

Foresight Brief

The *Foresight Brief* is a publication from the European Trade Union Institute (ETUI) focused on strategic thinking about the future challenges for the world of work. It is produced by the ETUI's Foresight Unit, whose work concentrates on two priority areas: climate change adaptation and new technologies. The *Foresight Brief* is also available in French under the title *Notes de prospective*.

Artificial intelligence: a game changer for the world of work

Aída Ponce Del Castillo

Senior researcher at the European Trade Union Institute

'Whoever becomes the ruler of AI will become the ruler of the world,' said Vladimir Putin in September 2017. The USA, Russia and China are all adamant that artificial intelligence (AI) will be the key technology underpinning their national power in the future.

What place, then, is there for Europe in this context? The European Commission has recently set out an initiative on AI which focuses on boosting the EU's technological and industrial capacity, developing an innovation ecosystem, ensuring the establishment of an appropriate legal and ethical framework, and preparing for socio-economic changes.

This edition of the Foresight Brief presents the results of a mapping exercise on AI's impact on the world of work. It looks at the issues of work organisation and infrastructure, introduces the idea of 'AI literacy' for the workforce (as a necessary complement to technical reskilling), and details several AI risks for companies and workers. It also looks at aspects related to algorithmic decision making and the necessary establishment of an ethical and legal framework.

#05 – June 2018

Editors of the Foresight Brief series:

Christophe Degryse
Philippe Pochet
Aída Ponce Del Castillo

Editor of this issue:

Christophe Degryse,
cdegryse@etui.org

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ISSN 2507-1548

1. The European Commission's vision of AI for Europe

The recent publication of the European Commission's Communication on 'Artificial Intelligence for Europe' is an important step in the necessary development of a governance system for AI which will allow Europe to set the standard internationally. At the national level, several European states such as Estonia, France, Finland, Ireland and the UK have developed their own strategies, which all highlight how AI can improve national productivity. Internationally, China, Japan, the USA and South Korea are also developing their own initiatives.

The Commission's Communication responds to the European Council's request to put forward a European approach to artificial intelligence by early 2018 (European Council 2017). This Foresight Brief looks at the Communication's key messages and identifies certain issues related to the world of work that the author believes the Commission needs to look into more closely.

The European Commission (EC) views AI as a technology that can boost the European digital single market and help Europe achieve greater industrial leadership.

The first pillar of the Communication focuses on financial investment. The EC's long-term plan is to catch up with Europe's competitors. The USA is currently the leader in the field due to the emergence of a multitude of start-ups. China, in second position, has stated its ambition to become world leader in AI by 2030. In the short term (2018-2020), the EC will increase R&D investments in AI to 1.5 billion euros (a 70% increase). If similar efforts are made at national level and by private actors, the expected total investment for this period will be around 20 billion euros. According to the EC, Europe's strength is in its capacity to interconnect different national systems and become a benchmark for quality.

The second pillar of the Communication addresses the impending socio-economic changes and the need to be prepared to face them. Here, according to the EC, the challenge lies in dealing with issues around education, training and skills development; this includes helping workers in jobs that will likely disappear or be transformed and training more AI specialists for new job profiles.

Finally, as a third pillar, the EC outlines the need for an environment of trust and accountability around the development and use of AI. It appears to be in favour of self-regulation and esteems that the current regulatory framework is strong and balanced as it relies on standards on safety, product liability, information security and protection of personal data (GDPR), free flow of non-personal data, e-privacy and cybersecurity.

A fourth pillar, on ethical concerns, will be developed at a later date: the EC plans to draft a series of ethics guidelines by the end of 2018, bringing together a diversity of stakeholders to do so. Building on the work done by the European Group on Ethics, the guidelines will look not only at the misuse of AI but also at its impact on fundamental rights concerning privacy, dignity, consumer protection and non-discrimination. Other topics will be also addressed, such as the future of work, fairness, safety, security, social inclusion and algorithmic transparency.

2. Mapping AI: five game-changing dimensions

The EC Communication sets broad guidelines for AI but the opinion of this Foresight Brief is that a more precise roadmap should be developed. In support of this argument, it identifies the impacts of AI on the world of work and looks at various aspects that need to be given serious consideration, including by the EC. Using foresight methods makes it possible to carry out analytical work when there is limited data and information, as is currently the case with AI.

What is already an undeniable reality, however, are the many concerns about the relation between AI and social and labour inequalities. Various problems have recently been coming to light: as the rules of the technology game are changing, legal provisions need to be enacted if we want to avoid situations similar to the Cambridge Analytica debacle. Lessons should be learned from this event, which could have been avoided had more attention been paid to what foresight experts call ‘weak signals’¹.

Exponential growth in AI development and its integration in applications, products and services have boosted the industry’s business models and platform services (Brashear *et al.* 2018). Against this background, research has tried to forecast job losses and opportunities. Methodologically speaking, researchers have either looked at the historical pattern of automation or made calculated predictions of job losses, but they have not been able to provide a reliable forecast as yet. Indeed, the major problem when trying to understand the impact of artificial intelligence on the labour market is this uncertainty and unpredictability. It is difficult to predict what jobs, tasks and skills will be potentially affected, both positively and negatively, by AI and its evolution.

The issue here is not just about jobs but also the development of new types of business models and companies, with new value chains, and a reorganisation of existing businesses. The future architecture of the labour market will probably be more fragmented but also more interconnected. To try and make sense of this future landscape, the author has used the ‘Futures Wheel’ method² to consider the main impacts of AI on the world of work. Five key issues are mapped out and presented below; the hope is that the EC will deepen its examination of these aspects as part of its analysis of the digital transformation and its initiative of building an inclusive European AI strategy.

AI is a game changer that will trigger the creation of new business models and companies, with new value chains, and a reorganisation of existing businesses.

2.1 AI's impact on work organisation

In the daily operation of a company, AI can be used in a multitude of tasks, ranging from managing data, performing functions like internal finance and accounting, automating tasks, managing production, the supply chain and recruitment, to incorporating machine learning for business intelli-

1. ‘Weak signals’ are past unclear yet observable phenomena warning us about the probability of future events. <http://wiwe.iknowfutures.eu/what-is-a-weak-signal/>
2. The Futures Wheel is a way of visually representing the primary impacts of a trend and identifying its secondary and tertiary consequences.

gence, forecasting sales and ensuring security. This, coupled with the fact that AI can be run from the Cloud, negating the need for people to work in the confines of a traditional office environment, increases work mobility ('office on the go') and connects workers to data rather than to a traditional company.

More than simply reshaping individual jobs or positions, AI will lead to a new and vastly different work organisation and new management models. It will create a state of 'hyper-connectedness', with workers dealing with bigger amounts of data coming from different channels, processes run at high speeds and algorithms that can take decisions. Workers will have to find their place in this assemblage of humans and non-humans.

AI is not a 'plug and play' technology. It implies a fundamental reorganisation of the internal architecture of a company, governed by an in-depth reflection on the place for this new technology. Here, social partners

have a key role to play, at company, sectoral, national and European (through European Social Dialogue committees) level. Information and consultation procedures can ensure the participation of workers in the redesign of their workplace architecture, help to anticipate the changes AI will bring about and help to identify the skills that workers will need in the future. Given the speed of AI-related change, information and consultation has to become a more intensive, established and

consistent practice in the life of companies. All of this will be particularly important for crowdworkers; ensuring their rights to representation, information and consultation will require creativity and possibly even inventing a new approach tailored to their specific working environment.

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2.2 The need to become AI literate

As AI becomes part of the daily life of companies, significant investments in upskilling/reskilling workers will be necessary, in all sectors and at all levels. This is already something companies are doing because it serves their interests: by increasing the skill levels of their workforce, they improve efficiency and increase competitiveness.

However, the author believes that acquiring technical skills, although necessary, is not enough. More importantly, workers need to become 'AI literate'; that is, able to understand AI's role and its impact on their work. This involves learning to work alongside AI and anticipating and visualising how AI can and will transform their career and role in a company. This 'AI literacy' requires computer literacy, understanding, processing and manipulating data (and understanding its limitations), identifying and solving AI-related problems, logical and computational thinking, and generally acquiring the ability to live and evolve in a new (AI) world. All of this benefits the workers themselves (including the self-employed and crowdworkers, and even 'non-workers' such as students and the unemployed),

not just the company that employs them, by going beyond the technical skills mentioned above towards the development of a capacity to critically engage with AI in various contexts.

The ideal scenario is to develop a framework that allows for both upskilling/reskilling and the development of AI literacy to take place, ensuring that individuals' capacities are transformed or improved in a comprehensive way. Schools have an obvious role to play in AI literacy, ideally providing every individual who enters the labour market with

a solid AI knowledge base. Once out of the school system, the education process must continue and guarantee that no one is left out or excluded, particularly minorities, seniors and women. Companies have a role to play here and one possible way of ensuring they do so is by integrating provisions on the development of AI literacy for workers in collective agreements.

More than just acquiring technical skills, workers need to become 'AI literate', able to understand and anticipate AI's impact on work.

2.3 AI risks

Asked about the future of AI, 550 top experts shared the following opinion: there is a 50% chance that high-level machine intelligence (defined as a level of intelligence such that a machine can carry out most human professions at least as well as a typical human) will exist by around 2040-2050, rising to a 90% chance by 2075, with systems expected to move on to a level of super-intelligence within less than 30 years thereafter. Asked about the potential impact of such an evolution, about one in three believed that it would turn out to be 'bad' or 'extremely bad' for humanity (Müller and Bostrom 2016).

If anything, this shows that even experts have serious concerns about AI's impact on mankind. Several key risks exist and must be addressed: in particular, computing errors, cybercrime, superintelligent systems, the balance between autonomy and control, and the potential use of AI to undermine workers' rights.

Computing errors

These are perhaps the most obvious AI risk. Badly programmed software can lead to serious mistakes, particularly when such software has to work autonomously, making decisions independently. AI systems will have to be developed in tandem with a strong and reliable set of verifications and a quality assurance framework.

Cybercrime

As companies are increasingly interconnected and rely on flows of data, Cloud-based systems are becoming central to their survival, alongside

the priorities of protecting data and preventing attacks. Recent malware attacks, such as the WannaCry ransomware attack of May 2017, have demonstrated how fragile some computer systems are. Worse, we now face the risk of AI-powered cyber attacks. According to a report produced by 26 experts from around the world, entitled ‘The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation’ (Brundage *et al.* 2018), AI will multiply the ability of cybercriminals to attack companies and individuals, by allowing them to automate hacking procedures. Even more worryingly, AI-supported political disruption is also fast becoming a reality: states may use automated systems to suppress political dissent and target voters through ‘automated, hyper-personalised disinformation campaigns’. ‘Denial-of-information attacks’ can be used to drown actual facts in a sea of fake news.

Superintelligent systems

This alludes to the existential risk some technologies pose and, in particular, the unforeseeable and possibly irreversible impact of a self-learning technology that has the potential to become more intelligent than the humans who invented it.

One key feature of AI is its ability to act autonomously and come up with solutions that humans have not considered. In some sectors, such as high-frequency trading (HFT), algorithms competing with one another have ‘escaped’ human control and triggered short-term catastrophic financial events known as ‘flash crashes’, wiping billions of euros off the markets. Some see this as an irrelevant problem which only affects a small community of investors, but it actually impacts millions of individuals whose future pensions are invested in tradable financial instruments.

Autonomy vs control

Apart from specific applications where near-complete autonomy is achieved, such as HFT, AI systems are still mainly collaborative and involve interaction with human operators. The risk here is the lack of a clearly defined boundary between autonomy and control in the relationship between worker and robot, particularly when such collaborative systems involve rapid to-and-fro relinquishment of control from the human to the AI system and vice versa. Aircraft autopilot systems or AI-assisted surgical operations are a couple of examples that come to mind in this case.

Use of AI to undermine workers’ rights

For workers, the concerns are obvious and relate to how their job may change or even disappear if replaced by an AI system. Even when such extreme situations are avoided, working in an environment where AI systems are in place raises the risk of misuse or abuse, particularly in cases of

workplace monitoring and surveillance or in discriminatory practices like scoring or profiling.

Here, data management is key, and the distinction between personal and non-personal data does matter. Workers need to know how their personal data is collected, retained, processed, disseminated and possibly sold, and how data related to their behaviour at work can be used (potentially against them). In other words, workers and individuals working in complex ecosystems have to become 'privacy-aware'. This should be ensured through collective agreements, which in some cases are already starting to show adaptation to digital changes³. In the future, these agreements should include clauses related to surveillance, behavioural profiling, geo-tracking, human verification in processes using AI, and the overlap between human and AI territories of responsibility.

However, this approach only protects organised workers, not those who work via online platforms, the so-called 'gig workers'. These face other risks, due to the 'decomposition of jobs into tiny micro-tasks that can be digitally distributed' (Lehdonvirta 2018).

Here, algorithms filter tasks and distribute them to workers according to different parameters. A team of researchers at the Oxford Internet Institute studied the situation of such workers who are constantly confronted with algorithmic reputation scores and automated tests. They identified specific risks such as job insecurity, discrimination, social isolation, overwork, unstructured work, opacity and uncertainty regarding legal responsibilities, and the presence of intermediaries who can complicate the information flow (Graham *et al.* 2017). For these individuals, worker representation must be rethought so that their voice can be heard.

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2.4 Algorithmic decision making

References to algorithms are made throughout this brief. They are a set of mathematical equations used for problem solving, including recruitment, distribution of tasks, work scheduling and performance assessment, or more invisible tasks such as identifying data patterns and correlations.

The concern is that algorithms will increasingly be embedded in decision-making processes, with no human intervention. In this sort of context, workers must be able to understand how an automated decision was made so that in cases of false, biased or harmful decisions they are able to contest it.

In the quest for greater explicability and accountability, various proposals exist for reducing this opacity. Those of the 'open code movement' believe that the code is the most 'transparent' part of the algorithm and should be accessible and open. Some data scientists, meanwhile, argue that the code may be useful but that what also matters is the data fed to the algorithm, the way it is selected and the form it takes. Another proposal is to rely on 'unconditional counterfactual explanations'. This entails describing the minimum

3. In Germany, the manufacturer Schaeffler, its EWC and IG Metall adopted an agreement to deal with the digital changes: <http://www.planetlabor.com/en/industrial-relations/corporate-news/germany-schaeffler-its-wc-and-ig-metall-seeking-together-to-meet-the-digital-challenge/>

conditions and information that would have led to an alternative (either decision or preferred situation), without opening the black box and knowing the full rationale of the code (Wachter *et al.* 2018).

Working with algorithms requires not only a high level of trust but also an understanding of how automated decisions are made. Which of the above

Workers must be able to understand how an algorithmic decision has been made and have the possibility to contest it.

options is chosen is not the primary issue at stake here; it is rather the ability of the concerned individual to make sense of a decision and possibly contest it. To do that, the code and the data matter, but other pieces of information (where the data comes from, and its accuracy, completeness and possible bias) are also very useful. What is of key importance is to design algorithms that can be audited or

scrutinised at a level beyond the code, so as to visualise how they work in a given environment (Ananny and Crawford 2018). This is how algorithmic decisions can be made less invisible or unclear.

2.5 Ethics and law

The current trend in addressing the ethical and legal aspects of AI and machine learning is to focus on fairness, autonomy, responsibility and ethical principles. Various corporations and professional groups are adopting codes of ethics and codes of conduct, proposing their own ethical approach. This does not, however, guarantee consistency and coherence and it allows a minority to decide what is ethical and fair.

Considering that AI is a game-changing and revolutionary technology, self-regulation and a system based on a multiplicity of codes of ethics do not work. Instead, the sector needs a consistent set of ethical rules, possibly

AI is a multi-purpose technology and intersects with other frontier technologies, creating additional layers of ethical, societal and legal implications.

modelled on the 2017 UNESCO recommendations on robotics and AI (COMEST 2017). This could be used as a universal framework as it focuses on human integrity and dignity, autonomy, privacy, beneficence, justice, the 'do not harm' principle, and the principle of responsibility.

Not just an ethical but also a legal framework is needed. AI does not evolve in an isolated environment. It is a multi-purpose technology that intersects with enabling or frontier technologies (Nano-Bio-Info-Cogno). The convergence of these technologies creates additional layers of complexity and has ethical, societal and legal implications. Regulators will need to figure out how to manage risks and attribute liability, particularly as machines increasingly acquire the ability to learn and take independent decisions. Without a legal framework, transparency and trust will not exist, which will be detrimental to everyone, even the industry.

ARTIFICIAL INTELLIGENCE: FIVE GAME-CHANGING DIMENSIONS



ALGORITHMIC DECISION-MAKING

- explicability & accountability
- code & data matter
- scrutiny beyond the code
- biased & blurred processes

a way forward

possibility to
contest decisions



ETHICS & LAW

- liability
- traceability
- responsibility
- universal ethical framework
- convergence of technology (Nano-Bio-Info-Cogno)

a way forward

ethical & legal
framework

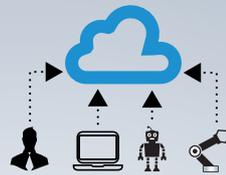
RISKS



- computing errors
- cybercrime
- superintelligent systems
- autonomy vs. control
- use of AI against workers' rights

a way forward

stronger
workers' participation



WORK ORGANISATION

- company's architecture
- work mobility
- transforming jobs & positions
- work speed & data volume

a way forward

a new corporate
governance &
regulation

AI
the next
generation

AI LITERACY



- upskilling
- understanding & manipulating data
- solving AI-related problems
- inclusion of workers & non-workers

a way forward

workers' critical
engagement with AI

3. Conclusion

Artificial intelligence is a game changer and promises to revolutionise the way we work and live. It will trigger the creation of new business models and lead to a new and vastly different work organisation and new management models. In this new world, acquiring technical skills (reskilling) will not be enough. Workers will need to become 'AI literate' to be able to assert themselves in a profoundly different work environment and to anticipate how AI can transform their career and role in a company.

Beyond this, automated decision making by algorithms is increasingly going to be part of our lives. Workers will need to understand how algorithms work and how automated decisions are made, in order to have the possibility of contesting them in case of false or biased decisions. Accessing the code, as some advocate, is not relevant here. What is needed is the right to step in and act if the code takes a decision that is harmful to an individual.

Finally, given the multi-purpose nature of AI and the fact that it intersects with so many other technologies, developing a solid ethical framework is an absolute necessity. This framework must deal seriously with AI's impact on some fundamental citizens' and workers' rights, such as privacy, dignity and non-discrimination: standards which need to be upheld, even (or rather, especially) in this fast-changing world of work.

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Foresight Briefs already published

Shaping the world of work in the digital economy

#01 – January 2017

Christophe Degryse

In June 2016, the ETUI's three-day conference in Brussels brought together the best experts on social issues related to the digitalisation of the economy, a theme that is still difficult to grasp in terms of its specific implications. In dedicating its first issue to this conference and its conclusions, this *Foresight Brief* offers more than a mere summary of the debates. It instead aims to draw out vital points concerning the strategic challenges that we believe the world of work faces in this new 'digital revolution'.

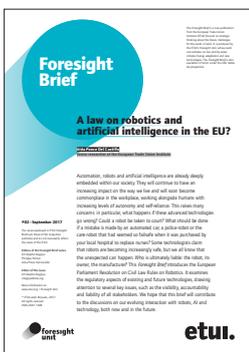


A law on robotics and artificial intelligence in the EU?

#02 – September 2017

Aída Ponce Del Castillo

This *Foresight Brief* introduces the European Parliament Resolution on Civil Law Rules on Robotics. It examines the regulatory aspects of existing and future technologies, drawing attention to several key issues, such as the visibility, accountability and liability of all stakeholders. We hope that this brief will contribute to the discussions on our evolving interaction with robots, AI and technology, both now and in the future.



Two futures and how to reconcile them

#03 – November 2017

Philippe Pochet

Although there is little argument about the fact that climate change and the digitalisation of the economy are the two main trends that will matter most over the coming decades, to date they have predominantly been considered separately rather than together. The aim of this *Foresight Brief* is therefore merely to initiate a debate. The author firstly analyses the different versions of these two narratives, before examining their potential formulation and ranking and then exploring the emergence of digital and green capitalism and its consequences. He concludes by proposing a scenario involving a two-step approach to change.



Technological revolutions and societal transitions

#04 – April 2018

Gérard Valenduc (ETUI)

Are we currently living through a new industrial and technological revolution? Does it differ qualitatively from similar revolutions in the past? How can we gauge its political implications? Researchers working within the school of evolutionary economics, in particular those who embrace the concept of techno-economic paradigms, regard the ongoing digitalisation of the economy not as a new revolution, but as the turning point between the installation period and the deployment period of a paradigm based on information and communication technologies. In this *Foresight Brief*, the author examines the different versions of these two narratives, before examining their potential formulation and ranking and then exploring the emergence of digital and green capitalism and its consequences. He concludes by proposing a scenario involving a two-step approach to change.

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