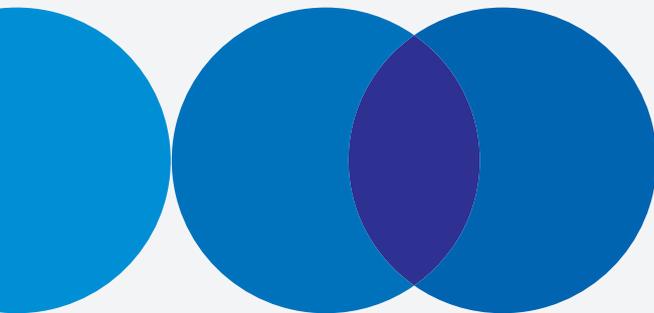




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29 MAR. 2018



ARTIFICIAL INTELLIGENCE AND WORK

PRESENTATION FILE



9 OCTOBER 2017



Muriel Pénicaud, Minister of Labour, and **Mounir Mahjoubi**, Minister of State for the Digital Sector, asked France Stratégie to examine the impacts of artificial intelligence on transformation of the world of work. This report is linked with the mission entrusted to Cédric Villani.

- Hearings conducted with almost 60 individuals
- Meetings with social partners
- Exchanges with the Villani mission

29 MARCH 2018



Delivery of the Report

1. WHAT IS ARTIFICIAL INTELLIGENCE?

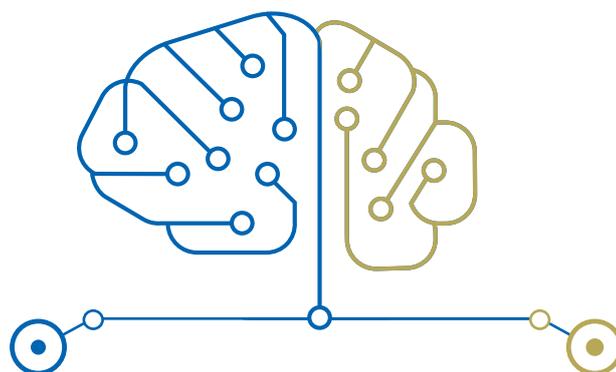
AI may be defined as a group of technologies aiming to carry out cognitive tasks traditionally assigned to humans computationally. It is one of the digital transformation's key technologies. It is not really new: the idea for the first formal neural networks – on which all recent progress in AI is based – dates back to the 1940s.

The public at large imagines AI to be machinery with as much intelligence as a human being, which is self-aware and can make choices completely autonomously. This is far from being the case. AI is present in our smartphones, to manage the voice assistant and optimise display of personalised advertising pages, but existing devices are by no means ready to be endowed with consciousness.

AI arouses fears, in particular because it enables increasing automation of tasks and could therefore play a major role in the changing world of work.

In practice, it is the way in which AI systems will be deployed and the productivity gains they enable shared, and what choices are made in terms of task and team organisation, that will largely determine which way the balance swings.

Finally, analysis of AI's impact on work must take full account of factors other than the technology itself. The degree to which AI is disseminated and its incorporation into daily work practices depend on its cost and is also based, among other things, on regulations, social acceptability, levels of education and available skills, and the economic context.



ECONOMIC OPPORTUNITY

Productivity gains

Lower costs of automated operations.
Improved processes for coordination between various services and actors.
Optimisation of production flows, etc.

New markets

Autonomous vehicles,
smart patient-monitoring platforms

SOCIAL OPPORTUNITY

Emergence of new professions thanks to big data
Vehicle fleet and chatbot supervisors

Improvement of working conditions and valorisation of (social, interpersonal, creative, etc.) activities/tasks

AI takeover of repetitive routine tasks,
empowerment of workers, customers, and patients

RISKS

FOR EMPLOYMENT

Possible major productivity gains

Chatbot, eventually autonomous vehicles

Modification of professional boundaries

Health sector

RISKS

FOR WORKERS

Skills depreciation, cognitive overload, loss of autonomy, increased monitoring, loss of the meaning of work

2. THREE ACTIVITY SECTORS UNDER SCRUTINY

The Report aims to give a realistic assessment of the current and potential effects of dissemination of artificial intelligence in three sectors: transport, banking and healthcare, all of which are expected to be heavily impacted by AI.

A. IN THE TRANSPORT SECTOR

The sector's current operations have four major focuses: freight transport (1/3 of sector production), warehousing and ancillary services (1/3), passenger transport (1/4) and mail services (under 10%). An upturn in activity is to be observed although it is still well below its 2008 level. The sector is suffering from a shortage of road freight transport drivers, which is likely to increase over the coming years as existing drivers grow older.



The major AI innovation will be the autonomous vehicle, even though the timeline for its deployment remains uncertain. Within the next 5 to 10 years, AI could enable development of predictive equipment maintenance, improvement of vehicle circulation and optimisation of logistics, in particular in the event of disruption.

WHAT IMPACTS ON WORK?

A decrease in numbers of lorry drivers is to be expected over time. Workforce costs account for up to 45% of total costs in Europe. The advent of autonomous vehicles would enable automated convoys to travel along motorways. A driver would only be required in the lorry leading a convoy. Direct consequence: fewer long-distance drivers will be required, but more local drivers will be needed to take lorries to motorways and operate local services. Jobs as “controllers” might well develop for remote supervision of fleet circulation. There may also be increased use of this form of transport due to its lower overall cost.

When the technology has been perfected, autonomous shared shuttles will be competing with private vehicles, taxis and chauffeur-driven cars. In parallel, new positions will be created to supervise fleets of vehicles, and take charge of customer relations, reception and safety. For all this, traditional public transport should not disappear, as its replacement by autonomous vehicles would generate road congestion. In fact, intercity public transport could well develop as competition to present-day car-sharing and regional train and coach offers.

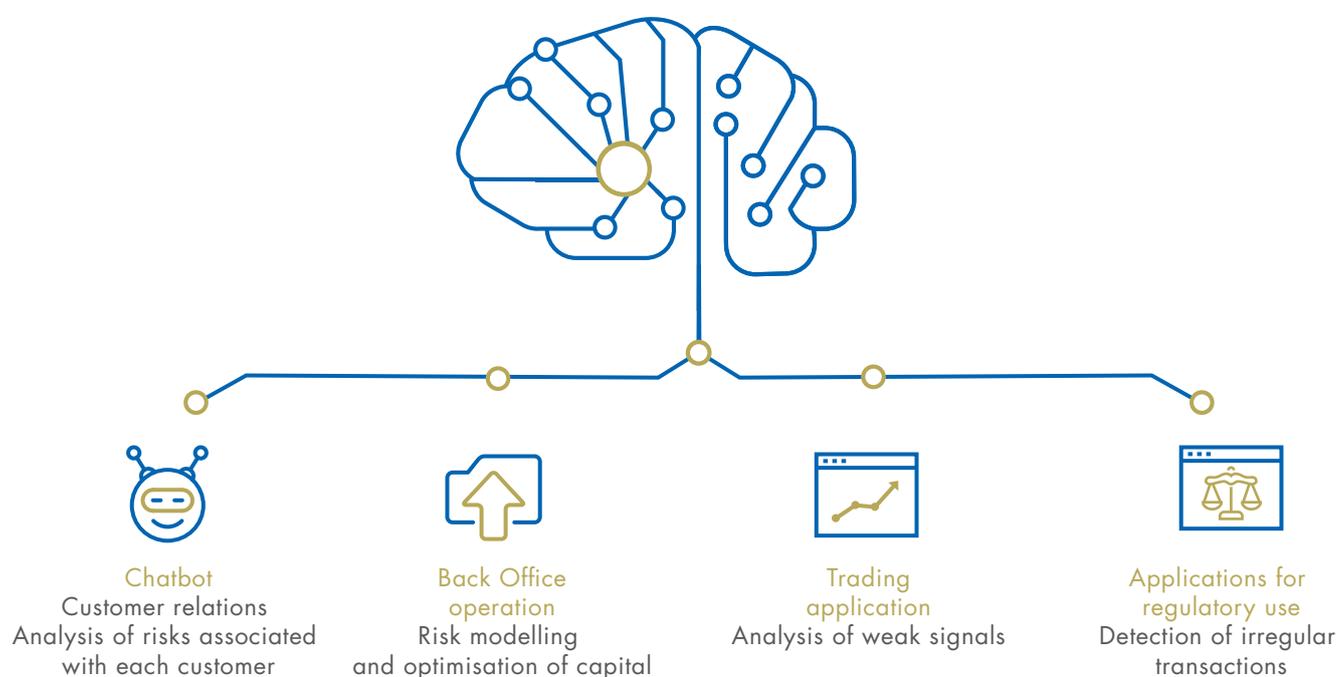
As regards maintenance, artificial intelligence could well polarise employment (above all for local garage-owners) between experts, able to carry out advanced diagnoses when smart tools fail, and “performers” who only carry out tasks indicated by such tools. Training has a key role to play in enabling individuals to acquire skills connected with new technologies and ensuring that they are in a position to repair new breakdowns. Finally, organisation of work in maintenance centres may well change: with more predictable workloads, days may become more condensed and routine.

B. IN RETAIL BANKING

In 2016, the French Banking Association (AFB), which has a total of 195 member banks, recorded around 200,000 employees in the banking sector. The sector’s workforce has been decreasing since 2012 and is likely to continue to do so as a result of future retirements. Recruiting drives should concentrate on qualified profiles. The Report focuses on retail banking activities, which account for over 2/3 of the net banking product.

The banking sector in general was one of the first to adopt digital tools to manage customer databases, develop online banking operations and handle technical operations. Its actors now possess large, well-structured masses of data, creating a favourable climate for development of AI. Dematerialisation of relations between customers and banks has become the general rule for simple operations, although continuation of at least some physical interaction would seem necessary for more complex cases as well as for fragile sectors of the public.

AI APPLICATIONS IN THE BANKING SECTOR



WHAT IMPACTS ON WORK?

Account managers and financial advisors, who currently account for a little under 1/5 of the sector's workforce, will be widely impacted by changes brought about by AI. Implementation of tools that enable sorting of and response to the most frequent requests, along with advanced personalised recommendation tools, will lead to a decrease in numbers of employees and an increase in the complexity of tasks they still need to handle. The financial advisor's role may well be consolidated and redirected towards customer support.

In support services, information system departments in particular, AI is unlikely to do much to shake up current organisation. Transformations will continue: the most repetitive tasks (data collection and control procedures, for example) will be optimised or accelerated and staff will have to learn to interact with AI. Companies, however, should outsource needs specifically connected with AI. The largest groups will be able to reorientate their research departments and try to develop partnerships.

Human resources departments are unlikely to see complete automation of their tasks. AI is already very much a part of recruitment and career management processes, and should continue to extend its influence and enable limitation of repetitive tasks.

The numerous changes that have already taken place in the sector, the irruption of digital technology in particular, have led to adaptation and training of staff rather than elimination of jobs. Consequently, the advent of AI is not seen as a revolution but more as new stage in the digital transformation.



C. IN THE HEALTH SECTOR

Health professionals account for 7% of the labour force. Numbers of general practitioners and specialists are likely to stagnate over the years to come, while there should be an increase in numbers of nurses, midwives and masseurs/physiotherapists. Numbers of physicians in private practice will continue to decrease.

Health is one of the sectors in which AI could lead to major transformations. It has a great many applications, on simple and complex tasks alike: from aid to diagnosis and prescription to robotisation of various medical acts. Although it is as yet not widely disseminated in the sector, an increase in the quantity and quality of data collected is nonetheless to be observed.

WHAT IMPACTS ON WORK?

Medical imaging professionals will be particularly impacted by the changes brought about by AI. With the advent of automated image reading, radiologists should be able to concentrate on interpretation of complex pathologies and/or focus on interventional radiology. First-level diagnosis could even be carried out by radiographers trained in making diagnoses. In cardiology, interpretation of Electrocardiograms (ECGs) will soon be carried out by software. General practitioners, emergency physicians and even nurses may well use such tools, so gaining time and better orientating patients. We may also see subspecialisation of cardiology professions, so reinforcing a trend already at work in this particular specialisation.

General practitioners will have the use of decision-support software to update their knowledge of best practices/clinical protocols. Medical assistants will be able to help ensure that the right decisions on therapies are made, for example. Nurses should be able to devote more of their time to preparation of patient treatment hypotheses and carrying out first-level diagnoses. Use of AI-based connected objects will improve remote monitoring of various parameters (weight, blood pressure, etc.) and, for example, lead to increased prevention of pathologies. Use of robots provided with smart sensors to oversee elderly people with cognitive and behavioural disorders (such as Alzheimer's) will lead to reduction of the physical and mental arduousness of work carried out by nurses and caregivers.

Distance-treatment platforms centralising all data on patients' state of health will open up new perspectives. First of all, they will set the scene for networking of actors involved in patients' treatment paths (doctors, nurses, emergency physicians, staff responsible for coordination in healthcare facilities, etc.).

Surgeons' activities will also be transformed by the rise of AI. Coupled with robotics, artificial intelligence will enable introduction of partly autonomous tools able to perform various tasks, such as suturing, with extreme accuracy. Prior to operations, surgeons will also be able to train on virtual clones of their patients' organs.



D. AMBIVALENT EFFECTS ON QUALIFICATIONS

AI's effects on qualifications are complex, and largely depend on organisational choices made by the entities that use it: advanced automation or human/machine complementarity.

When AI manages basic tasks, it leads to increased specialisation needs as well as development of a "non-specialised" status. The banking sector provides a good example of this apparent dichotomy: it needs specialised employees to respond to the most complex requests not handled by AI and, at the same time, requires staff able to receive and orientate customers.

When it enables performance of complex tasks, AI can lead to related deskilling of workers or, in contrast, an increase in skills. Such is the case with nurses and radiographers, as well as with maintenance staff in the transport sector.

E. TRANSFORMATION OF ORGANISATION

Deployment of AI influences the way work is organised. Once in place, AI tools enable improved information management, activity planning and actor coordination. As a coordination tool, it may also lead to greater isolation of workers. In the transport sector, for example, automatic systems transmit information to staff who have become simple "performers". Working conditions may also deteriorate, with loss of autonomy, work intensification, etc.

Crosscutting skills would seem important in order to ensure successful complementarity between machines and workers (ability to communicate with others, ability to transfer organisational skills and knowhow, ability to manage the unexpected, etc.).

3. ISSUES AND RECOMMENDATIONS

- **Anticipating AI's effects on work and helping organisations anticipate their skills needs.** Forward planning must be initiated to pinpoint which tasks are/are not automatable by AI. Various aspects have to be taken into account, including task complexity, acceptable risk of error by AI, and the degree of interdependence of tasks or professions within an organisation. Companies then need to be assisted in definition of their future skills needs and assessment of applicants' skills.
- **Ensuring that workers receive training on AI issues.** We need to foster emergence of talents to produce AI and encourage development of skills in digital technology in order to deploy AI-based systems. Alongside such development of cutting-edge skills, we need to train workers to fully understand the technological, legal, economic and ethical issues involved in the use of tools based on artificial intelligence.
- **Better safeguarding of career paths in sectors highly impacted by AI.** The spread of AI in different sectors and, above all, the speed at which the transition is taking place are difficult to assess. It would seem essential to protect individuals whose jobs may disappear in the nearest of futures. Training individuals by skills blocks seems to be the way to go in order to enable transition from one profession to another.

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