 'sociotechnical projections of urbanity and education' emerging in the last decade or so. Here technological development is assumed to offer infinite scope for solving a range of social, economic and environmental problems. Focused mainly on the city and visions of how cities will develop, these projections are 'popularised at TED Conferences and Ideas Festivals and undergirded by the Promethean ambitions of Silicon Valley' (:205). Such visions of the future present the city as the site of intervention, and new technologies (especially the digital integration and optimisation of human activity and the physical environment) as the vehicle for attaining a more sustainable future. Creativity, and especially the capacity to invent and innovate, is positioned as the key capability. Crucially,

> *'…*learning is framed as the principal *imperative* of the here and now. A redesign of education alongside emerging technology is thought necessary to ensure development of the creative, aesthetic, technical, scientific, and innovative capacities required for achieving a vibrant future' (Means, 2019: 206. Original emphasis).

Means goes on to give an overview of these representations, constructing three ideal-types from the range of narratives in circulation. The first is 'solutionism' wherein 'urbanity and learning are conceived as a networked and customizable project aligned with creativity as a resource for solving twenty-first century problems' (:215). For the most part this takes the form of devising ever more complex algorithms. This approach is illustrated with the example of software corporation Cisco, for whom learning is the principle means of stimulating entrepreneurial innovators and therefore economic productivity. The second ideal-type is 'collaborationism' which emphasises and celebrates increased technological affordances of networking to increase participation, collaboration and sharing in solving a similarly wide range of current problems. These affordances and the new forms of value they bring are also seen to pave the way for fundamental economic transformation, where capitalism and bureaucratic states give way to a 'collaborative commons' (e.g. Rifkin, 2014). The third ideal-type is 'techno-realism', as exemplified in the work of Cowen (2013). More akin to surrender or acquiescence, this account predicts that technological developments such as AI will rapidly and permanently exacerbate urban and regional inequalities and will consolidate a small elite and a large underclass, the latter facing either continual precarity or unemployment. In this scenario, a kind of extreme meritocracy has the individual's fate dependent on their personal resilience and their investments

in learning of a sort that opens up opportunities to invent, own or add value to the technological means of production.

These ideal types have quite different ontological reference-points, and while the differences are important, our main concern here is with what the representations have in common. As Means puts it 'each signal a prevailing sense that technological change exists as an inevitable, isolated, and objective variable' (:214) and that they each 'reflect forms of ideological reasoning inherent to an education futurism as it positions digitalization as a force of change outside complexities of power and history' (:215). Means goes on to note that despite there being a whole range of 'utopian and dystopian scenarios and alternative futures' available, nevertheless

> '…the rationalities of solutionism, collaborationism and techno-realism each share a common ideological orientation reflecting a paradox…Namely, within the realm of technology anything is thought possible, while at the level of political economy nothing is…'

And more specifically,

> 'Within such boundaries, serious debates over our patterns of production, exchange, ownership, labour, consumption, and endless growth are largely made invisible. Simultaneously, we are inundated with fantastical narratives of technological change…alongside their projections of creativity and learning as resolution, transcendence, and resilience' (Means, 2019: 220).

This assessment encapsulates a fundamental problem and further illustrates the ideological nature of conventional 4IR discourses which, as Trauth-Goik argued, offer a one-dimensional view of what might best serve the needs of humanity. It strongly suggests that the question 'what should we do about rapid digital technological change', whilst important, is the wrong starting-point for a progressive concept of lifelong learning. A more realistic and productive starting-point might be the questions 'what kind of society do we want, how can it be realised sustainably, and what models of learning will serve us best'?

Towards a progressive concept of lifelong learning

The tendency for the 'economic' dimension to come to dominate lifelong learning policy, noted earlier, could perhaps be understood as a triumph of neoliberalism, reflecting the influence of global corporate interests and a narrow view of skills and human capital, linked to the idea of a 'knowledge economy', as the main route to national economic survival in a global market. However, and by contrast, rapid technological changes of the sort outlined in 4IR discourse question the relative certainties of a narrow view of skills and how these contribute to productivity. Such changes also challenge the established assumptions of an education-labour market

relationship where it is possible to discern skills 'gaps' and then fill them with a degree of efficiency in an orchestrated policy-driven process. There are abundant examples of how 'digital disruptors' are in the process of changing established areas of economic activity and their associated labour markets. These are not confined to automation in manufacturing, distribution, retail, and banking but also apply to large swathes of professional work (Susskind & Susskind, 2015) and to the exponential growth in the gig economy in fields like food delivery and taxi services. Jordan (2019) argues that in addition, the very distinction between producing and consuming is increasingly blurred by digital transformations, giving rise to a range of changes in jobs, workplaces, homes, infrastructures, social lives, domestic lives and leisure. In a nutshell, it seems important that ordinary citizens have ready access to learning that can enhance their understanding of such social change, but which can also assist them with surviving and thriving in a new context (Bound, et al., 2020). Thus, the first element of the 4IR highlights the need for a broad conceptualisation of lifelong learning.

As we have seen, in addition to its account of far-reaching technological change, the 4IR discourse also presents strong messages about inevitability, about how this sits in the historical development of humankind and how it is corporate interests that have the capacity to provide solutions to the new problems that are generated. This brings us to a further crucial point: regardless of their basis in evidence or their validity, such messages give rise to new anxieties, questions and concerns. Our view is that lifelong learning can be an important counterweight to these anxieties, questions and concerns, with the potential to provide individuals with the tools to navigate – perhaps sometimes negotiate – their way. Here, policy and provision which reflects a progressive concept of lifelong learning holds out the promise of individual empowerment but also may contribute to social cohesion in times of rapid change. Where lifelong learning has at times been narrowly conceived to offer ways to mitigate individual or national risks of economic marginalisation, the 4IR discourse makes it easier to imagine and to advocate forms of lifelong learning that attend to democratic and social participation, a view articulated by Painter and Shafique (2020):

> 'Technological change and economic shifts are creating an ever more urgent need to ensure growth is inclusive and fairly shared…In response to these trends, we need a much greater focus on socially inclusive lifelong learning. This means equipping more people with the cognitive skills and knowledge that are developed through academic or vocational education, but it also means greater equity in the distribution of the non-cognitive ('soft') skills, such as resilience and confidence, that are increasingly important to success at work and to life chances more generally (Painter and Shafique, 2020).

Along similar lines, a universal entitlement to lifelong learning is recommended by the International Labour Organisation's Global Commission on the Future of Work:

> '…the imperative for LLL has been recently reinforced by emerging debates surrounding the accelerating pace of technological change and the future of work and employment. Consequently, as labour markets and the demand for skills evolves, a comprehensive people-centred and rights-based approach to LLL is seen as a key strategy to help workers adjust to change, prevent the high social costs and maximise the positive effects of the complex and disruptive changes that lie ahead (International Labour Organisation, 2019: 3).

Statements of this kind signal the rediscovery of a rights-based approach and offer nascent hope of a return to earlier humanist and democratic conceptions of social progress. However, we would argue that a refreshed and progressive concept of lifelong learning would need a firmer theoretical basis. Means makes a similar point, arguing that theorists 'need to generate new forms of critical analysis…as well as engaging with and offering counter perspectives that take a more creative and expansive sociohistorical view' (2019: 220). Examples cited by Means include the highly optimistic general utopian vision of digital technology as socially emancipatory (e.g., Smicek & Williams 2016), and a more specific assessment of how learning and technology are arguably becoming more directed towards democratic participation and egalitarianism: 'By creating millions of networked people, financially exploited but with the whole of human intelligence one thumb-swipe away, info-capitalism has created a new agent of change in history, the educated and connected human being' (Mason, 2015: 27).[3]

Means concludes that the messages he is criticising, in which the city is conceived 'as a digital platform to be optimised and computed' must be replaced by a different view, in which the city as 'a site of conscious experimentation and applied mass intellectuality' (: 222). Yet while it offers a helpful general background, such an analysis does not do much to help us think directly about the core concepts of a lifelong learning policy, and we may do better to turn to previous attempts, such as the 'life wide learning' concept developed by Jackson (Jackson 2012), itself grounded in the earlier work of educators such as Lindeman and Dewey. Alternatively, a learning theory that has always and explicitly put employment-facing needs equally alongside personal and societal needs is the capabilities approach (e.g. McGrath et al. 2020; Powell and McGrath 2019), grounded in the earlier work of Sen and Nussbaum. In both cases, there are rich ontological views of the person, of human flourishing, of learning, and indeed the significance of social location. Although we do not explore these perspectives here, they do influence our reading of the recent and contemporary policy and our thinking about how it may develop in future.

Finally, a refreshed idea of lifelong learning would need to take into account the changing nature of work itself. The very meaning of 'work-facing learning' continues to shift, and rapidly: where once it was mainly conceived to be about sets of skills demanded by employers for specific roles, it must surely now include greater attention

to individual development, growth, versatility, and well-being so that people are better equipped for a productive working life in more flexible, agile arrangements.

The nature of work is changing, often quite fundamentally. Whilst there is a 'perpetuation of an ideology of work as a source of rights and income entitlement' (Peters, 2020: 485), there is constant *de facto* erosion of this, especially for those living on poverty wages (Judge and Slaughter, 2020). Therefore, while most governments are concerned with enabling industrial transformation for a better future of work, this is more difficult to achieve than it sounds because the fundamental problem is not one of labour scarcity – of getting enough people with the skills to take up new opportunities presented by technological innovation - a view consistent with orthodox human capital assumptions (Autor, 2015). Instead, there is a structural problem of job scarcity, where the so-called race between education and technology is reversed, as workers (especially young workers) struggle to find jobs that match educational achievements (Brown, Lauder and Cheung, 2020; Brown 2020; Brown & James, 2020). This has profound implications for learning opportunities through the lives of most people.

Conclusion

Our consideration of prominent concepts, policy and practice under the umbrella terms '4IR' and 'lifelong learning', and how these interact, leads us to conclude that the dominant narrative of the 4IR discussed in this chapter may bear little relationship to the realities of work transformation.[4] There is an urgent need to reimagine the 4IR in tandem with a progressive conceptualisation of lifelong learning. Such a conceptualisation would be framed to combine the three dimensions described earlier, i.e., it would continually attend to the capacities needed under the broad headings of economic participation, personal development and democratic participation of citizens. More specifically we propose the following 'principles of procedure'. The conceptualisation would:

1. begin from, encapsulate and promulgate a coherent view of the person/citizen and the person/citizen's entitlement to learning opportunities, including their right to ethically sound learning opportunities and privacy;
2. maintain breadth in its view of the learning process and its view of the range of purposes and beneficiaries of learning activity. This would acknowledge that whilst many worthwhile learning activities are directly work- and job-oriented, many others do not have an obvious or immediate connection to the workplace, or are undertaken before such a connection can be seen;
3. direct resources to provision that responds to known and emergent employer needs for upskilling whilst also engaging in constant horizon-scanning for emergent jobs and skills, and new forms of economic activity, responding early and experimentally to these including 'bottom up' approaches to economic and social innovation;

4. provide opportunities which support individual agility and transitions as a right in a time of inevitable rapid technological change, whilst recognising that greater agility may itself reduce opportunities for some forms of workplace learning;
5. pay particular attention to building creative and other capacities of the sort that machines are not good at, thereby contributing to the maintenance of human dignity and self-worth amongst citizens;
6. foster the creation and promote the use of new tools for learning, which themselves often incorporate advanced AI, whilst maintaining ethical standards (e.g., preventing the unethical use of learning-related data in career progression);
7. ensure the wide and continuing availability of opportunities for citizens to engage in learning that builds critical appreciation of recent and contemporary technological developments and their effects - positive and negative – on lives, livelihoods, prospects and well-being;
8. have a high profile in a fundamental and assessed part of the school curriculum, such that an understanding of and preparedness for lifelong learning is a regular and expected feature of schooling for all citizens.

As well as following from the foregoing discussion, these principles take into account that it is likely that policy responses will tend towards the conservative. Peters describes how many responses to technological change seek to preserve society as it is:

> ‘Education is seen a social sponge and lifelong learning is seen as a ‘solution’ to the need for perpetual retraining in new skills. The emphasis seems to fall on mopping up the unemployed, creating work, rather than focusing on a sustainable future society that can protect its citizens’ (Peters, 2020: 486).

We have suggested that in addition to having strongly ideological features and being highly problematic in its conflation of elements, the 4IR discourse now needs to be contested in ways that give impetus for a new and progressive conceptualisation of lifelong learning. There is further work to be done to develop the theoretical underpinnings of these conceptualisations. We also suggest that any concept of lifelong learning is necessarily pluralistic, combining strands that are sometimes in tension. The point is not to seek to resolve such tensions, but to recognise them for what they are, as fault-lines running through any society that seeks to accommodate capitalist relations of production with democratic governance and concern for social cohesion, health, the quality of life and ecological sustainability. Furthermore, if any one dimension comes to dominate and the others become ‘empty signifiers’, this constitutes the demise of lifelong learning (James, 2020).

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Endnotes

[1] Arguably the most famous popular expression of this is the phrase 'Growth is a rising tide that lifts all boats'. Often used by J F Kennedy, this was seemingly supported by, amongst others, Kuznets' theory that economic growth first produces greater inequalities, then greater equalities. See Piketty (2014) for an account of why this theory became so politically influential in a Cold War climate.

[2] Van de Pas was Director-General, European Commission Directorate for Education and Culture.

[3] A recent isolated example of this in the UK may be where a prominent footballer used social media to trigger a rapid U-turn in government policy, such that free school meals were retained for the poorest children during school closures during COVID lockdown.

[4] This is the focus of a major comparative research programme involving the authors of this chapter. For more information see, https://digitalfuturesofwork.com/