Jurisdictional Scan: AI and the Future of Work

Case study: China

Introduction

The emergence of Artificial Intelligence (AI) in everyday processes is becoming increasingly common, affecting the lives of people in implicit and explicit manners. The application of AI has changed government processes, enabling governments to be more efficient in a variety of realms ranging from defence to healthcare (Datar, 2019). While Canada has adopted some AI measures, it lags behind countries such as China who have leveraged the potential of AI. Specifically, China has started to apply AI to its healthcare system to increase efficiency and accuracy of traditional medical practices. With China's fast-paced and dynamic development and implementation of AI, it is integral to learn China's application of AI in healthcare, and further assess the benefits and challenges with the Chinese approach. Subsequently, we can deduct key lessons from China's application of AI in healthcare, and explore how these lessons apply to Canada.

China: AI & Healthcare

The healthcare system is foundational to ensuring the resilience and prosperity of a country, a notion the outbreak of COVID-19 has reinforced (Barton, 2017). With scarce medical resources and an ageing population taxing the healthcare system, China is searching for tools to address China's insufficient and unequally distributed medical resources (Kong, 2019). Consequently, to boost medical care standards for its population of over 13 billion people, China has utilized AI to make better use of its limited medical resources and engage in a systematic reform of its medical sector. Given that AI has been historically applied to solve complex challenges, AI is expected to transform the Chinese medical sector and ignite an approximately $147 billion market over the next 20 years (Kong, 2019). As the Chinese Business Review outlined, AI-driven treatment approaches can deliver a wide range of benefits including tackling doctor shortages, high misdiagnosis rates, and errors in disease prediction (Meinhardt, 2019).

Advantages: Efficiency & Accuracy

The application of AI in China's medical sector has transformed conventional practices, enabling physicians to develop personalized and more effective treatments for each patient (Barton, 2017). While the use of AI in healthcare is still in its infancy, it is projected to continue increasing physician's efficiency and accuracy with the help of medical imaging, electronic medical records and virtual assistants.

The role of AI in medical imaging is the most common use of AI in the Chinese healthcare industry, helping radiologists assess medical images and curate treatments personalized to patients (Innovation Centre Denmark, 2020). A prominent benefit of AI imaging is its contribution to elevating the success and accuracy of the diagnosis process, as there are algorithms "whose performances were better than the board-certified cardiological doctors in detecting diverse types of cardiac arrhythmias from ECGs" (Kong, 2019). A common challenge among physicians is their prevalence to 'optimism bias,' yet AI in medical imaging largely eliminates this bias that leads to costly misdiagnosis (Kong, 2019).

In addition to the application of AI in medical imaging, AI has further assisted doctors with diagnosis with the help of electronic medical records and virtual assistants. In terms of electronic medical records, "AI can use natural language processing technology to standardize and structure medical records and use speech recognition and speech synthesis to process large amounts of text entry" (Innovation Centre Denmark, 2020). Consequently, voice electronic medical record systems improve traditional medical records and help physicians save time that can be allotted to better patient-doctor interactions (Kong, 2019). As for virtual assistants, they provide real time support to doctors, further expanding doctor's capacity to see more patients and respond to inquiries based on large amounts of historical information Innovation Centre Denmark, 2020). Thus, virtual assistants increase efficiency of doctors by saving them time and energy on rather administrative tasks (Innovation Centre Denmark, 2020).

Challenges: A Struggle to Implementation

Despite China's breakthrough with the integration of AI in the medical sector, it has faced multiple challenges (McKinsey, 2017). A notable barrier to increasing AI in the healthcare system stems from limited data sharing, as AI systems need to process large and diverse databases to be effective and accurate (Kong, 2019). As McKinsey and Company outlines, AI systems need significant quantities of data to "train" themselves and continuously sharpen their output (Barton, 2017). However, a rising concern with obtaining access to big data is centred around ethical implications, as personal medical information could be misused (Kong, 2019). Thus, this calls for privacy protection and ethical design to be kept in mind when designing AI applications and algorithms. Another risk with the expanding AI in the medical sector is that AI systems can be wrong, resulting in serious complications (Nicholson Price II, 2019). For instance, if an AI system fails to acknowledge a tumor in a radiological scan, such an error can be detrimental to a patient.

Lessons Learned: Takeaways for Canada

Similarly to China, Canada has its own struggles with respect to inefficiency in the healthcare system, with prolonged wait times being a cornerstone challenge. As the Fraser Institute outlines, Canada's long waits are some of longest among developed countries, becoming a

defining feature of the Canadian healthcare system (Barua, 2014). The consequences of delayed access to health care are broad, ranging from lower productivity at work to mortality (Barua, 2014). As demonstrated by China's application of AI in the healthcare system, AI could increase efficiency and expand a physician's capacity with respect to seeing a higher volume of patients without compromising on the quality of care and diagnosis. Perhaps, a key lesson Canada can deduct from China is how the use of AI can enable physicians to help a larger number of patients within a shorter timeframe. In addition to delay in access to healthcare services, Canada has also battled with the issue misdiagnosis, which accounted for 28,000 deaths in 2019 (Desjardins, 2019). As established by China, the use of AI in medical imaging, electronic medical records, and virtual assistants can improve diagnosis, while decreasing the probability of error that could be deadly to patients. While it is fundamental to recognize the potential benefits of expanding AI in Canada's healthcare system, it is equally valuable to recognize implementation barriers. Similarly to China, Canada could encounter the challenge of handling big data, errors in AI systems and the ethical implications engraved in the expansion of AI in the medical field.

Case study: Japan

1. **Introduction**

As a powerful and independent force in technological innovation development, instead of focusing on artificial intelligence's allocation on military aspects (such as the US and UK), Japan has been mainly putting its AI resources on the cultural and social aspects of development (Garcia, 2019). In 2016, Japanese government brought up the goal of "Society 5.0" as the 5th Science and Technology Basic Plan (Garcia, 2019). "Society 5.0" is a sustainable human-centric society with the implementation of AI, IoT(Internet of Things), robotics and other cutting-edge technologies that aimed to help with integral societal development. It represents Japan's next step in human revolution which comes after hunter-gather, agrarian, industrial and information societies (Garcia, 2019). Japanese government's goal emphasizes AI and its functions on individual needs and social issues such as the shrinking labor force which resulted by declining birth rate, aging population, as well as various energy and environmental issues (Garcia, 2019).

2. **Opportunities**

a). Dealing with Japan's shrinking labor force:

The shrinking population in Japan causes a rapidly shrinking workforce and declining quality of service.

In the current days Japan, deaths outnumber births by 1000 people everyday on average. The total population in some regions of Japan is far less than 70 years ago. The economic gap caused by shrinking population cannot be filled simply by immigration (Schneider, Hong, and Le, 2018). In 2015, almost 1/3 of the Japanese citizens were at age of 65(Schneider, Hong, and Le, 2018). It was released by the Population Division of the UN Department of Economic and Social Affairs that Japan's population will dip below 100 million soon after the

middle of the 21st century (Schneider, Hong, and Le, 2018). By the century's end, Japan will likely lose 34% of its current population (Schneider, Hong, and Le, 2018). In the short term, the labor force and productivity of Japan cannot be rapidly increased through the policy and other political means. The impact on labor quality and output influenced by the shortage of population and aging of population will greatly affect the integrated development of Japan. Therefore, the emphasis on AI can greatly solve the issue. According to the Nomura Research Institute, robots or AI may replace approximately half of Japan's labor force in the next one or two decades as the Institute quantifies the potential impact of AI (Garcia, 2019). Among the industries, the service sector will be influenced most, as AI could potentially maximize the efficiency of the labor output and lead Japan to a commercialized era. The Japanese Government also claimed that by 2045, AI technologies are expected to generate an economic return of about JPY 121 trillion (Garcia, 2019).

b). Smart City and SDG

As one of the most ambitious projects in the AI market, the Smart Cities in Japan echoes people's increasing demand of the environmental issues and the sustainable development goals. A Smart City produced by Toyota was one example – the City has 2000 Toyota employees and their families, including retired couples, retailers and scientists. Each household uses home robotic systems to take care of their daily life and uses sensor-based AI technology to monitor their health and well-being (González, 2021). More importantly, this whole City is completely sustainable by using hydrogen fuel cells as energy sources (González, 2021).

3. <u>Challenges</u>

Just like any other disruptive technology, AI carries risks and poses policy challenges, including jobs, safety, privacy, and regulatory issues.

A study by Gartner highlights the negative impacts that are possibly caused by AI. The study shows that millions of job opportunities will be eliminated and replaced by the AI technologies or robotic systems (Neuromation, 2018). Another study by Oxford University shows that, not only Japan, 47% of the US's employment will be "at risk" due to the development of the AI (Neuromation, 2018). Furthermore, due to the lack of training and experimental human employees, the development of AI may have negative impacts on the growth of the AI market, and the "hiring war" is likely to be triggered shortly (Neuromation, 2018).

Another challenge lies within AI's self-learn and act ability. Over the past few years, there was a growing concern of AI as a human threat. Some argue that AI's potential growth could lead to technological singularity, when machine intelligence overtakes human intelligence and takes humans into the unknown with no turning back (Neuromation, 2018).

4. <u>Takeaways to Canada</u>

Just as what Japan is encountering, Canada is also facing an aging population as the seniors in Canada are a rapidly growing segment of the population (Government of Canada, 2014). According to the Canadian Government, 15.6% of the Canadians were aged 65 or older in

2014 (Government of Canada, 2014). By less than a decade(count from 2021), seniors will likely make up 23% of the Canadians (Government of Canada, 2014).

In the face of aging of the population and the huge proportion of the elderly in Canada, 2 main takeaways from Japan's AI technologies are: 1. Helping with the shrinking labor force; 2. Improving elderly's living quality.

According to the Government statistics, in 2030, there will be about 650,000 people living in Canadian seniors' residences or nursing homes, which is about 69% more than the record in 2014 (Government of Canada, 2014). The extra capacity should be built by public and private resources will cost at $140 billion (Government of Canada, 2014).

In order to save the cost of human resources when building up the extra capacity, Japan's innovation on the robotic system and AI technologies could both help with reducing the cost and improving elderly's living quality. As a critical application for elderly care, the human pose detection could provide quick responses when accidents or falls happen (Garcia, 2019). The elderly care robots could also provide proactive suggestions, entertainment, and other activities in addition to wellness and environmental monitoring and help with all types of eldercare (Garcia, 2019). Thus, by introducing the AI technology to Canada, the government is able to transfer and optimize the utility of the human labor force, save the cost, and improve the quality of life of the elderly at the same time.

Case study: Singapore

Introduction

Artificial Intelligence (AI) is increasingly becoming a tool that permeates all parts of a country's political and economic landscape. Specifically, AI has the potential to drastically alter the workplace dynamics in all sectors. Canada has undertaken research and development in AI, however substantial work remains. Singapore has focused its AI work on technology, makerspace and innovation, this paper will focus on the latter. The paper will highlight Singapore's action in ensuring workers in all sectors of the economy can effectively adapt and work with AI technology to improve their efficiency. In turn, we will deduct how this strategy can effectively be applied in Canada.

Singapore: AI & Work

The strength of a country's workforce is of great importance in ensuring its prosperity and economic success, especially in the face of COVID-19. The pandemic has caused a dramatic shift in work place practices and mandated a need for innovative solutions to challenges in a host of industries. Singapore has focused on a talent development programme premised on working professionals acquired the relevant skills and being data-aware ("AI Innovation | AI Singapore", 2020). Singapore supports its focus on AI innovation with concerted research aimed at developing techniques, algorithms and adjacent technologies that will contribute to assisting a dynamic workforce ("AI Innovation | AI Singapore", 2020). Overall, the focus in Singapore is on crafting continuous learning AI to reach the stage of Artificial General Intelligence.

Advantages: AI & Work

Singapore has partnered with DataCamp to employ their data science, machine learning and AI curriculum to all public schools and higher learning institutions of higher learning at no cost. Furthermore, the programme AI for Industry enables citizens to gain proficiency in python and be able to program basic AI and data applications ("AI Innovation | AI Singapore", 2020). Furthermore, one programme is focused exclusively on a data apprenticeship, six-months in duration, it encompasses on-the-job training in data curation for AI solutions, two-months of coursework and four-months of hands-on training on a real industry project ("AI Innovation | AI Singapore", 2020). While still in its initial stage, this endeavour effectively allows Singapore citizens to gain valuable experience in working collaboratively with AI technology. This will become increasingly important as AI begins to permeate a host of industries, workers will be required to adapt and work in unison with this new technology (Manyika & Sneader, 2018). The work in Singapore is valuable because it encompasses citizens of all education levels, both office workers and manual laborers. For example, factories may have AI technology to facilitate the movement of products, but workers must be able to effectively work in unison while performing other tasks (Manyika & Sneader, 2018). Additionally, this central approach to AI development is effective because talent is created at the grassroots level and can serve to benefit all private corporations and public sectors. In contrast, an individualistic approach whereby corporations pursue their own projects may create great disparity in AI advancement.

Challenges: Implementation & Monitoring

Despite a thorough plan for AI and the future of work, Singapore is susceptible to certain challenges. The country must monitor uptake of the resources it provides for use in the secondary and post-secondary educational settings. In consolidation with this, the success of those students who undertake the program must be measured. Both of these are vital because without proper implementation and measurement, the programme may not achieve its goal of supporting and assisting workers to acquire the skills to succeed in an AI prominent environment. Furthermore, it is important to ensure the need meets the demand for AI work in Singapore. Singapore must continue to innovate in the AI field to create sustainable job opportunities for those who partake in the apprenticeship program and wish to continue afterwards.

Lessons Learned: Takeaways for Canada

The Singaporean AI program can enact meaningful progress in Canada's AI work. It may support the Brookfield Institute, a leading hub for Canadian innovation in two of its projects. First, the Brookfield Institute is focused on skills for an innovation-driven economy; whereby they seek to understand future skill demands across Canada to help companies and people gain the skills to thrive ("About Us – Brookfield Institute for Innovation + Entrepreneurship", 2021). In addition, the Brookfield Institute is pursuing work on AI and society, to explore the opportunities enabled by AI while investigating the social, political, and ethical challenges of current and future capabilities ("About Us – Brookfield Institute for Innovation + Entrepreneurship", 2021). By incorporating Singapore's AI education programme in Canada,

this would effectively support the Brookfield Institute's larger mission of creating an inclusive innovation economy for people of different ages, incomes and backgrounds.

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