



Technology and work: Past lessons and future directions

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ABSTRACT

This paper addresses arguments that suggest life would be better if machines took the place of humans in work. These arguments are highly topical and remain central to modern debates on automation. Yet, as argued in this paper, they have a long history. They draw strength from different ideas including about the value of work and free time. These ideas also fit with broader agendas that address futures beyond capitalism. The paper uses a review of the history of ideas on possible automated futures to develop critical insights into the scope for using technology to work less and better in the future. A key conclusion – again developing ideas from the past – is that automation should promote opportunities for well-being in work as well as beyond it. This conclusion helps to support a politics of automation aimed at securing greater democracy in the development and use of technology in society.

1. Introduction

For at least two centuries, debates in economics and political economy have shown interest in the scope for automating work and creating a future society of abundance [1]. This interest has been sparked by a concern that work is something to be avoided and that a ‘good life’ consists in having more time for activities outside of work. It would be better for humanity – so the argument goes – if people’s freedom not to work could be expanded. Economists and political economists through time have promoted the vision of a future where technology reduces work time and enables human flourishing.

In modern times, the same interest has resurfaced [2–5]. Within contemporary economics debates, there is seen to be the real and imminent prospect of work disappearing. The acceleration of artificial intelligence and machine learning, it is claimed, holds the potential for a future ‘world without work’ [6]. To be sure, there are many doubters (like in the past) about when and whether work will be automated away [7–9]. But this doubt should not detract from what is a genuine concern for the impact of new digital technologies on the future of work. As in the past, there is a belief that these technologies – if managed correctly – can be used to benefit society, not least by potentially creating more time for people to spend away from work.

This paper aims to examine modern debates about the possibilities for automation from a history of ideas perspective. It will establish that past ideas on the future of work offer a useful critical context in which to assess modern ideas on the same subject. They highlight the importance of ideas about the value of work and free time in understanding the

scope for using technology to improve the quality of life. They also point to the need to examine the limits of the present and possible futures beyond capitalism. Envisioning the future of work can align with efforts to imagine life in a post-capitalist system.

The paper has three main parts. The first investigates the contribution of three key writers on the future of work and capitalism. These are Karl Marx, J.S. Mill and J.M. Keynes. Marx offered a critique of technology under capitalism and a vision for its reuse under communism; Mill advanced a case for using technology to reduce society’s need to work; while Keynes showed how technology could be used to create a post-capitalist society with more leisure time. Each writer is shown to offer their own unique perspective on how technology might (and should) be used to lighten work.

The second part confronts future of work debates that exist in the present. While these debates rest on a common view that mass automation is likely to occur in the future, they offer different ideas about the benefits and costs of the disappearance of work. These relate to different understandings about how work affects well-being and the merits of replacing work with more free time. This part assesses critically the above ideas, revealing their wider limitations for evaluating work’s future.

The third part of the paper maps out an alternative agenda for analysing the future of work – one that draws insight from past ideas but also looks forward to a future where technology might be used to reduce the duration of work while improving its quality. Five ideas are set out: 1) the meaning of work extends beyond the wage-labour relation and encompasses factors such as autonomy, creativity and sociality – work’s

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broader meaning also means that its allocation matters; 2) the status of leisure and its link to the pursuit of creative activity and self-development; 3) the reframing of automation as a means to enhance work quality and increase human freedom; 4) the scope for change – the importance of the democratisation of workplaces and their technologies; 5) future envisioning that can transcend capitalism. These ideas confirm the benefit of learning from and reapplying the ideas of past thinkers such as those reviewed in the paper. The conclusion draws together the main contributions.

2. Automation and the demise of work

The history of economic thought offers different perspectives on the future of work. These perspectives span different time periods and encompass different ideological positions – some against capitalism and others for it. For the purposes of the discussion in this section, the focus will be on three key contributions from within economics and political economy (namely those of Marx, Mill and Keynes). These are significant not just for the things they say about work in the future but also for the attempts they make to reimagine society. They are focused upon because their influence on economic and political thought has endured. In the present, they have continued to be invoked, even though they emerged at very different times and have very different political implications. They may not represent the full range of ideas on automation and the future of work, but they provide good starting points for rethinking the role of technology in work.

The first contribution is that of Marx. He held to the view that technology was restricted under capitalism. Automation was biased and regressive in its effects. It was undertaken by capitalist employers for the benefit of profit-making. Technology was not used to reduce work hours and add to the quality of work – to the contrary, it was employed to extend the duration of work and intensify its pace. Workers were being maimed and killed by machinery and technology was viewed by the working class as its foe. Marx [10]: 481) referred emotively to the worker being turned ‘into a crippled monstrosity’ by modern machinery. The Luddites in the early nineteenth century were not irrational when they rose up against new technology – rather, they were acting on the basis of a genuine and real concern about its negative effects on the quality of their lives at work [1]: 34–35). The point was not that technology was bad in itself, but that it was used in ways that enriched capitalist employers, at the expense of workers. In practice, workers had to struggle for higher wages, better working conditions and shorter work hours. They had to organise, via unions, to ensure that they shared in the benefits of technology. Without collective resistance, technology would remain a threat to the living standards and lives of workers.

Marx, however, argued that technology could be repurposed. While it was constrained by the profit motive and used for negative ends under capitalism, it could be harnessed for the common good under communism. Marx believed that capitalism would give way to communism via a revolution led by the working class. In the inevitable transition to communism, technology would be put to alternative uses. Specifically, it would be used to achieve two goals: firstly, the reduction of work hours; secondly, the transformation of work itself. The use of technology to reduce work hours would help to curtail what Marx [11]: 959) termed as the ‘realm of necessity’. Production for need rather than for profit would help to reduce the amount of necessary work required in society. Further reductions in work time would be achieved by using technology to expand free time. Marx thought that the ‘realm of freedom’ – the realm of self-determined activities – would be enlarged under communism and that people would enjoy more enriching lives by working less. Free expression and creativity within society would be realised by extending hours away from work.

But technology would also help to raise the quality of work by reducing drudgery and allowing more time for meaningful work. In a future communist society, work would be carried out in ways that would be rewarding and pleasurable for workers. Common ownership and

shared governance of workplaces would create the conditions for workers to direct technology in a manner that would give meaning and purpose to work. The ideal for Marx was not to eliminate work by automation, but to create a work environment where workers could work with technology to produce great work [12,13]. This great work would meet basic material needs while enhancing the well-being of workers. The allure of communism, in Marx’s terms, was that it could realise the full potential of people inside and outside of work. It promised not just fewer hours of work but also work that would be fulfilling to perform. A technologically-enabled communism, in short, would facilitate the achievement of less and better work.

The second contribution to be discussed is that of Mill. Mill is often cast as an avowed liberal who balked at restrictions on individual liberty and centralised forms of ownership. Yet, in his writings on technology and work, he appears as a quite different figure – one that favoured radical reforms and the move to socialism (though not full communism). While coming from a different philosophical and political position, he agreed with Marx that technology was progressing in a way that was disadvantageous to workers. The hope of humanity was that technology would reduce work hours and improve working conditions. In reality, however, workers were working longer hours and in worse working conditions as technology developed. Technology under present capitalist conditions simply ‘enabled a greater population to live the same life of drudgery and imprisonment’ [14]: 756). The problems of work were not natural nor universal, but were symptoms of a system that favoured capital accumulation over human growth.

Mill took the view that reforms (including in work) would be needed to advance the quality of life. He supported, in particular, the curtailment of economic growth and the move to a ‘stationary state’ [14]: 756). Heretically, from the vantage-point of classical economics, he viewed a slowing of economic growth as compatible with promoting well-being. If economic growth could be slowed and indeed brought to a halt, more time could be created for other things in life than just wage-earning and profit-seeking. While the economy might be stationary, the qualitative content of life could be raised. There was more to life than just greater material wealth and a purpose of technology was to expand the time for people to enjoy activities of their own choosing.

Mill, more directly, favoured greater democratic ownership of productive assets. Drawing on the positive experiences of the cooperative movement in Northern England, Mill [14]: 790-92) argued that worker ownership was an essential condition not just for achieving higher productivity but also for creating work that was less exhausting and more dignified in nature. If workers could be made joint owners of firms, they would be more highly motivated to work, and more inclined to identify with and find meaning in their work. Mill was critical of communism for stifling individuality, but was willing to support reforms aimed at democratising work and decentralising power. Experiments in socialist work organisation were to be encouraged and alternative post-capitalist futures were to be taken seriously, even if society was to stick with capitalism in the present [14]: 214).

Mill, like Marx, saw that technology could be turned into a mechanism for the collective good. Its regressive nature under modern capitalism reflected only on its particular uses. It could be put to different uses. Rather than add to the burden of work, it was to be used to increase people’s freedom from toil and their ability to self-create in leisure hours. Mill had a view of positive freedom that entailed making time for people to be and do what they like [15]. This led him to support technological progress as a means to lighten work and to back moves to democratise workplaces.

On work’s transformation, Mill was not wholly consistent. He referred to how work-life might be changed under more democratic conditions – for example, ‘the dignity of labour’ [14]: 792) could be restored by granting workers ownership stakes in firms. This goal could be achieved alongside greater leisure time. But he was also keen to stress the idea – inherited from classical economics – that work was inherently bad [16]: 91). He rejected the ‘Gospel of Work’ advocated by Thomas

Carlyle and instead gave support to an alternative 'Gospel of Leisure'. More leisure, not more 'good work', was the primary goal of automation – work was to be overcome not dignified. In this respect, he lacked the vision of Marx in relation to negating alienating work. Instead, Mill focused on the idea of extending free time via harnessing technology, achieving slower economic growth and democratic reform of the workplace.

Keynes provides the third contribution. He published a famous essay in 1930 – 'Economic possibilities for our grandchildren' [17] – that predicted a great decline in work time. If technology continued to advance, productivity gains would enable people to increase their living standards with fewer hours of work. Keynes predicted that, by 2030, the working week would be just 15 hours – in the future, everyone would lead better lives with less work to do. The future promised less work for society and this future would be realised by continuous productivity growth under capitalism.

Written at a time of economic depression, Keynes's essay painted a positive picture of the future. Unlike Marx, no bloody revolution would be needed to achieve progress – rather, constant capital accumulation would bring about a better future. Capitalism would deliver in the end. Those (including followers of Marx) advocating for revolutionary change in society were to be ignored and faith was to be placed in the structures of capitalism in securing a work-less future.

Keynes also differed from Mill in rejecting any idea of slowing the economy and reforming work. In contrast, he wanted capital investment and economic growth to advance more rapidly and for the existing ownership arrangements of work to continue. Part of the case for stimulating economic activity under capitalism was to alleviate unemployment – the high unemployment of the 1930s, in particular, could not be resolved without higher government spending. But a deeper reason for favouring stronger economic growth was to hasten the reduction in work hours. If economic growth could be accelerated, the technology needed to reduce working hours could be brought forward in time. Importantly, progress could be made without any wholesale change in the way that businesses were run. Only the stimulus for capital investment needed to be maintained. The kind of socialist work organisation advocated by Mill had no place in Keynes's reform agenda.

But Keynes was no apologist for capitalism. While praising its dynamism and capacity to cut work hours, he believed that it had many flaws. The capitalist instinct for money-making was immoral and debased the character of capitalists. This instinct was needed to stimulate investment in new technology, but it could (and should) be replaced in the future with different (higher-level) motives. For Keynes, the benefit of labour-saving technology was that it could extend the time for people to explore and realise non-capitalist ways of living. Rather than spend their time seeking and making more money, people (both capitalists and workers) could enjoy pursuing activities for their own sake. Radically, Keynes envisioned a future where the productivity dividend offered by technological progress would be used to transcend capitalism and to build a whole new social republic [18]: 18). In Keynes's vision of the future, capitalism would give way to a different society – one based on the pursuit of leisure and the enrichment of life through self-directed activities, from painting and gardening to writing novels and poetry. This transition would be facilitated by technology and would lead to a future where people would 'live wisely and agreeably and well' [17]: 367).

Several summary points can be made. Firstly, the ideas of Marx, Mill and Keynes reveal a continuity in economic thought on futures of work where the burden of work is lightened via automation. Secondly, their ideas show how views about the nature of work and leisure – particularly their respective costs and benefits – have informed positions on the future of work. A negative view of work, in particular, has strengthened the case for replacing human workers in work. Though, as suggested above, the origins of the costs of work have been viewed somewhat differently. Marx linked these costs to work alienation under capitalism – work resistance was specific to capitalist social relations and could be

overcome by transcending these relations. Mill and Keynes, by contrast, regarded the costs of work as given and hard to resolve – this motivated their desire to see work minimised and leisure maximised. All three authors, however, held to a positive view of leisure – they agreed that leisure entailed the pursuit of free creative activity and that its expansion demanded the reduction of working hours. Enhancing the human freedom to live well beyond work required using technology to reduce work time.

Thirdly, there is the relationship between the above views and ideas on the future of capitalism. In all three authors' writings, criticism of capitalism was advanced and used to support the case for creating an alternative society. In such a society, technology would enhance the quality of life by giving people the opportunity to pursue meaningful and purposeful activities. The hope of extending human freedom and well-being inspired a view of progress where technology would help to replace the ways of working and living that are commonplace under capitalism. At least in the case of Marx, this vision also extended to giving people meaningful lives in work and transforming work itself into an activity that people would actively embrace. Marx, uniquely, wanted to see work improved in qualitative terms not just reduced in duration. How the above strands of thought fit with modern debates focused on the future of work is taken up below.

3. Robot revivalism and modern future of work debates

In the first two decades of the twenty-first century, interest in the capacity for digital technologies to replace human labour has increased. New terms such as the 'Second Machine Age' and 'Fourth Industrial Revolution' have been coined to define the epoch-changing times that modern societies are now living through [2,4]. It is argued that automation is set to increase in society. While up to now jobs with routine tasks have been the focus of automation, in the future, jobs with non-routine tasks will also be automated. The sheer rapidity and scope of technological progress will lead to fewer job opportunities and a labour market that can support far fewer people in work. From driverless cars to robots capable of caring for the elderly, jobs will disappear in increasing numbers and many more people will face the prospect of living their lives without work [6].

Predictions of the future of work are stark. Frey and Osborne [19], to take one prominent example, predict that close to half of all existing jobs in the US could disappear in the next twenty years. While they identify limits to their own predictions (e.g. due to the relative costs of labour and capital), they nonetheless point towards a future where work is less abundant than now. Others have produced different and lower estimates of future job losses [20]. But these estimates have not altered the broader direction and thrust of debate. Specifically, it has remained a matter of concern that technology is about to accelerate and curtail the number of available jobs. To deny the possibilities for mass automation, from this perspective, is to miss how quickly technology is advancing and the extent to which this technology can (and will) displace human labour.

Responses to the automation risk differ among authors. The differences in opinion reflect partly on differences in ideology and politics, and reveal some fault-lines in current debates. Firstly, there are those who worry about the loss of jobs and the increase in inequality [2,3]. If automation accelerates, many workers will lose the ability to earn wages. As a result, they will face direct hardship and poverty. They will also lose out relative to those who manage to remain in work or own capital. Economic and social divides are likely to grow with greater automation, leading to more discontentment and potentially unrest in society. The concern for the loss of paid work is not just monetary but also existential. Without any paid work to do, people risk losing their way in life and suffering poorer health. Research showing the negative effects of unemployment on well-being and health outcomes supports the idea that an acceleration in automation will bring harm to society [21]. This harm, indeed, may extend to an increase in so-called 'deaths

of despair' [22], where the demise of work is linked to higher drug and alcohol use, and a higher suicide rate.

Writers taking this position call for policies aimed at protecting work. In particular, they advocate upskilling via more and better education and new training programmes. Workers have to be equipped with the skills to 'race with machines' if they are to stay in work and lead fulfilling (work-centred) lives [2]. This view offers support to capitalism and rejects any kind of radical reform. Indeed, it places faith in capitalist incentives and structures to deliver a better future – one where people will continue to gain the benefits (extrinsic as well as intrinsic) that work can provide. An essentially positive view of work informs the case for maintaining its existence in the face of strong automation forces. Importantly, these forces are not to be resisted, but instead accommodated in ways that preserve abundant work for people to do.

In the above case, there are overlaps with Keynes via support for technological progress under capitalism. But there are also differences. Keynes's relatively relaxed view of automation and the gradual disappearance of work is replaced with anxiety that work must be maintained and new jobs created to replace those that face automation. An anxiety about the loss of work replaces Keynes's optimism that society can reach higher levels of well-being by working less. This anxiety can be challenged, as the below discussion will show.

Secondly, there is a very different and much more critical view of the future of work. This is less concerned with saving work than seeking its total elimination [23]. If technology can replace work, all the better for society. Writers in this camp adopt a 'post-work' position, arguing that work is bad in itself and that life can only be enhanced by reducing it to zero. 'Full automation' is elevated as a goal and used to promote a vision of a post-capitalist future. There is concern that technology needs to be accelerated and that society must adapt to working less – the goal of full employment must give way to a vision of securing a future leisure society. A 'universal basic income' (UBI) is supported as a substitute for income from paid work and a shorter (four-day) working week is endorsed to facilitate the transition to a work-less future [24].

On this view, automation is something to be embraced not feared and the mission of society should be to use technology to escape work. True freedom lies with reducing the amount of work that society is required to perform and automation must be hastened if people are to find meaning and purpose in their lives. This leisure-centred vision is close to the one articulated by Keynes (and also by Mill). By contrast, it differs from Marx in not considering directly the scope for overcoming the costs of work – a point elaborated on below.

Both the above views have problems. They assume that automation is almost inevitable when barriers to its realisation can be stressed. Jobs may persist in the future as technology complements labour rather than replaces it [8]. Work may also be created via product innovation and the development of higher consumer demand, in part, due to erosions in price inflation and increased real incomes [7]. The history of capitalism shows how technological advances have been accommodated without mass unemployment and there is no reason why the same trend cannot be realised in future years [1]. Those stressing the job-destroying potential of technology are prone to overlook how jobs are likely to remain commonplace in society and how technological progress may coexist with persistently high levels of employment [25,26].

But there are deeper issues of concern. Beyond potentially not predicting the future accurately, there is the issue of how the ideal future of work is conceptualised and how technology is seen to create and resolve problems in making this future possible. Starting with the first view outlined above, there is a seeming unquestioning faith in the virtues of work. The ideal outcome is viewed as one where work is sustained in its present forms. This is partly to keep workers out of poverty, but also to create the opportunity for them to experience the direct benefits that work can bring.

Brynjolfsson and McAfee [2]: 234) refer to how work provides people with the means not only to earn a living but also to achieve 'self-worth, community, engagement, healthy values, structure and dignity'

in their lives. They illustrate this point by highlighting the harm (economic as well as social) suffered by communities that have faced high rates of joblessness and how work can support good health and positive community relations: 'The evidence suggests that communities in which people are working are much healthier than communities where work is scarce, all other being equal' [2]: 236). People and societies need work to live well. This leads the authors to support an 'economy of workers' [2]: 237) and to insist on policies aimed at securing a work-full future, even while technology advances.

The problem with this view is that it overlooks the costs of work. In some cases, work may be far from beneficial, but instead a direct threat to well-being. Brynjolfsson and McAfee [2]: 234) give the example of an Amazon warehouse worker who feels 'pride' in his job – this is taken as evidence of the utility of work. What this misses is the substantial evidence showing how Amazon warehouse jobs are some of the worst in modern society. These jobs have been linked to high work intensity and workplace injuries [27]. They illustrate how technology can be employed to generate more bad jobs and confirm how work can be associated with lower well-being and worse health outcomes.

The point is not that all work is bad – many jobs, indeed, have positive features, as argued by Brynjolfsson and McAfee. The loss of work inflicts real harm on people: unemployment leads to misery beyond the loss of money. But there are also costs attached to work – from long hours to boring tasks. To ignore these costs is to draw a veil over the hardships that many workers face in their work-lives.

Ironically, despite the rhetoric around revolutionary technological change, there remains in the work of writers such as Brynjolfsson and McAfee an essentially conservative vision of the future of society – one that promises the same work routine and ignores the benefits of working less (including the shortening of the working week). Fear about the loss of work blinds them to the scope for progressing well-being via work automation. The visionary thinking, in this respect, is inferior to that found in the earlier writings of Marx, Mill and Keynes.

The second view cited above takes the opposite stance that work is not beneficial and that automation should be used to eliminate it. This overstates the costs of work, at expense of its benefits. There is scope for people to find meaning and purpose in work. This is to not eulogise work – that is, to present it as always good – but to recognise how work can bring some benefits to people's lives, at least under the right conditions [28].

'Post-work' discourse, in general, tends to see life as beginning where work is at an end. Leisure or free time is held up as the source of human freedom and creativity. This misses the capacity for people to act freely and creatively in work. The possibilities for lessening work's burden and using technology and work reform to increase access to meaningful work is therefore missed. The vision, as mentioned above, aligns more with those of Keynes and Mill than that of Marx. More directly, it lacks recognition – in line with Marx – about how work might be transformed in the future and made into something that adds to well-being in the same way as leisure activities. The vision of a post-capitalist future is less than it might (and should) be.

Two points can be emphasised. Firstly, while interesting and thought-provoking, modern debates on automation offer a limited depiction of the future of work and society. Readers are often presented with stark futures – either a struggle to preserve the same or similar quantity of work under capitalism or a transition to a 'post-work' society where all work is somehow ended. Missing is any vision of how technology might deliver shorter work hours, more free time, and higher quality work at the same time. Secondly, and related to the first point, contributions are somewhat limited relative to those of the past. The views of Marx, Mill and Keynes – as set out in the previous section – are not carried forward in any clear or consistent way. In contrast, these views tend to be treated superficially or else ignored completely. As argued below, however, reviving and restating some of their essential ideas can be seen as important in crafting a progressive agenda for automation in modern times.

4. Rethinking work in the future

The argument to be made here is not that contemporary writers on the future of work should get into debates about what particular authors said in the past, but that they should take insight and inspiration from these authors in developing novel insights that can be applied in the present. This means engaging constructively with ideas about the meanings of work and leisure. It also means contemplating visions of the future that move society beyond the practices and values that are now taken for granted. Learning from the past, in short, can help to shape a better future.

The following set of ideas can be regarded as particularly important. They draw insight from the writers reviewed earlier in the paper and offer scope to extend modern thinking on technology and work in the future.

The first idea relates to the meaning attached to work. It is evident based on the discussion above that work needs to be seen more broadly than just a way to earn a living. It might assume this general form under capitalism and be viewed as an instrumental activity as a result, but there are other aspects of work to consider. Work, where it meets workers' needs for autonomy, creativity and sociality, can be uplifting and a source of joy in life. This positive role, admittedly, is realised in the context of severe constraints, not least due to the wage-labour relation that requires the majority of people to work for income. Work for wages remains a fundamentally unfree activity. But it is clear that there is variation in the quality of work within society – while some workers experience bad features (e.g. high work intensity) in their jobs, others can achieve well-being via access to positive factors, such as the opportunity for skill development and creative achievement [29]. Importantly, too, the nature of work is not beyond reform – rather, there is scope to change it and make it into an activity that adds to the quality of life for all.

The above suggests the need to reject simple binary views of work as all good and all bad. Instead, it requires us to think of work as an activity that is shaped by its environment and content. Some tasks (like cleaning) can be arduous and painful in themselves. But the organisation of these tasks can be altered. They can be allocated to some and not others in society, creating divisions in opportunity for meaning in life [30]. In this case, there are issues around how society allocates work and the scope for people to move between jobs. Bad work tasks can also be administered and enforced via hierarchies. This leads to inequalities of power and unequal outcomes. In addition, technology can affect how people experience work. On the one hand, technology can degrade workers – it can increase the pace of their work and rob them of their skills. On the other hand, by automating drudge work, technology can elevate the quality of workers' lives at work. Indeed, it can make room for more meaningful work [31].

The point is that there is no reason why people should work continuously in work tasks that lack meaning – indeed, the presence of conditions that lend themselves to this outcome can be seen to be in need of reform. Work should not be tolerated as a bad thing but instead should be turned into an activity that uplifts and brings pleasure to life. This means changing how work is organised and how technology is used.

On the above point, Marx's analysis has merit since it accounts for variability in the quality of work. Work is bad only because it is organised under capitalism. There is scope to change it beyond capitalism. The stress on work's transformation is linked to the reorganisation of work and the reuse of technology, as we saw above. This stress complements the idea of creating more time away from work and adds urgency to the case for radical change in society. It can be emphasised that there is value in following Marx regarding work as a human activity and a key focus for reform, including through change in work organisation and in the form and direction of technology.

A second idea relates to the status of leisure. Marx, Mill and Keynes, as was suggested above, favoured a society where leisure time was prolonged. This was based not on support for idle or dead time, but on

the value of enlarging the freedom of people to be creative outside of work. Running through Marx's, Mill's and Keynes' writings was the idea of giving people more time for themselves, not to idle away time, but to develop and realise their own talents. This idea can be embraced and taken forward in modern thinking.

Leisure is good not just because it provides an alternative to, and respite from, work, but also because it extends people's freedom to self-develop and realise their inner selves. Technology is beneficial, in this respect, because it creates the opportunity to add to free time and to enhance the ability of people to live as they want. Supporting the extension of leisure time via automation, then, rests on the idea of promoting the time for people to be free and creative beings. It fits with a freedom-argument for using technology to reduce work hours.

The third idea captures the goals to be achieved through automation. This helps to draw together the ideas outlined above. More directly, it means recognising that automation has two primary goals. One is to ensure that the quality of work is improved upon. The second is to ensure that leisure time is increased. On the first goal, technology should reduce drudgery. The goal should be to minimise as far as possible work that reduces the well-being of workers. Preventing harm from work should be a key goal of automation. But, equally, it should create new opportunities for workers to gain meaning from work. In work, technology should be used in ways that enhance workers' experiences of work. This means avoiding technology that deskills, intensifies work and reduces autonomy. Instead, it means using technology to preserve and enhance human skills, to extend variety in work and to create more work that is socially useful.

Secondly, technology must also add to leisure time. While it is important to recognise the value of work, it is also vital to acknowledge the value of leisure. People need and deserve lives outside of work. Long hours of work limit the ability of people to find meaning in their lives. Shorter work hours can be justified, even for those in ostensibly high-quality jobs, on the basis that they would create for more time and opportunity for them to pursue different goals in their lives. The wider aim should be to encourage technology that lessens work time. Objectives such as a four-day working week have merit, not least as challenges to the status quo and can be promoted as a desired outcome of automation [32].

The above two goals – summarised as 'less and better work' – combine aspects of the ideas of Marx, Mill and Keynes. From all three writers, there is support for using technology to expand free time. But, from Marx, there is also support for minimising the distresses of work and building a future society where people are able to be creators not just in leisure but also in work [13].

There are examples of where technology has lightened work. Dirty and dangerous work in manufacturing has reduced, for example. Work hours have also fallen historically. These changes have occurred under capitalism, though they have required labour protests and the pressure of the state [33]. They have not occurred automatically. In the present, despite technological advances and progress in labour standards, there remain problems of work, from entrenched low pay to persistently long hours of work (the five-day work week, for instance, has remained the norm for some one hundred years). The gap between the realities of work and the vision of Marx remains stark and illustrates the urgency of promoting this vision within modern debates.

A fourth idea concerns the scope for change. In contemporary society, technology is not neutral, but skewed towards particular interests. Its use as a means to accumulate capital and to extend management control has often added to inequality and injustice in the world. To be sure, technology has evolved differently according to different varieties of capitalism. For example, there has been greater scope for sharing of the returns of productivity growth in the Nordic countries with technological development coinciding with lower inequality and shorter work hours. This is in contrast to countries such as the US and UK where higher productivity linked to technological progress has coincided with higher inequality and longer work hours. In these countries, the fruits of

productivity growth have gone largely to capital owners, leaving many workers too poor to work less and unable to improve the quality of their work [34]. Across capitalist economies, however, there is a general tendency for technology to be shaped in ways that benefit capital over labour [35]. This extends to the use of technology to monitor workers and intensify work [36].

The above suggests that change is required in the way that technology is directed and governed. That is, there is a need to take seriously forms of economic democracy that give workers more of a say over what and how technology is used. Without greater democracy, many workers will remain vulnerable to exploitation at work and unable to secure the work hours and work quality they need to thrive.

Different options present themselves here. One is to increase the voice of workers in workplaces. This could help to secure technology that currently does not exist. Workers themselves will have ideas about what problems at work need to be overcome and possibly ways to resolve them. Democratising technology would entail workers being involved at an early stage in the innovation process. It would also mean workers becoming active participants in the deployment of technology. A more open and inclusive approach to work organisation would help to shape technology in ways that benefit workers and society more generally [37].

Practically speaking, the above implies a stronger role for unions in workplace governance. Rather than seeing unions as an impediment to progress, they should be viewed as partners in the process of developing and implementing technology. Workers or their representatives could be invited to sit on company boards. Following the tradition in Germany [38], a system of ‘codetermination’ (including formal work councils) could also assist in ensuring that productivity gains from technology translate into reductions in work hours and improved work quality.

More radically, worker ownership could be encouraged with workers taking direct stakes in firms. This would require steps to overcome credit and skill gaps that prevent workers from becoming owners of firms. But, with appropriate support, worker-owned firms could be increased in number and scale. The democratic structure within them would help, as earlier implied by Mill, to facilitate more equalitarian outcomes, ranging from a shorter working week to potentially more rewarding work for workers to do.

There are historical examples to support the case for greater workplace democracy. In the UK, for example, the Lucas Plan in the 1970s saw workers at Lucas Aerospace develop their own plan for the reorientation of production towards socially useful work [39]. While the plan was a response to the threat of layoffs, it showed how workers involvement could bring about positive solutions, including a creative reorganisation of work. Though ultimately unsuccessful (due, in part, to its promotion of goals beyond profit creation), it offered a glimpse into the scope for redesigning work under more democratic conditions (see also [40]).

More recently, there are examples of different communities seeking to use and adapt technology for their own ends. These include creators of open-source technology and commons-like peer production sites [41]. Their actions have created space for different forms of working and for cooperative action that subverts capitalist values and goals. They, in turn, have offered the basis for more democratic futures: ones that promise a higher standard of work and life. Realising these futures will depend on developing and deepening social and political alliances that challenge the use of technology for profit. Their realisation, in other words, will entail democratising work and the economy more generally.

A fifth and final idea concerns envisioning the future. Seeing a way to a better future should motivate all researchers and policy-makers. But, in this context, ideas about the future must be bold and imaginative. Here there are lessons to learn from past visionaries. As we saw above, for Marx, Mill and Keynes, confronting the future meant tackling the limits of capitalism and seeing pathways to post-capitalist futures.

In the present, as discussed above, debates on automation have taken a position between incrementalism and utopianism. Those supporting

work’s continuation miss the scope for living better with less work to do and endorse capitalism on the same foundations. They overlook the need and benefit of more radical reforms aimed at altering existing ownership arrangements. Radical perspectives assert the benefits of a ‘post-work’ future. These highlight the need for change, but seemingly invest technology with the power to transform society and understate the requirement for institutional change including greater democracy in work. A fetish for a UBI similarly distracts from the need for reforms in the workplace [42]. A focus on the idea of ‘post-work’ also puts out of sight the scope for restoring the quality of work.

In addition, the discussion of this idea misses the subversion of technology by grassroots networks and the possibilities for what Smith and Fressoli [41] refer to as ‘post-automation’. ‘In place of automation’s foundations in capital accumulation, managerial control and labour productivity, post-automation commits to more plural relations rooted in human creativity, conviviality and care’ [41]: 1–2). It entails a broadening of democracy, including the opening up of technological cultures to different social and activist groups. Change, then, can be realised not just in the social control of technology but also in who uses it and how it is used. To this extent, technology can be re-harnessed and re-developed in ways that take society beyond the pressures, routines and practices that currently dominate in society. Indeed, it may create more space for the building of a post-automation future where living well takes the place of working for a living.

There are lesson here from the literature on participatory and deliberative technology on how citizens can be included in the development and implementation of technology [43]. Citizens as workers might have interests in pursuing certain forms of technology but these may clash with those of citizens as consumers. To ensure a balanced set of interests are recognised and respected, society will need to evolve more open spaces that enable different voices to be heard. This will mean challenging existing power structures based on capital ownership and moving towards a more democratic system. In such a system, as argued above, the idea of automation may itself be rethought with greater consideration of how people choose and direct technology [41].

The point to make is that contemplation of better futures should embrace – in line with Marx, Mill and Keynes – the possibility of transcending capitalism. There is no reason to limit our imagination to capitalism – to the contrary, there is every reason to imagine futures beyond it. But, in reimagining the future, it is important to keep in mind the scope for reforming work, not just saving or negating it. The focus should be on seeking a future – beyond capitalism – where people’s creative needs are met in work and beyond it (see also [44]). This means securing workplaces where technology allows for meaningful work and adds to the freedom for creative activity in leisure. Imagining a better future means exploring forms of technology and work organisation that realise the benefits of work and leisure simultaneously. It also means seeking a broader democratisation of the institutions and practices of society and of contemplating ways to place the human interest at the centre of the way work and life are organised.

5. Conclusion

This paper has taken a historical and critical approach to the assessment of modern debates on automation. It has argued that key ideas on the future of work can be gleaned from the following trio of writers: Marx, Mill and Keynes. These writers offer useful insights into how technology might be used to overcome the costs of work and facilitate the move to a better society. They can also be used to identify some problems of concept, politics and vision within modern debates. In seeking to resolve these problems, the paper has offered ideas about how research on the future of work might be advanced and used to inform an alternative agenda for change in society – one that encompasses the goal of reducing work time while raising the quality of work. The importance of making work more democratic has been stressed in particular. Without greater democracy in workplaces, the scope for harnessing

technology for wider social and economic benefit will be severely limited.

The broader point to stress is that neither technology nor work are immutable. Both can be (and should be) reformed. Technology, indeed, should be redirected and remoulded to fit with the needs of workers for less as well as better work. This will require no less than a transformation in society. But there is no alternative if technology is to work for the benefit of all.

Learning from past ideas, as discussed in this paper, can be fruitful in identifying new directions not just for research but also for reforms aimed at securing a future that promises greater affluence with more meaningful activity, both in work and leisure. The task for the present is to create the conditions that will make this future a real possibility and ideally a reality.

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Declaration of competing interest

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Data availability

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