

## Chapter 1 – Introduction

### Abstract

This chapter serves as an introduction to the book, exploring key terms, in particular Industrie 4.0 and the fourth Industrial Revolution (4th IR). It examines the origins of the term and its mobilisation not only in Germany but elsewhere. In addition, it provides an overview of the other chapters, signalling the wide ranging arguments that the book seeks to address. The 4th IR encompasses far more than a narrow technical focus upon advanced manufacturing processes. Consequently, this chapter engages with discussions about post-work, Marxism as well as Italian Workerism, which provide a counter to mainstream arguments about the 4th IR. These former arguments provide a rather different understanding of the ideological and socio-economic context in which the 4th IR is located to those found in policy and consultancy documents. Importantly, the chapter engages with vocational education and training and allied conceptualisations of skill. In this instance the arguments will be related to those that address the labour market, class, gender and regional variations present not only in Europe but also within low and middle income countries.

### Introduction

Industrie 4.0 and the fourth Industrial Revolution (4th IR) anticipate the transformation of economic, social and political relations, or at least that is what some pundits would like us to believe. The terms themselves are fairly recent with industrie 4.0 being coined in 2011 at the Hanover trade fair by three engineers<sup>(1, 2)</sup> and the 4th IR by Klaus Schwab of the World Economic Forum in 2016 (Schulze, 2019). In this book I address a number of the debates and contestations that surround these terms. By doing so this allows me to consider the broader socio-economic context within which these debates are placed and the implications for the development of a socially just society. In addition, the chapter provides an overview of the other chapters, signalling the wide ranging arguments that the book seeks to address.

Both terms Industrie 4.0 and the 4th IR find their way into any number of policy documents as well as in the pronouncements of consultancy firms, all of which call not only for the re-thinking of organisational practices and the nature of waged labour but also of educational processes and vocational education and training (VET). More often than not the 4th IR is framed by a linear, technicist and deterministic logic in which the first Industrial Revolution is followed by the second, third and so forth. In this instance diagrammatic representations similar to figure 1 are endlessly reiterated. These diagrams are reminiscent

[Insert figure 1 about here]

Figure 1

of those found in social and economic history text books and further secure the inevitability of these processes (Fuchs 2018; Peters 2017:3; Kagermann, Wahlster, and Helbig 2013:13; Wahlster 2016:4; Schrauf and Bertram 2016:8). This trajectory is set within a very particular

periodicity, with the 1st Industrial Revolution running from 1760 to around 1840 being related to the development of steam power, mechanical production and the railways,. The 2<sup>nd</sup> Industrial Revolution ran from the late nineteenth to the early mid-twentieth century and was marked by the development of mass production and electrification (Peters 2017:3). The 3<sup>rd</sup> Industrial Revolution featured the emergence of personal computers, digitalisation and the Internet and is seen as anticipating the 4<sup>th</sup> which intensifies these features. The 4th IR is construed as having a number of characteristics, which include. (Schwab 2017:7, 8)

enabling “smart factories”. . . creating a world in which virtual and physical systems of manufacturing globally cooperate with each other in a flexible way. This enables the absolute customization of products and the creation of new operating models. . .

It is the fusion of these technologies [gene sequencing, nanotechnology, quantum computing, etc] and their interaction across the physical, digital and biological domains that make the fourth industrial revolution fundamentally different from previous revolutions.

Brynjolfsson and McAfee (2014) mobilise a not dissimilar trajectory arguing that the first industrial revolution ushered in the first machine age which was followed by the second machine age which developed in recent decades and is being taken forward in the current conjuncture. For these writers the second machine age encompasses the 3<sup>rd</sup> and 4<sup>th</sup> IR and beyond. Bastani (2019) mobilises a rather different terminology and describes the current conjuncture as the third disruption, with the first representing the development of agriculture, the second the first industrial revolution and the third presaging a post-scarcity world (37). McAfee (2019) has argued, rather more conventionally, this is one in which we can gain more from less, whereby fewer resources are required to produce socio-economic well-being.

There are a number of additional features associated with the 4th IR that are used to argue that we are entering a new era that is qualitatively different to the recent past. These features include the automation of not only manufacturing and industrial processes but also of those surrounding the provision of services and domestic life. These advances are allied to the development of smart factories and the internet of things (IoT). In this instance machines communicate with one another which in turn is related to the increasing salience of artificial intelligence, robotisation and the internet of services (IoS). The mobilisation of algorithms becomes all pervasive in any number of spheres from the factory, to finance, to dating web sites, to the home and so on. All of these ideas are linked to notions of interoperability, interconnectivity, automation and the development of networks (Hajkowicz et al. 2016; Bloem et al. 2014).

Pundits would argue we are on the cusp of a new era – the fourth Industrial revolution! The implication is that we should all adjust to the new conditions presaged by the 4th IR thereby ensuring our continuing viability as workers. Such a discourse is not only drawn upon in the global north but also the south in low and middle income countries where these are accompanied by calls for societal change. Whilst these new conditions are inevitably

disruptive it is nevertheless suggested that they can be managed successfully to benefit all members of society. However, such a standpoint obscures the interests that lie behind such constructions, which are set on a very particular terrain. This terrain accepts unequivocally current social and economic relations, lodged within capitalism and a framework that is predicated on consensus which plays down the antagonistic relations between capital and labour, or in the vernacular, the conflictual relationship between the 1% and the rest - the 99%.

### **Socio-economic context**

There are a number of socio-political and economic issues that serve to contextualise the 4th IR amongst which we could place neoliberalism, globalisation and the transformation of waged relations, with the latter being echoed in the transition from Fordism to Post-Fordism. There are a number of narratives surrounding the development of neoliberalism. In some accounts it developed as a response to the contradictions and failings of Keynesianism in the West and the social democratic welfare state which led to the fiscal crisis of the state in the 1970s, as well as growing rates of unemployment allied with the increasing costs of providing welfare services. In contradistinction to the universalism of social democracy with its concern with full-employment and a fairer distribution of income and wealth, neoliberalism emphasises the 'free' market, the privatisation of public services, and the commodification of education and labour. All of life is to be orientated towards the development of an economically competitive and efficient society. The claim being that such a social formation would be able to compete effectively in world markets, and if successful, all members of society would benefit. However, in the current conjuncture such aspirations have been shown to be deeply flawed with neoliberalism exacerbating inequality leading to a society marked by an increasing polarisation between the rich and the rest of society.

In contrast to the determinism of the preceding linear description of the industrial revolutions (see figure 1) we could imagine another trajectory which runs from the depression of the pre-war years, through to the development of Keynesianism and social democracy following the Second World War and then on to neoliberalism. However, in this instance the shift both to and from social democracy was not the result of technical determinism but rather derives from the balance of power between capital and labour. In other words, the outcome was forged through class struggle. The move towards neoliberalism could be described in Gramscian terms as transformism or as a passive revolution in which the dominant class transforms social relations so as to secure its interests. Yet in the current conjuncture neoliberalism may be reaching its limits. We are, after Gramsci (1971:276), entering an interregnum in which 'the old is dying and the new cannot be born' (and see Streeck, 2016:35-44). The flaws of neoliberalism are becoming increasingly apparent. To name but a few, these flaws can be seen in the failings of the market and of the privatisation of public services, the growth in inequality, the arbitrariness surrounding the distribution of income and wealth, the increasing polarisations in society, not only between rich and poor but also politically and socially. These flaws can also be seen in the retreat from the 'free' market allied with societal retrenchment whereby states become increasingly inward looking as best exemplified by Trump's America (Monbiot,

2017). The current conjuncture is marked by the decoupling of employment and wages from productivity and growth, this is especially the case in Anglophone societies of the US and UK and serves to undermine the claims of those who celebrate the operation of the market.

Neoliberalism and its doctrine of market fundamentalism which fantasied about a minimal state, a meritocratic social order and a personally liberated world is seen as just that – a fantasy (Bloom and Sancino, 2019:19-22). For Mason (2019:xii) ‘the free market system has imploded’ and its mantra of consumerism, selfishness and hierarchy has lost its ideological and persuasive weight. Perhaps such accounts exaggerate the success of neoliberalism which whilst all pervasive failed to secure the hegemony that social democracy had attained in the immediate post-war years in the west (Education Group, 1981). Another way in which we can think about these processes and trajectories is through the alleged transition from industrial to immaterial capitalism which emphasises the salience of knowledge, digitalisation as well as the pivotal importance of cognitive and soft skills. In this instance there is something of an affinity with the 4th IR as well as with the transition from Fordism to Post-Fordism and beyond and is allied to discussions of the knowledge/information society, in which intellectual property rights assume greater importance. Here, rather than outcomes being determined by the presumption of linear and technicist developments these latter arguments recognise that they are shaped by economic, social and political processes. Italian Workerism is one way of attempting to make sense of these processes whereby worker struggles against the Fordist regime of industrial capitalism – the refusal of work – resulted in the shift towards post-Fordism and immaterial capitalism (Lotringer and Marazzi, 2007, Tronti, 2019).

The salience of immaterial labour has an affinity with the 4th IR and debates concerned with the nature of waged labour in current conditions which emphasise knowledge, cognitive processes and soft skills. It is important to acknowledge the material basis of immaterial labour as it is very easy to ignore the material infrastructure that underpins the internet and cognitive labour. In addition features of the 4th IR, big data, AI, automation point in a number of different directions, towards both technological unemployment as well as the need for an increasingly skilled labour force. In these instances such changes could be seen as presaging transformative changes and impacting upon the labour market. In the case of technological unemployment this could be seen as deriving from the automation of routine manufacturing and white collar jobs and their articulation with the IoT and IoS. These changes have been construed by some writers as anticipating a post-work society or at least one in which the hours of waged labour are considerably shortened providing space for the fuller development of human potentiality. Such developments could be seen as being undermined by the current economic and social relations of capitalism that are predicated on scarcity rather than the abundance promised by post-work and post-capitalist societies and the technological advances predicated by the 4th IR (Mason, 2015).

The preceding discussion could be seen as rooted in the west and global North. There are however a number of points to be made. Capitalism of whatever type is orientated towards the accumulation of capital. The decision to mobilise machines or waged labour will not only be shaped by the balance of power between capital and labour but also by the resulting

costs, which in turn will be related to the operation of the labour market. Thus, in uncertain times it may be economically expedient for capital to mobilise waged labour even though it might be more productive and cheaper to use machines and the IoT. Such processes will impact upon low and middle income countries and their use as sources of cheap and semi-skilled labour. In addition Brown, Lauder and Ashton (2011:64) refer to 'oasis operations' whereby high-tech factories, offices and research institutes exist alongside 'low-spec' neighbourhoods upon which they have little effect. Such operations may nevertheless impact upon employment and wages in the developed nations by creating a high skills low wage nexus. In this way such developments impact upon labour markets that are differentiated both within and across nations, regions and localities. This can be seen in the aforementioned 'oasis operations' whereby a globalised labour market can be set in the same locality as one that addresses a more localised labour market for low waged, low skilled as well as craft-based work (Peri, 2018).

The forms of technological development presaged by the 4th IR can effect low and middle income countries in several ways. Historically, the development of industrial manufacturing plants served to provide significant benefits for low and middle income societies through the provision of employment and wages. However, late industrialisers deindustrialise at an earlier point than their earlier counterparts, thereby truncating these benefits. In addition such technological developments may facilitate the re-bundling of processes that were formerly separated leading to the reshoring of manufacturing plants in the developed societies and consequently resulting in a loss of employment in the emerging economies and depriving them of the opportunity to develop large manufacturing sectors. There is of course an irony with this argument which reads a little like that of an apologist for neoliberal capitalism as it belies the suffering and exploitation that surrounds factory work in the developing and emerging economies. For whilst the move to urban settings in search of employment can be an antidote to extreme rural poverty it carries its own significant emotional and 'economic' costs which could barely be conceived of as an escape from poverty (War on Want, 2019a, b).

### **Vocational Education and Training (VET), Knowledge, and Skill**

I use the term vocational education and training (VET) to refer to education and training that is thought to directly address the needs of employers. Various terms have been used to describe this type of education, sometimes it is referred to a TVET with T standing for technical or career education. Clarke and Winch (2007:1) suggest TVET is concerned with 'the social development of labour' implicitly pointing towards the reproduction and production of labour power. In the English context VET has frequently been thought of as narrowly and instrumentally orientated towards work and as having relatively low status, being best suited to 'other people's children'. Even when the term is used to consider university education and is described as higher vocational education (HIVE) it often echoes the preceding disparagement. Bathmaker (2014:np) suggests VET includes 'pre-vocational preparation, general vocational education, work-related learning, work-based learning, higher vocational education (for associated professionals and technicians)', distinguishing it from academic and professional education. However, if we consider HIVE and VET as being

concerned with the social development of labour it operates on a much broader sphere and will encompass professional education as well as much that passes as higher education. It is the case, that in recent years and particularly, following the 2008 financial crisis that education in general and higher education in particular has become increasingly vocationalised and is to become business facing which is now an important feature of the education landscape.

The rhetoric that surrounds VET, knowledge and skill in the current conjuncture mimics the types of arguments that were present in the last half of the twentieth century. Here we encounter a range of familiar themes that discuss the constant need for up- and re-skilling with the resulting necessity that workers are flexible and should engage in lifelong learning. These notions sit alongside others that address the changing nature of waged employment and the shift away from manufacturing towards the service sector. Here again we meet with well-established neoliberal tropes that call for the development of an enterprising subjectivity, which would, or so it is claimed, develop skills and dispositions that enable workers to survive the precarious labour market conditions they encounter. An emphasis is given to the requirement for the development not only of cognitive but also soft skills. There are two points to raise; firstly the rapidity of technological change demands the acquisition of skills that enable workers to manage the ongoing transformations that impact upon waged labour. Secondly, whilst employment in manufacturing may be less widespread than in the past, it still requires the development of technological skills that would enable workers to surveil the IoT and to handle any crises that occur in manufacturing processes. This would require the development of high level cognitive and problem solving skills together with a specific and complex understanding of the particular manufacturing process and its configuration. Thus the rapidity of technical changes requires the development of generic and easily transferable skills which sits somewhat contradictorily alongside the need for skills that address the specificity of any particular manufacturing process.

In many accounts concerned with the developing or emerging economies of the global south the rhetoric of up-skilling rests alongside the perception of a skills-gap. In this instance questions of diversity and equality are raised with women and girls being seen as an important reservoir of labour that could be mobilised and up-skilled thereby addressing the skills-gap. Such processes are uneven and encounter the very particular labour markets that are confronted, both formal and informal, which are set in specific socio-economic and political contexts. It is important to acknowledge that alleged skills-gaps and labour shortages can co-exist alongside the existence of surplus labour and it is important to note, there are political as well as economic processes at play that relate to capitalist accumulation practices. In addition and importantly, discussions of the 4th IR may lead us to focus on manufacturing processes and consequently ignore or at least play down the very real significance of various forms of care and service labour that are found in the economies of both the global north and south and that are crucial to societal and individual well-being.

### **Chapter break down**

**Chapter 1** serves as an introduction to the book.

## ***Chapter 2 – Socio-technical Imaginaries and the fourth industrial revolution***

Those who promulgate notions of the 4th IR are at one and the same time constructing and reconstituting a particular understanding of the future and importantly, its imagining. This is often an iterative and circular process with the same arguments being reproduced in a range of policy and consultancy documents. Consequently, we encounter a number of recurring themes, robotisation, artificial intelligence, digitalisation, smart factories, interoperability, interconnectivity, nanotechnology and so on. Such notions seep into popular culture and media representations and contribute towards socio-technical imaginaries. Importantly, the imaginaries that swirl around the 4th IR acknowledge a range of contradictory tensions that either intensify current trends or are thought will emerge in the future. The chapter examines arguments derived from the World Economic Forum, the EU and the ILO that address the future of work and skills and draws out the implications of these for VET. In addition, it explores how these arguments play out in low and middle income economies. However, within this socio-technical imaginary there is the promise that difficulties can be managed and in this sense overcome. Whilst the discourse emphasises the transformative power of technology it is in effect domesticated, its potential framed to sit within a particular, and one might suggest, neoliberal or at least capitalist project.

## ***Chapter 3 – Robotisation, artificial intelligence, employment and the fourth industrial revolution***

Any number of papers and books have argued that the growth of robotisation will have a profound impact on employment and will lead to the replacement of routine manual jobs, resulting in technological unemployment. This is set against those who draw upon historical examples to suggest that such arguments are misfounded. These arguments are echoed by labour market analysts of western societies who anticipate frictional/temporary unemployment before stability is reasserted. This chapter critiques, challenges and moves beyond such arguments which are distanced from the lived experience of workers in disadvantaged regions of Europe and the US. In order to fully understand these processes it is necessary to engage with arguments that address the capitalist labour process, class struggle as well as the significance of rentier capitalism. These arguments need to be articulated with conceptualisations of class, race and gender and their intersectionality in current conditions. In addition, this discussion needs to be related to the socio-economic conditions faced by low and middle income economies. The chapter concludes by considering the implication of the preceding discussion for Vocational Education and Training.

## ***Chapter 4 – Post-work, post-capitalism and the fourth industrial revolution***

This chapter draws upon the arguments raised earlier that address the future of work and skill setting this alongside more radical analyses. Much of the work that addresses the labour market refuses the suggestion that labour is being expelled from paid employment and stands in direct opposition to some of the analyses considered in the previous chapters.

There is a tension between those who experience and bemoan precariousness, intermittent and under-employment and those for whom the whole of life seems to be centred around work. Paradoxically, for some this had led to the expulsion from waged labour, whilst for others it has led to its intensification. In its ideological manifestation the 4th IR is presented as an inevitable development flowing from the first to the current IR. However, what is silenced in these constructions is the manner in which the 4th IR connects to the development of capitalism and its articulation with class struggle. These processes alert us to the manner in which technology is entwined with social relations. Consequently, this chapter addresses arguments that engage with Italian Workerism, post-capitalism, post-work, universal basic income and paradoxically, the politics of abundance. Thus, it seeks to develop a politically informed analysis that moves beyond current conceptualisations of the 4th IR that in turn can inform a critical, if not transformative praxis.

### **Chapter 5**

Chapter 5 concludes the book and serves to bring together the various themes that run through the book drawing out their significance for VET and educational systems committed to the development of socially just societies. At the same time such interventions have to go beyond the narrowly educative and engage with a broader politics committed to the transformation of society. Many of the rhetorical claims surrounding the 4th IR align themselves with a notion of social justice. However, this is set within a capitalist terrain that seeks to manage the tensions flowing from the new condition presaged by the 4th IR, rather than their transcendence. Such rhetorical claims frequently serve to domesticate tensions thereby underplaying their potential in the struggle for the creation of a socially just society.

### **Conclusion**

In this introductory chapter I have alluded to a number of the debates and questions that are to be addressed throughout this book. The key concern being to critique constructions of the 4th IR through the lens of a socially just society. This leads to an examination of the manner in which we make sense of waged labour and its articulation to post-work and post-capitalism. This serves to raise the question as to whether we consider waged labour to be a site in which we enact our human potentiality or one where we experience exploitation and oppression. The association of waged work with job satisfaction and personal fulfilment could be seen as a way in which particular groups of workers are co-opted by capital. Such arguments bear on the manner in which VET, knowledge and skill is understood. Perhaps waged labour is so wedded to capitalist relations that in order to go past it we need to move beyond such labour towards a post-scarcity society - that is if we are committed to the development of a socially just society.

### **Notes**

1. 'The marketing-style term Industrie 4.0 was invented and promoted by three engineers: Henning Kagermann (physicist and one of the founders of SAP), Wolfgang Wahlster (professor of artificial intelligence), and Wolf-Dieter Lukas (physicist and senior official at the German Federal Ministry of Education and Research). What they started in 2011 during a



press conference at the Hannover Messe and in 2016 became the main motto of the World Economic Forum (WEF) meeting in Davos almost perfectly matches what McCray [2012] defines as 'visioneering' (Pfeiffer, 2017:107-108)

2. 'Fourth Industrial Revolution or Industry 4.0' was first mentioned by Bosch at the Hannover Trade Fair in 2011. Experts at the trade fair said that a new Industrial Revolution had arrived with innovations brought into production by the modern face of the information era. When the German Government took these opinions seriously, the Fourth Industrial Revolution had become official. After the trade fair, a working group on the Fourth Industrial Revolution was established. One year later, this working group presented its suggestions for the actual implementation of Industry 4.0 at the next Hannover Trade Fair, and reported this to the German Government. Bosch executive Siegfried Dais and SAP AG executive Henning Kagermann co-chaired the working group' (Bosch Turkey:online).  
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War on Want. 2019a. *Sweatshops in China*, <https://waronwant.org/sweatshops-china>

War on Want. 2019b. *Sweatshops in Bangladesh*, <https://waronwant.org/sweatshops-bangladesh>

**Figure 1. Industrial Revolutions**

