The impacts of artificial intelligence (AI) on jobs: an industry perspective

Placide Poba-Nzaou, Malatsi Galani, Sylvestre Uwizeyemungu and Arnela Ceric

Placide Poba-Nzaou is based at the Department of Organization and Human Resource, University of Quebec in Montreal, Montreal, Canada. Malatsi Galani is based at the Department of Computer Science and Information Systems, Botswana International University of Science and Technology, Palapye, Botswana, and Department of Computing and Information Technology, University of Wollongong, Wollongong, Australia. Sylvestre Uwizeyemungu is based at the Department of Accounting, UQTR, Trois-Rivieres, Canada. Arnela Ceric is based at the Charles Sturt University, Albury, Australia.

Abstract

Purpose – *This paper aims to explore the impacts of artificial intelligence (AI) on jobs.*

Design/methodology/approach – *The authors followed rapid review guidelines. The authors collected industry and government reports published prior and up to August 2017 in Google and Google Scholar using combination of key words: ''job automation'' or ''work automation'' with technology keywords: ''artificial intelligence,'' ''machine learning,'' etc. In total, 11 were included in this research.*

Findings – *The use of AI technologies will impact jobs in the near future as some job tasks are automated. AI is likely to substitute both, routine and nonroutine tasks. It is expected that humans and robots would work together in ways never imaginable. Changes in employability skills are expected. Because of the magnitude of these impacts on jobs, consulted reports call for concerted solutions that go beyond organizations' and industry's boundaries to include other relevant stakeholders. Moreover, organizations will have to rethink their human resource (HR) function to realign its expertise to the reality of AI.*

Practical implications – *In this context, the HR function will have to understand the dynamics that generate the impacts of these technologies in a workplace, to anticipate changes and actively contribute to creating an organizational environment that will facilitate the collaboration between human workers and complex digital agents, while ensuring compliance with labor and employment laws and supporting strategic organizational objectives.*

Originality/value – *This paper contributes to the debate on ongoing concerns by providing a synthesis of relevant professional literature.*

Keywords *Impacts, Jobs, HR function, Artificial intelligence (AI), Jobs automation*

Paper type *Research paper*

1. Introduction

This paper presents a background of the transformative capability of artificial intelligence (AI) on human work and reports the results of a rapid review of the impacts of AI and associated technologies on jobs based on industry and government reports. It also draws implications for the human resource function.

2. Artificial intelligence and transformation of human work

For decades, organizations have been automating their processes to reduce costs and improve operational efficiency. Today, automation and digitization have infiltrated all areas of life. AI is a driver and enabler of digitization. AI uses data to learn and perform tasks. Learning capability based on machine learning is one of new key characteristics of AI. Increasingly, these applications use deep learning to explore data representations, and it enables AI to learn and apply its knowledge to different situations (National Academies of Sciences Engineering Medicine, 2018). These new technologies allow AI make complex decisions based on predictions at a low cost (Agrawal *et al.*, 2017). For instance, Fukoku,

an insurance company, replaced 34 employees with an AI system that can calculate payouts to policyholders. The firm is expecting to save about US$1m per year after spending approximately US$1.9m to install the system (McCurry, 2017).

Agrawal *et al.* (2017) argue that the breakthrough in driverless cars was made when AI predicted what a human driver would do in response to a set of inputs, thus demonstrating that tasks relying on a judgment that can be defined with an algorithm are easier to be performed by AI. Chui *et al.* (2015) suggest that automation based on AI will lead to labor savings, increased outputs, quality and reliability for businesses. For instance, the Kiva robots used by Amazon are equipped with navigation, motor skills and sensory perception to fulfill warehouse orders four times faster than an unautomated warehouse system (Chui *et al.*, 2015). Chui *et al.* (2015) argue that although AI will not cause automation of entire occupations, it will result in up to 45% of work activities being automated across both low-skill and high-skill occupations. Intellectual work, in contrast, can be automated through various types of AI based on algorithms that can analyze reports and data and inform operational decisions. Lawyers already use e-discovery software that identifies key documents relevant to specific court cases. However, it is not clear how this will impact individuals and societies, as more data is needed on the progress rate of AI, its impact on each job type and the creation of new work opportunities (Mitchell and Brynjolfsson, 2017; Nedelkoska and Quintini, 2018). Chui *et al.* (2016, p. 3) analyzed work activities in different occupations in the USA to examine the technical feasibility of their automation. They noted that a job is automatable if "the tasks it entails allows the work to be performed by a computer, even if a job is not automated" (Frey *et al.*, 2016, p. 15). Manyika *et al.* (2017) found that within occupations, predictable physical activity has the highest technical automation potential. Activities with very low potential are stakeholder interactions, applying expertise and managing people. Additional factors that employers must consider in deciding whether to automate work activities are the costs of automation, benefits of automation, regulatory frameworks and social acceptance (Manyika *et al.*, 2017).

Makridakis (2017) summarizes four possible scenarios concerning the impact of AI on humans: the optimists, pessimists, pragmatists and the doubters. The optimists predict that humans will soon rely on robots to perform most of the work and thus be able to spend time on more important things. The pessimists believe that AI and robots could threaten to end humanity as AI might exceed human intelligence. The pragmatists believe that AI augments our skills, can be controlled and regulated, and we will stay ahead in the race against AI. Finally, the doubters believe that AI is a fad and cannot replace humans.

3. Research methodology

This study followed rapid review guidelines based on the following steps (Tricco *et al.*, 2015): literature search (only gray literature), inclusion criteria (limited by date, language and study design), screening (title/abstract then full-text) and a narrative synthesis. We collected industry and government reports published prior and up to August 2017 in Google and Google Scholar. Several scholars concur that despite the popularity of rapid review, there is no consensus on its definition and main methodological processes (Harker and Kleijnen, 2012; Khangura *et al.*, 2014). A rapid review is based on agreed systematic processes that include modifications such as quicker searching of a limited number of databases, relying on faster inclusion screening and analyzing the data by using only selected methods of quantitative or qualitative analysis to draw rapid conclusions about a specific research question (Harker and Kleijnen, 2012). The research strategy used combinations of the keywords "job automation" or "work automation" with the following keywords: "artificial intelligence," "robots," "machine learning," "deep learning" and "smart machines". Reports needed to meet the following three criteria to be included in the review:

- English publication;
- reporting impacts of AI on jobs; and
- being based on a rigorous approach (detailed information on the scope of the report, data source, data collection and analysis).

In total, 18 reports were identified, and 11 were included in this research. Reasons for exclusion included lack of information on the impacts of AI on jobs and the approach leading to the results.

4. Results

Technology adoptions have transformational impacts on jobs, employment and entire economies. From an economic point of view, the most often cited impacts are productivity growth, which contributes to the improvement of the standard of living (National Academies of Sciences Engineering Medicine, 2017), and the accentuation of inequalities in the redistribution of wealth (Makridakis, 2017; National Academies of Sciences Engineering Medicine, 2018). Some of most significant jobs' impacts are displacements of jobs, the alteration of the types of jobs available and generating a polarization of the labor market (Frey and Osborne, 2017; Lamb and Lo, 2017; World Bank, 2016).

Contrarily, the gains generated within organizations are redistributed disproportionately among workers. This is because some digital technologies tend to "enhance" the skills of highly skilled workers by increasing their productivity while suppressing routine tasks and often middle-level jobs (Economics Frontier, 2018; Lamb and Lo, 2017; Manyika *et al.*, 2017; Nedelkoska and Quintini, 2018).

The results highlight that there is no consensus on the quantification of the potential impacts of these technologies on jobs. Some studies reveal very pessimistic projections. Frey and Osborne (2017) estimate that 47% of jobs are at risk of automation in the USA in the next 20 years, whereas Hopkins (2016) projects that by 2025, 16% of jobs will be replaced by technological systems, and at the same time, 9% of new jobs will be created, netting a 7% jobs loss.

The World Development Report estimates this rate at 57% on average across the 21 Organisation for Economic Co-operation and Development (OECD) countries. According to the OECD, on average 9% of all positions are presently at high risk of automation, as more than 70% of their tasks can be automated; with a rate of 6% in South Korea, 12% in Austria, with Canada and the USA both at 9% (Arntz *et al.*, 2016). According to McKinsey Global Institute, only about 5% of all jobs in the USA could be fully automated with proven technologies (Manyika *et al.*, 2017). The same report points out that for 60% of jobs, at least 30% of all activities could be automated. The rate of technical automation potential of jobs varies by jobs and industries. For example, the rate of potential automation is 90% for an industrial welder and drops to 30% for customer service representatives and 25% for chief executive officers (Manyika *et al.*, 2017). Acemoglu and Restrepo (2020) point out, whatever the job automation rate is, there is no guarantee that such jobs would be replaced.

Finally, it must be noted that statistics on the impacts of automation on jobs are exclusively based on technical feasibility without regard for other factors. Of particular note are factors related to social acceptability, legal compliance and the costs of deploying the technologies compared to the associated economic benefits (Manyika *et al.*, 2017; National Academies of Sciences Engineering Medicine, 2017).

5. General implications and specific implications for human resource (HR) function

5.1 General implications

The findings showed that the use of AI technologies will impact jobs, as AI is likely to substitute both routine and nonroutine job activities. There is likely to be a shift toward

higher-order cognitive and socioemotional skills, advanced and information and communication technologies skills. Highly educated workers are less likely to be impacted by new technologies. However, individuals with low-skilled jobs are deemed high risk. Unfortunately, with 4.2 billion people without internet access, there is a potential for an increased gap between developed and developing countries. The concerning finding is that employment growth will be less than employment lost.

5.2 Implications for human resource function

Our findings have following implications for the role of HR. As stated by Poba-Nzaou (2017):

- Given the scale and speed of the changes that are affecting both organizations and the labor market, new HR roles may be needed.
- There are real opportunities for the HR to play key roles as the deployment of AI is having impacts on job definition and associated skills, etc.

In addition, organizations will continue to use human labor particularly for tasks that require creative reasoning, interpersonal empathy and complement digital technology capabilities (Manyika *et al.*, 2017; National Academies of Sciences Engineering Medicine, 2017).

The HR function must evolve to understand the dynamics to facilitate the collaboration between human workers and complex digital agents while ensuring compliance with labor and employment laws and supporting strategic organizational objectives.

6. Conclusion

Our findings demonstrate that AI will continue to have an enormous impact on human jobs and offer opportunities for growth and profits. However, if AI is used to substitute human jobs, significant implications of job losses, economic inequality and reduced spending will ensue. Equally concerning is AI's threat to data privacy and informational bias. AI uses data from different sources and thus can be used to manipulate choices and decision for employees and individuals. The question is how can privacy be ensured? The use of robots and AI also presents new dangers and safety risks. For example, there have been a few deaths caused by driverless cars. With the increasing use of driverless cars, more accidents are likely to occur. It remains clear what a process might be for regulating AI-related incidents.

Finally, the use of AI has enormous implications for human skills in organizations. It is expected that market requirements for employability skills will change. Three points are worth highlighting (Frey and Osborne, 2017; Nedelkoska and Quintini, 2018; World Bank, 2016): increased importance of advanced digital skills, particularly in data analysis and the ability to make data-driven decisions; a decrease in demand for skills associated with routine tasks; and increased obsolescence of some employability skills for most workers.

In conclusion, because the disruptive nature of AI on jobs is unprecedented, organizations, governments and universities must be proactive in the quest for global solutions. Finally, answers are needed to questions about the impacts of AI on jobs (Makridakis, 2017):

Q1. Will the use of AI lead to improvement in choices and quality of life for humans (the optimists)?

Q2. How can we ensure that we retain the ability to make decisions instead of increasingly depending on AI to do this for us (the pessimists)?

Q3. What are the mechanisms in place to control and regulate AI so that it can be turned off in case of emergency, and who is responsible for this (the pragmatists)?

References

Acemoglu, D. and Restrepo, P. (2020), "Robots and jobs: evidence from US labor markets", *Journal of Political Economy*, Vol. 128 No. 6, pp. 2188-2244, doi: 10.3386/w23285.

Agrawal, A., Gans, J. and Goldfarb, A. (2017), *What to Expect from Artificial Intelligence*, MIT Sloan Management Review.

Arntz, M. Gregory, T. and Zierahn, U. (2016), "The risk of automation for jobs in OECD countries: a comparative analysis", available at: Paris:https://ifuturo.org/wp-content/uploads/attachments/automation.pdf

Chui, M., Manyika, J. and Miremadi, M. (2015), "Four fundamentals of workplace automation", *McKinsey Quarterly*, Vol. 29 No. 3, pp. 1-9, available at: https://roubler.com/sg/wp-content/uploads/sites/49/2016/11/Four-fundamentals-of-workplace-automation.pdf

Chui, M., Manyika, J. and Miremadi, M. (2016), "Where machines could replace humans – and where they can't (yet)", *McKinsey Quarterly*, Vol. 30 No. 2, pp. 1-9, available at: http://pinguet.free.fr/wheremachines.pdf

Economics Frontier (2018), "The impact of artificial intelligence on work: an evidence synthesis on implications for individuals, communities, and societies – review prepared for the royal society and the british academy", available at: https://royalsociety.org/-/media/policy/projects/ai-and-work/evidence-synthesis-the-impact-of-AI-on-work.PDF

Frey, C.B. and Osborne, M.A. (2017), "The future of employment: how susceptible are jobs to computerisation? ", *Technological Forecasting and Social Change*, Vol. 114, pp. 254-280, doi: 10.1016/j.techfore.2016.08.019.

Frey, C.B. Osborne, M. Holmes, C. Rahbari, E. Garlick, R. Friedlander, G. and Chalif, P. (2016), "Technology at work v2. 0: the future is not what it used to be. Retrieved from oxford, England", available at: www.oxfordmartin.ox.ac.uk/downloads/reports/Citi_GPS_Technology_Work_2.pdf

Harker, J. and Kleijnen, J. (2012), "What is a rapid review? A methodological exploration of rapid reviews in health technology assessments", *International Journal of Evidence-Based Healthcare*, Vol. 10 No. 4, pp. 397-410.

Hopkins, B. (2016), "Forrester's top emerging technologies to watch: 2017-2021", available at: https://go.forrester.com/blogs/16-09-14-forresters_top_emerging_technologies_to_watch_2017_2021/

Khangura, S., Polisena, J., Clifford, T.J., Farrah, K. and Kamel, C. (2014), "Rapid review: an emerging approach to evidence synthesis in health technology assessment", *International Journal of Technology Assessment in Health Care*, Vol. 30 No. 1, p. 20.

Lamb, C.P. and Lo, M. (2017), "Automation across the nation: understanding the potential impacts of technological trends across Canada (1926769651)", Toronto, available at: https://brookfieldinstitute.ca/wp-content/uploads/RP_BrookfieldInstitute_Automation-Across-the-Nation-1.pdf

Makridakis, S. (2017), "The forthcoming artificial intelligence (AI) revolution: its impact on society and firms", *Futures*, Vol. 90, pp. 46-60, doi: 10.1016/j.futures.2017.03.006.

Manyika, J. Chui, M. and Miremadi, M. (2017), "A future that works: AI, automation, employment, and productivity", available at: www.mckinsey.com/~/media/mckinsey/featured%20insights/Digital%20Disruption/Harnessing%20automation%20for%20a%20future%20that%20works/MGI-A-future-that-works-Executive-summary.ashx

McCurry, J. (2017), "Japanese company replaces office workers with artificial intelligence, Japanese company replaces office workers with artificial intelligence", The Guardian, available at: www.theguardian.com/technology/2017/jan/05/japanese-company-replaces-office-workers-artificial-intelligence-ai-fukoku-mutual-life-insurance

Mitchell, T. and Brynjolfsson, E. (2017), "Track how technology is transforming work", *Nature*, Vol. 544 No. 7650, pp. 290-292, doi: 10.1038/544290a.

National Academies of Sciences Engineering Medicine (2017), *Information Technology and the US Workforce: Where Are we and Where Do we Go from Here*?, National Academies Press, Washington, DC.

National Academies of Sciences Engineering Medicine (2018), *The Frontiers of Machine Learning: 2017 Raymond and Beverly Sackler US-UK Scientific Forum*, Vol. 16, National Academy Press, Washington, DC.

Nedelkoska, L. and Quintini, G. (2018), "Automation, skills use and training", available at: www.oecd-ilibrary.org/docserver/2e2f4eea-en.pdf?expires=1594796547&id=id&accname=guest&checksum=B955D8861727CF9306BAEA064DADD01E

Poba-Nzaou, P. (2017), "Évolution de l'emploi et des compétences à l'ère del'intelligence artificielle", *RH: la Revue Des CRHA et CRIA*, Vol. 20 No. 4, pp. 20-24.

Tricco, A.C., Antony, J., Zarin, W., Strifler, L., Ghassemi, M., Ivory, J. and Straus, S.E. (2015), "A scoping review of rapid review methods", *BMC Medicine*, Vol. 13 No. 1, p. 224.

World Bank (2016), "Digital dividends: world development report 2016", Washington, DC, available at: http://documents1.worldbank.org/curated/en/896971468194972881/pdf/102725-PUB-Replacement-PUBLIC.pdf

Corresponding author

Placide Poba-Nzaou can be contacted at: poba-nzaou.placide@uqam.ca