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Beijing International Model United Nations 2018

Background Guide

United Nations Educational,
Scientific and Cultural Organization

Topic A:

Prospect of Artificial General Intelligence

Topic B:

Application of Innovative Technologies in Education

青年责任
共同命运

Youth Responsibility

F  R

A Shared Future

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Welcome Letter

Welcome to the United Nations Educational, Scientific, and Cultural Organization (UNESCO) of Beijing International Model United Nations 2018. It is a privilege for us dais members to extend our sincere greetings to all delegations.

The 21st century has witnessed awe-inspiring technological explosions. They make it more convenient for common citizens, inspire more entrepreneurs to start up companies, push governments to devise more flexible plans and inject all fields with more vitality.

Artificial Intelligence is currently the hotbed for innovation and investment. Meanwhile, Artificial General Intelligence is provoking hot debate on its possible future path. It involves many aspects and stretches into many fields. However, what is the right attitude and how to adopt the proper measures haven't been given clear guidelines.

As for innovative technologies in education, many sides are aware of the unstoppable trend of educational revolution. The application of such advanced technologies is en route to sophisticated implementation, yet still in need of impetus and pushing force. Education as an inseparable part of civilization, ought to be paid more attention to and thus many sides are striving for this collective goal.

Both topics are now lack of progressive insights and solutions, hence they require your innovative ideas and constructive outlooks. Though some of you may have never participated in a MUN activity, or you may be quite familiar with engaging in MUN conferences, it essentially does not make a difference. What we are looking forward to is your passion towards the addressed issues and your full devotion to duty as a delegate of your represented nation.

Our goal of providing you with this Background Guide is to give a brief analysis of the topics, which may be helpful in directing your research. During the conference, every delegation's stance and opinions are of fair importance. Should you have any questions concerning the rules and procedures, or the topics themselves, feel free to contact us.

We wish you a fruitful and unforgettable experience here in UNESCO, BIMUN 2018.

Dais Members of UNESCO

BIMUN 2018

Introduction to the Committee

The United Nations Educational, Scientific and Cultural Organization (UNESCO), as a specialized agency of the United Nations, endeavours to seek peace and security by strengthening cooperation through educational, scientific and cultural reforms in order to safeguard justice, the rule of law, human rights, as well as the fundamental freedom proclaimed in the United Nations Charter.

UNESCO has 195 member states and ten associate members. It pursues its goals through five principal programs: education, natural sciences, social sciences, culture and communication. Projects supported by UNESCO include literacy, technical, and teacher-training programs, international science programs, regional and cultural history projects, the promotion of independent media and cultural diversity, translations of world literature, international agreements to preserve the world's cultural and natural heritage and to protect human rights. It is also a member of the United Nations Development Group (UNDP).

UNESCO's objective is "to contribute to the building of peace, the eradication of poverty, sustainable development and intercultural dialogue through education, the sciences, culture, communication and information."¹ Other priorities include attaining quality Education For All and lifelong learning, dealing with emerging ethical challenges, maintaining cultural diversity and building inclusive knowledge societies through communication and information-sharing.

The broad goals of the international community, as revealed in the internationally agreed development goals, including the Sustainable Development Goals (SDGs), underpin all of UNESCO's strategies and activities.

UNESCO has two major governing bodies, the General Conference and the Executive Board. We will hold the General Conference that consists of the representatives of all UNESCO's Member States. Each country has one vote, regardless of its size or its share in the budget.

The General Conference decides the policies and the lines of work of the Organization. Its main duties include arranging programmes and determining the budget of UNESCO. It lays down rules and directives for the Executive Board and assigns specific tasks. Tactful negotiations are needed before a balance is reached among various regions, so that the universality of UNESCO can be properly matched.

1 "Introducing UNESCO". UNESCO. Retrieved 8 August 2011.

Introduction to the Topics

Artificial Intelligence has been capturing worldwide attention in various fields due to its immense potential in application and great complexity regarding ethical issues. It has two divisions, which are Artificial Narrow Intelligence(ANI) and Artificial General Intelligence(AGI) respectively.

ANI research focuses on devising intelligent beings that specialized in a certain field yet much more capable than mankind; AGI research devotes itself to the ultimate pursuit of AI---to create man-like entities that possess possibly the same cognitive ability with humans.

Basically there are two approaches to the field of artificial general intelligence. The first one is to adopt whatever technique derived from computer science to create artefacts that behave in an intelligent way. The other is to develop computational architectures that simulate human behaviours in various domains. Nevertheless, it is unlikely that human intelligence can be interpreted through a single explanatory framework, so we are obliged to employ diverse means to fulfil a satisfactory artificial system.

Now the application of ANI has succeeded in various fields, whereas AGI not only encounters technical barriers, but also triggers heated discussion on "Robot ethics". On the one hand, Artificial Intelligence will inevitably witness a series of technological breakthroughs; on the other hand, technology advancement rests on the reconciliation with moral principles. Therefore, the prospect of Artificial General Intelligence is far from foreseeable and perceivable. Whether its progress will march on endlessly or come to sudden halt someday later still hangs in the balance.

In 2015, the member states of the United Nations came to consensus and published 2030 agenda for Sustainable Development and its 17 Sustainable Development Goals. Among the goals, the quality of education is highlighted, additionally, the goals "ensure inclusive and equitable quality education and provide lifelong learning opportunities for all"². The technologies nowadays have made remarkable progress, and it plays an increasingly crucial role in promoting the quality of education and learning opportunities for whom are necessary.

Specifically, Goal 4 Quality Education and Goal 9 Industry, Innovation and Infrastructure, correspond with the two topics that the committee set on the agenda. Bold efforts are needed to make greater strides for achieving universal education goals. The innovative technology is conducive to speeding up the process of cultivating talents via knowledge factories.

² United Nations Sustainable Development. (2018). Education - United Nations Sustainable Development. [online] Available at: <http://www.un.org/sustainabledevelopment/education/> [Accessed 5 Feb. 2018].

Topic A: Prospect of Artificial General Intelligence

Past Actions and Current Situation

The Development of Artificial Intelligence, An Overview

The seeds of modern AI were sowed by classical philosophers who endeavoured to interpret the process of human thinking as the mechanical manipulation of “symbols”. Despite that the term “Artificial Intelligence” did not come into being until 1956, the origin of the field stretches back to at least the 1940s, when a programmable digital computer was invented. This device sparked inspiration of a group of scientists to seriously discuss the possibility of creating an electronic brain.

Nonetheless, it appeared that computer scientists were over-optimistic about the prospect or in another word, conceited. In the ensuing decades, AI went through ups and downs as some research problems the researchers encountered were much more complicated than they seemed to be. All those unfulfilled promises caused a public distrust towards the AI field and funding was cut down continuously. The “AI winter” appeared on the historical stage.

It wasn't until the late 1990s that AI ushered in a transition era when researchers embarked on conquering sub-problems of AI and applying AI to subjects such as image recognition and medical diagnosis. Still, the reputation of AI in the business world was not generally positive. There was little agreement on the reasons of AI's failure to turn the fantasy of the creation of human-level intelligence into reality that has prevailed in the 1960s.

However, the AI circle successfully translated hindrance into motivation and stepped onto the right track. The early milestone was in 1997, when IBM's chess-player computer defeated the temporal world champion Garry Kasparov. The event was broadcasted live via the Internet and received over 74 million hits, with no other events being on par with in the following decade.

Then in 2010, the recent wave of AI craze started. It was mainly driven by three factors: the availability of big data from abundant sources, the dramatic outbreak of machine learning algorithms, the significant evolution of powerful computers. Indeed, the speed and pace of AI improvement was unprecedented, investment and interest in AI boomed. Even till today, the fever shows no signs of cooling, but proceeds with unstoppable momentum.

Nonetheless, that merely marked the success of ANI rather than AGI. According to futurists, we are currently still at the first age of artificial intelligence. In another word, the AI applications carried out today are only applicable to narrow fields (playing Go, for example). In the second age, computers would be able to execute every possible order from humans, hence the defeat of mankind. In the third age, hopefully, Artificial Superintelligence (ASI) would be brought into existence. By then, human beings would become completely inferior to “computers” in terms of cognitive ability.

Actions of the United Nations

As the most renowned international organization, with respect to the hotly discussed topic of artificial intelligence, the United Nations has paid special attention to ethical and security issues. It has laid out the principles for the formulation of policies put forward by all governmental bodies concerning artificial intelligence.

Early in 2014, the United Nations drafted “Convention on Certain Conventional Weapons”, in which it had stated clearly its purpose of imposing restrictions on any research about weapons with artificial intelligence. In 2016, all 123 countries that reached agreement on the Convention made a decision to debate on artificial intelligence weapon system on the United Nations General Assembly which was to be held in Geneva in 2017.

Also in 2016, UNESCO together with COMEST, jointly published “Preliminary Draft Report on Robot Ethics”. This report pointed out the ethical issues related with robot-making activities and mechanism for responsibility sharing, and emphasized on the importance of “traceability”, so as to ensure that the decision-making process and the behaviour of the extant robots are under the supervision of UNESCO.

Then on 21 December 2017, UNESCO successfully held a session on the implications of artificial intelligence and big data in building inclusive Knowledge Societies and achieving the Sustainable Development Goals at the Internet Governance Forum in Geneva, Switzerland.

A UNESCO representative first opened the debate by stating that “new technologies involving artificial intelligence and big data are rapidly evolving, constantly reshaping our understandings of access to information.” By reaffirming the significance of these new advances in technological breakthrough, he also insisted on “the crucial need to develop them along the values of UNESCO’s concept of Internet Universality which includes human rights, openness and accessibility, and multi-stakeholder participation.”

Besides, the United Nations International Telecommunications Union also held a summit in Geneva. The topic was “AI bring benefits to human beings”. It aimed to discuss how to speed up the publicity process of artificial intelligence applications so as to further address global issues including poverty, starvation, health, equality, environmental protection and etc.

ANI to AGI, a Transition Period

As mentioned above, the term “deep learning” has given rise to another round of optimism nowadays. Deep learning has radically brought about revolutionary changes in many different industries and has completed many difficult tasks. Thousands of start-up companies have emerged; big companies are pouring money into the field.

However, since AGI is one of the most difficult problems in science (along with understanding the brain), a similar kind of enlightenment will occur---AI problem is even more tough to handle than what we have perceived till today, and we will grasp that some of the promises made by superpowers are far-fetched.

The bitter fact is, the only example to the intelligence level we aim is the human intelligence, but we are still far from comprehending how it works.

Hardware performance would not be a bottleneck at all in the near future. The real challenge is actually the software. The actual functional operation of the brain is too complex for the current AI models to fit in. While deep learning has witnessed a surge of progress in the past few years, it is still unlikely to be the ultimate answer for a human-like intelligence.

Therefore, from ANI to AGI, it is not a smooth transition. In another word, if we keep broadening and improving the specific AIs, we will not bring up an AGI model all of a sudden someday. As someone puts it, “AI has by now succeeded in doing essentially everything that requires ‘thinking’, but has failed to do most of what people and animals do ‘without thinking’.”

Deep Reflection

To fulfil such an intangible goal of obtaining AGI, major powers in the world are putting great efforts into the field. In such an age of artificial intelligence, national security is becoming increasingly vulnerable, for AI broadens and deepens the connotation of this sensitive word. As for those less developed countries, it is particularly difficult for them to safeguard their national security.

Thanks to the contribution made by artificial intelligence, the world is becoming more polarized. “Unbalance” and “Uncertainty” have turned out to be the world’s main theme, with great powers becoming stronger and the less-developed becoming weaker. The influence exerted by artificial intelligence technology is tremendous. It can enhance the efficiency of innovative development, elevate the level of overall social governance, promote the construction of military security defence. When a country employs AI as the high-tech leading expert, its comprehensive national strength might be reshaped within a short period.

Problems and Challenges

Shortage of Funds

In 1956, the Dartmouth Conference was held in Britain, which was convened by Marvin Minsky, John McCarthy, Claude Shannon and Nathan Rochester. During the conference, one concept was put forward—the artificial intelligence (AI).

After the Dartmouth Conference, especially from late 1950s to 1960s, various achievements were made in different fields of AI, such as search inference, natural language learning, micro world, etc. At the same time, the Advanced Research Projects Agency of US Defence Department (ARPA) offered a large amount of money to sponsor the research work, unquestionably injecting great vitality to the development of AI. In 1965, H. A. Simon stated that robots could do all things that man could do in twenty years; Marvin Minsky predicted in 1967--within one generation, substantial progress would be made in bringing up AI. However, those researchers were so optimistic about the prospects of AI that the expected goals were not fulfilled. All this led to the disappointment of sponsors and their funds withdrawal. Although the emergence of better chips and expert system in 1980s rendered the AI thriving again for a short time, this industry underwent the same downfall like that in late 1960s.

Currently, as the AI enters into the era of artificial general intelligence, some preliminary AI technologies have been utilized to make our life more convenient, like autonomous driving, face identification, mechanical arm in manufacturing industry and so forth. Meanwhile, many venture capital firms have the foresight and are willing to invest in AI industry. Nevertheless, we cannot deny one fact that it is quite hard to improve the AI technology to a higher level and create more intelligent autonomous robots just as expected. The allocation of capital and the arcane acts of the research field somewhat perplex the sponsors. They invest to benefit from the target industry, but the AI field cannot bring satisfactory outcomes to them in a short period, at the same time, the large amount of preliminary investment in an AI project and the potential failure become the facts that mainly impede those benefit-driven sponsors.

Legal Responsibility of Misconduct Concerning AI

Protection of Privacy

The artificial intelligence, especially the artificial general intelligence, and the autonomous robots based on it are quite dependent on the countless data to conduct self-reflection and accumulate experiences from the daily life, so as to analyse the problems they are about to confront. This process is usually called the big-data-guided learning. However, among all the categories of the big data, it is ineluctable for them to offend the privacy of individuals. Hence, here comes a question: how to guide the artificial general intelligence to selectively learn from the database? This is a question we have to ponder over, otherwise there would be a default for autonomous robots or their manipulators to

utilize the private information without any cost, probably leading to information crimes. For example, the life-relevant data of certain individuals might be used to predict their life habits, hobbies or daily agendas; such sensitive information as the ID card number, name and cell phone number might be utilized to commit online fraud and other crimes.

Distribution of Legal Responsibility

Both civil and criminal responsibility have the same requirement on their subject: it must be a consciously-autonomous object. This is the basis for responsibility distribution. Human can surely meet this requirement, but comparatively, other animals are yet consonant with this standard, not to mention the current robots. However, this situation is only temporary. When AI-driven robots evolve into a higher level, it is possible for us to consider the distribution of legal responsibility. Under this circumstance, some questions are non-ignorable: what is the restraint when distributing and confirming legal responsibility? What intellectual level should the robots remain? Taking the criminal law as an example, there is an explicit distribution of responsibility age, which takes full account of the intellectual level of people at different ages. Therefore, before identifying the legal responsibility of an AI-based robot, its intellectual level should be clearly defined---whether it conforms to that of a man of the same age or not. On condition that the autonomy of the robot's consciousness could not reach the same level, which means it ought not to take the same responsibility as one normal man, those relevant parties have to assume penalty instead: designer, producer, programmer or user.

Robot Personification

The autonomous robots based on artificial general intelligence and computer technologies might possess almost the same characteristics as human beings in the future, hence certainly being endowed with a higher level of autonomy and sensing ability. As a result, they can deal with things on their own, including tackling moral and legal affairs.

From the perspective of mankind, there do exist numerous moral and legal mysteries that are unsolvable and mutually paradoxical. Therefore, for robots, possessing higher-level autonomy and sensing ability does not mean that they are utterly capable of grasping how the moral and legal system of the human world works. Then here come the questions: what moral and legal standards are suitable for robots' self-learning? Albeit man have different understandings towards the same provision, what about robots? What is the solution to "right vs wrong"? Who should determine the learning mode of these robots?

Unbalanced Development of Artificial General Intelligence Between Different Countries and Regions

Technological Foundation

As is known to all, the artificial general intelligence, a higher level of AI, is based on computer sciences, big data, cloud computing etc. So, the development of artificial

general intelligence is conditional. Considering that the development of computer technology differs in various countries and regions, it is in line with the artificial general intelligence.

Looking back at the history of AI, after the Dartmouth Conference held in Britain, the research of AI was promoted in several representative countries respectively—the United Kingdom, the United States and Japan. As a result, compared with other countries and regions, they possess preferential conditions and are more experienced, and thus cannot be outweighed by other competitors within a short period.

Practical Needs

In contrast to the people in developed countries, those in developing countries and regions still suffer from poverty, starving, infectious diseases, shortage of educational resources, which reflects that the development needs in various countries and regions differ too much from each other. As a saying goes: Only when your stomach is stuffed can you have the need to learn rites. It is the same with the application of AI. The practical needs are also another factor impeding the development of the artificial general intelligence in poorer countries.

Unemployment Caused by AI

The Artificial Intelligence will strike the employment of the society. According to American economists Erik Brynjolfsson and Andrew McAfee, compared with the increasing price of labour force, the robots with cheaper price and higher efficiency will eventually replace human workers in doing their jobs. In 2009, the former deputy president of the Federal Reserve, Alan Blinder, estimated that 22%-29% of the jobs in America would be replaced in ten years. (Alan Blinder, 2009) In the past several years, it has been proven that the application of AI indeed replaced many jobs, especially in such fields as manufacturing industry and large-scale and simplex work. This trend could be irreversible.

Before the thorough intelligence revolution, the production department of human society is usually divided into three parts: agriculture, industry and service sector. In agricultural society, agriculture is the major production department, and the fundamental needs can be met by agricultural production. After entering the industrial era, industry gradually becomes the major production department of the society, and the machine production begins to replace manual labour. As a result, the status of agriculture decreases and many unemployed farmers come to cities and work in the factories. Then, when the post-industrial era comes, this cycle repeats. Many workers who cannot keep up with the pace of technological advancement are transferred to the service sector. With the rising of artificial general intelligence, we will face the same problem. However, it is impossible for us to simply transfer the agricultural population into cities and transform the first and secondary industries into tertiary industry to solve the unemployment issue. So, we have to come up with another way to solve the problem.

Debate on Robot Ethics

The Cause of Robots' Development

Since the emergence of robots in the 1930s, they have changed people's way of life, thinking and identifying the world. As regards this phenomenon, the founder of Microsoft, Bill Gates pointed out that the development of robot industry would be similar to the thriving of computer industry thirty years ago. When we look back at the history of robot technology, its development speed is the same as, even faster than that of computer industry, just as predicted by the Law of Moore³. It is the constant upgrading of the computer industry that motivates the development of robot technology. However, in the extensive use of robots, the problems are much severer than before, even involving some traditional ethical and moral problems and thus exerting great impact on our social life.

Definition of Robot

In order to solve the relevant problems brought by robots, we have to be clear about its definition. Some previous definitions describe robot as a multifunctional machine that has changeable routines, or a specific system that has programmable moves for various assignments. Comparatively, different from those mentioned above, a more accurate definition should help us to distinguish robot from computer technologies. The advanced robot is supposed to have a sensor and is capable of simulating the ability of recognition and execution.

The Emergence of Ethical Problems

With the advancement of robot industry and the application of artificial general intelligence, at present, the design of robot is beyond the range of traditional mechanical definition. Meanwhile, robots are more integrated into our daily life and playing many roles whose responsibilities were usually carried by man. This has attracted the public attention to the robot ethics problem.

As we enter into the 21st century, the humanlike robot technology has been further developed, and the autonomous robot emerges. Correspondingly, great achievements have been made in robotics, especially in robot ethics. For instance, American philosopher Colin Allen et al. compiled the book: *Moral Machines: Teaching Robots Right from Wrong*, arguing that it is necessary to begin building moral-based decision-making system for robots and teaching them basic sensitivity to morality; Ronald C. Arkin wrote the *Governing Lethal Behaviour in Autonomous Robots*, exploring how to produce "artificial conscience" in a new class of robots; and the We Robot 2012 convention held in the United States in 2012 had enduring influence on the development of robot ethics. All these have proven that the formulation of relevant standards on robot ethics, including laws and regulations, and industrial standard, plays a key role in promoting the robot technology's advancement.

³ Moore's Law is a computing term which originated around 1970; the simplified version of this law states that processor speeds, or overall processing power for computers will double every two years—www.moorelaw.org.

***Specific Problems Posed**

Personification of Robots

As the artificial general intelligence gradually replaces the traditional AI, the humanlike autonomous robots have emerged. They are able to sense the surroundings, capable of accumulating knowledge and making decisions according to specific situations. To some degree, they have their own personalities, based on which a problem is raised: whether human beings should endow robots with the same legitimate rights and let them carry the duty as we have? If the answer is positive, what rights should robots be given and what responsibilities should they shoulder? These are worth pondering when we enter a new era of the artificial intelligence and robot technology.

Sense of Obligation and Guilt

Despite that autonomous robots have been capable of learning and sensing the surrounding world, there is one thing that they haven't possessed, or in other words, it is hard for them to have it—emotions and the sense of obligation and guilt. When one man commits a crime, he will be brought to justice and put into jail. As a prisoner, he can feel the sense of guilt and learn that the sentence is the cost he has to pay for what he did. Yet, currently, the autonomous robots are not able to have the same reaction, which means that it is meaningless to punish robots for crimes committed by them.

Robot Responsibility Caused by Hacker Attack

All moves of robots are based on programmable routines, and it is even the same with the autonomous robots. Considering this, there exists the possibility to hack into and manipulate the robots. So we have to consider whether this kind of incorrect moves or even crimes under manipulation should be attributed to robots themselves, and what responsibilities should the hacker shoulder upon when making such moves.

Robot's Relation with Human Beings

With the development of autonomous robots, they play more roles in our society and may greatly influence the communication among people. Currently, they can take care of the elderly and children, do chores at home and even have some simple reactions. If this trend continues, the autonomous robots will certainly exert greater impact to our daily lives. They can even become our partner and family member. As a result, how to define the role of advanced autonomous robots is a problem we have to face and discuss in the coming years.

Possible Solutions

Government Policy Adjustment

The government policy should always be conducive to promoting economic development and social stability, although sometimes it may not accord with the demand, the long-term trend of government policy will not change.

With regard to the unemployment caused by AI, there are two subjects: AI-based autonomous robots and laid-off workers. The priority of the government is to pacify these workers and resettle them as soon as possible.

American sociologist John Rawls assumes that all the social values, including freedom, opportunity and wealth, are supposed to be distributed on an equal basis. For these laid-off workers, if losing job means losing source of income, they should be compensated, and levying AI tax from the beneficiary among relevant parties can be a method. In this way, the fundamental needs of the unemployed can be met and, meanwhile, the pace will be slower to apply Artificial General Intelligence to replace human workers. Furthermore, this tax can also be used to improve the capabilities of workers and adapt them to the new conditions.

In the era when one robot can replace dozens of workers, the application of it will surely reduce the labour cost, the production cost, like electricity fee and water fee, as well. Hence, when output is equivalent, it is more efficient for factory managers to use robots instead of labours. For those autonomous robots, in that the application of them can create equivalent output as human workers do and bring more benefits to their owner, it is quite reasonable to tax them according to the principle of equality.

Betterment of Cooperation Mechanism

Establishment of Information Sharing System

As we all know, there have been numerous symposiums and forums on robotics and AI such as the International Conference on Robotics and Automation, the Computer Ethics Philosophical Enquiry, the We Robot and etc., but their themes and contents are relatively separate, which to some extent impedes the coordination and communication of robotics and AI research. So, to establish a comprehensive information sharing system can ease this situation and promote in-depth view exchange between scholars and roboticists from diverse fields, so as to inject vitality to robot industry and AI research as well.

Establishment of Talents Exchange Mechanism

Currently, several scientific and technological heights have formed in both developing and developed countries and regions, which proves the thriving of robotics and AI research after entering the 21st century. However, some traditional and conservative thoughts on talents still limit the development of robot and AI. Although the institution of higher

education in some countries have their own talent pool, there is one undeniable fact that the links between them are still at a low level. In order to accelerate the development of AI and robotics, it is suggested that each country carry out talent exchange with the prerequisite that their competitive edge can be maintained and this kind of exchange should be based on the principle of equality and mutual benefit.

Improvement on Regulatory System

Hacker's Manipulation

Considering that the incorrect moves of robots under manipulation of hackers are not in accordance with the will of robot itself, so it means that the relevant responsibility generated by these moves shall not be carried by robot alone. From the perspective of government and monitoring institutions, they should strengthen the supervision of hacker attack, encourage designers and producers to improve the resistant ability of robots' routines against attacks from outside and enhance the publicity and education to improve anti-hacker awareness of the public.

Distribution of Legal Responsibility

Assuming that the autonomous robots have the same personification as human does, they are supposed to shoulder the responsibility as well. Hence, when producing the autonomous robots and designing routines for them, it is better for designers and producers to make it clear in the specifications what moves of robots can be controlled by the designed routine and vice versa. In this way, if the moves and actions conducted by robot according to specific condition engender damages or even commit crimes, the responsibility allocation will be quite easier. Likewise, like what is mentioned above, when the robots are delivered to market from the factory, the competent authorities of the government should play a regulatory role to guarantee that those robots are of good quality and meet the relevant requirements.

Collective Agreement on Robot Ethics

On October 25, 2017, the Future Investment Summit was held in the capital of Saudi Arabia—Riyadh. During the summit, a “female” robot called Sophia was granted the Saudi Arabian citizenship, making her the first robot that ever had a nationality. This incident is quite inspiring, which points out a direction of possible solution to robot ethics issue.

From the perspective of mankind, robots were regarded as machines that are helpful for production and daily life at the very beginning. Now, the advancement of robotics and computer sciences have made robots more intelligent and autonomous and capable of doing the same thing as human does. So there should be a cushioning process for people to recognize the reality and accept it. To speed up this process, necessary measures must be taken by the government to improve people's awareness and knowledge about AI-based autonomous robots. After recognition, the whole society is supposed to form a

unified criterion on robot ethics, which will be helpful in settling the disputes over robots' social and legal responsibilities and their legitimate rights and interests.

Topic B: Application of Innovative Technologies in Education

Past Actions and Current Situation

Past Actions

It has been noted that the technologies would reinforce the efficiency of education, reduce the cost, increase the accessibility of education for students, and enhance student's abilities and promote lifelong learning. In order to improve the quality and popularization of education, the United Nations and related organizations, such as the United Nations Educational, Scientific, Cultural Organization, have contributed great effort and the organizations endeavor to ensure the quality of the education, and promote the use of innovative technologies in schooling. According to the resolution adopted by the General Assembly on 20th December, 2013, it encourages member states of the United Nations and related stakeholders to strengthen the support for the different science, technology and innovation partnerships with concerning parties in primary, secondary and higher education.

In addition, UNESCO believes that the innovative technologies, including ICT and related advanced technologies, would moreover ensure the quality of education by giving students a broader access to knowledge and harnessing the power of education. Therefore, the United Nations and UNESOC encourage the international society to apply the ICT and related innovative technologies in the field of education. In 2015, Qingdao Declaration was signed by member states of UNESCO in China, to enhance the role of innovative technologies, especially information communication technologies, in the field of education.

Under the spirit and promise of Sustainable Development Goals, different regions actively promote the application of innovative technologies to facilitate the educational development. Especially those considered as More Economically Developed Countries (hereinafter referred as "MEDCs") have established several policies to improve the education technology in order to reinforce the overall intellectual capabilities. For US as an instance, the US Department of Education released National Technology Plan in 2016. Within the plan, it calls for schools and districts to improve technology-based assessments and establish a robust technology infrastructure, in order to augment the education demand in future. Further, European Union realises that education system should be able to cater for the demand of changing societies. The official document named Improving and modernising education, published by the European Commission, states that the modernized technologies should be encouraged to reform the educational system for better quality and future of educational system. Additionally, the European Union has worked closely with its member states to develop the digital framework that

would help the policy makers to effectively apply the latest technologies to facilitate educational system.

Despite the effort by the countries where are technologically and economically developed, the developing countries also vigorously develop their own policies to further expedite the application of advanced technologies in education system. China has issued the National Medium and Long-Term Development Plan for Educational Reform and Development in 2010. The plan emphasizes the importance of technology in education, and it further suggests that the technologies for education should be strengthened and innovative that the educational system would be more effective in providing broader access of knowledge to different level of students. Furthermore, countries in the African regions have made great progress in establishing the ICT and related advanced technologies for educational use. Even though the policy supports the local administrations to implement latest technologies to facilitate schooling, the great expenditure and lack of specialized technocrats is probably a major concern for the countries which are economically under-developed.

In order to reform the educational system for better purposes, the international society, including countries and international organizations, has demonstrated great efforts to encourage the application of advanced and innovative technologies in the education. Such efforts and policies are critical to the following phase of development in education and related technological field.

Current Situation

Along with the outstanding breakthrough made in the applied technology, the varieties of technologies were developed, such as Artificial Intelligence and Virtual Reality. In addition, information technologies are also developed along with the technological breakthrough nowadays.

With the remarkable progress made in the innovations and technologies, Information Communication Technologies have broader power to be applied. The innovation of hardware, such as smart phones, tablets and laptops provides people with more access to exchange information and absorb fragmented information.

It can be observed in the figure that increasing numbers of people own more than one smart mobile devices. The popularization of smart devices renders people to access the network and share the information more easily, and people can receive and exchange information anywhere. Such innovation and popularization of technologies, especially in hardware, give ICT great potentiality. With such power and potentials, varieties of means of communication is revolutionized, the boom of the social media industry could be an example.

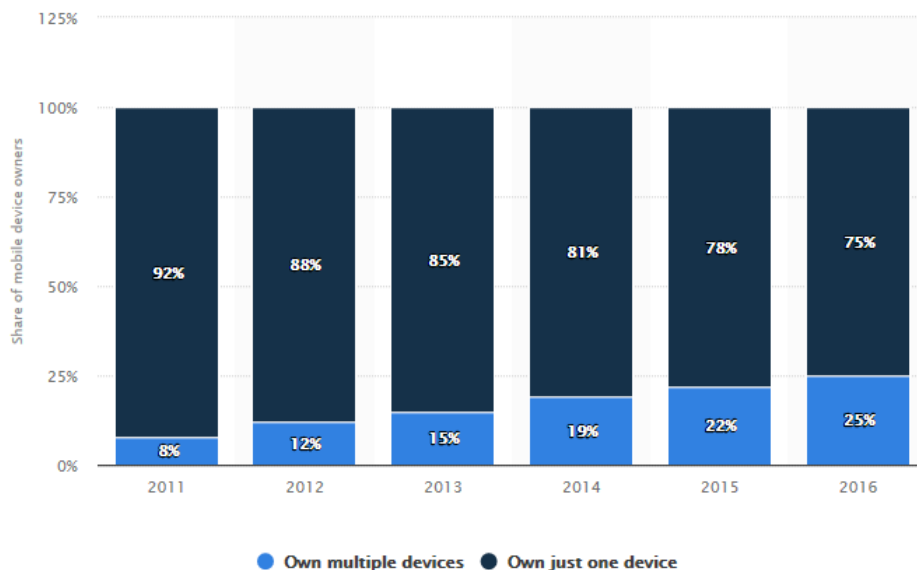


Figure: Share of mobile device owners worldwide from 2011 to 2016, by number of devices owned⁴

The astonishing development of technologies enables the school or related educational organizations to apply cutting-edge technologies to facilitate education. According to the research by New Media Consortium, there are several technologies would be popularized to reform and impact traditional education system, which includes: Cloud Computing, Mobile Learning, Tablet Computing, Massive Online Open Courses, 3D- Printing, Virtual and Remote Laboratories and Wearable Technology. Some of the schools already use such innovative technologies to facilitate the teaching. Pursuant to the report by BBC, almost 70% of primary and secondary schools in UK now use tablet computers⁵. What is more, Massive Online Open Courses (hereinafter referred as "MOOCs") are also popular amid students in different levels and age groups. According to research by Class Central, there are 23 million people use MOOCs for learning⁶. Through tablet, MOOCs and other related technologies, people would have broader and easier access to knowledge and education. Other technologies, such as Cloud Computing and Mobile Learning would help student to consolidate the knowledge and accumulate information more easily. Such changes in the technologies would enhance the current educational system and further improve the quality of education. Even though the application of innovative technologies would seem ideal to accomplish the 4th Goal of Sustainable Development, there are several obstacles that need to be dealt with, if the application of the technology is needed to be further promoted in education.

4 Share of mobile device owners worldwide from 2011 to 2016, n. (2016). Multiple mobile device ownership worldwide 2011-2016 | Forecast. [online] Statista. Available at: <https://www.statista.com/statistics/245501/multiple-mobile-device-ownership-worldwide/> [Accessed 6 Feb. 2018].

5 BBC News. (2018). Tablet computers in '70% of schools'. [online] Available at: <http://www.bbc.com/news/education-30216408> [Accessed 9 Feb. 2018].

6 Class Central's MOOC Report. (2018). By The Numbers: MOOCs in 2016 — Class Central. [online] Available at: <https://www.class-central.com/report/mooc-stats-2016/> [Accessed 7 Feb. 2018].

Problems and Challenges

Discord between New and Old Concept of Education

Application of cutting-edge technologies would surely impact the way of learning that students would have broader access to the knowledge and education. However, the innovative method of education is challenged. Some argue that the New concept of education would sabotage the benefit of traditional way of education. Those who believe new concept of education is beneficial claim that the use of advanced technologies in the classroom would not only facilitate students to improve the academic performance, but also further cultivate students' creativity. According to the research, students with technological devices would outperform the students without technological devices. In addition, the result of an experiment done within the medical school implies that the use of technologies within the classroom would not only increase the student's academic capabilities, but also be helpful to create good learning environment that the instructor becomes more efficient in improving student's understanding on the content.

However, those who disagree with the concept of new education believe that the application of advanced technologies within the classroom would not benefit student's performance and capabilities. The students with technological devices would lose their basic skills. Additionally, the electronic devices would become distractions in the classroom while the teaching is in the process. Furthermore, it is believed that the reason of some teachers and school managing parties resisting to new methods of education is that they see the technological experimentation as outside the scope of their job description. Moreover, it is believed that the education based on the latest technologies and cutting-edge online framework would not be helpful to students' personal development in social skills. The core of the education does not only lie upon the development of academic performance, but also the cultivation of social skills. The electronic devices and new technologies would surely help student improve the academic skills, however, the use of electronic devices within classroom would lessen the social interaction among students and isolate the student from the other that social skills would be rather underdeveloped.

Unbalanced Development of Technologies among Different Regions

Despite the conflict between traditional and modern ideas of teaching, the gap among different regions is also considered as a severe obstacle to promote advanced educational technologies.

Economy plays a fairly important role in the technological development. Less Economically Developed Countries are concerned by the expenditure in the technological development due to limited capital. However, those who are more developed would have technological advantages. According to the statistics, the smartphone ownership in

Africa is 46% in 2015⁷. However, 68% of US population owns smartphones⁸. The economic disadvantages in African regions would affect their technological development process. As a result, they may not have enough capital to popularize the advanced technologies in schools.

Disadvantages and Drawbacks of New-style Education

Even though the application of advanced technologies in education seems ideal in improving the academic performance of students, the newly developed educational technologies may have flaws that negatively affect the overall performance of innovative technologies in educational application. The flaws include:

1. The technology is still in development

The technologies, such as VR, AR and AI are still in the process of development that they cannot be commonly used in schools for educational purposes.

2. Technologies could weaken basic social skills

The use of technologies in education may cause the weakening of basic social skills. Students would pay more attention to the electronic devices that they would lack opportunities to have social interactions with others. The over-concentration on the technological devices may improve the academic performance by facilitating the grasp of knowledge. However, the lack of oral communication may degrade students' social skills.

Lack of Specialized Technocrats in the Implementation Process

The application of innovative technologies requires the technocrats of high education background who are specialized in the related field. However, the limited number of specialized technocrats would stall the process of the implementation of technologies in the school. In addition, lack of systematic and standardized training process in the related area also affects the application of technologies. Some of schools or the local administrations have not been trained or educated concerning the implementation of the technologies, and even though the application of the technical devices is installed properly, the devices might not be properly operated that the devices would be severely damaged.

⁷ The Mobile Economy-Africa 2016. (2016). [ebook] GSMA Intelligence, p.2. Available at: <http://www.gsma.com> [Accessed 9 Feb. 2018].

⁸ Anderson, M. (2015). Technology Device Ownership: 2015. [online] Pew Research Center: Internet, Science & Tech. Available at: <http://www.pewinternet.org/2015/10/29/technology-device-ownership-2015/> [Accessed 9 Feb. 2018].

Possible Solutions

Government Policy Encouragement

Nowadays, iPads are used in kindergartens, virtual classrooms are utilised in high schools, and even online diploma is issued to graduate students. Governments are trying to fund these programs, which proved to be highly costly. In 2014, US venture funding for education technology reached \$1.87 billion, compared with \$385 million in 2009. Overall education technology spending globally will reach \$19 billion by 2019⁹.

The use of high technology in the education field is always a heated topic. In the past, high tech in classrooms mainly refers to computers, broadband, PowerPoints and so on. Modern classes call for even more cutting-edge technologies, including but not limited to artificial intelligence, deep learning and so on.

Even though most educators call for more funding in the education industry, there are some who believe that technology isn't necessarily beneficial for the education. Therefore, they speak out for a somewhat "retro" way of education—banning the use of high technology products in classrooms. According to their argument, such products could potentially harm the well-rounded development of students, for example, their calculating abilities. Although their opinions are not accepted by the mainstream, such arguments should be considered by policy makers.

The attempt to find money for the tech tools is bound to encounter numerous hardships. When many schools across the globe face cutback in their budgets, some failed to keep up with the technology. In some cases, devices progress so quickly and reach obsolescence even before enough money are raised. Pew's 2012 study shows that only 54% of teachers of low-income students reported that students had enough access to technology at school.¹⁰ The Atlantic recently said that only 39% of public schools have wireless Internet available throughout the school building¹¹. The government should put more emphasis on education by providing a friendly budget.

Many argue what institutions are entitled to receive such funds. It is hard to decide what schools are qualified to receive such funds. Since schools in developed areas tend to have more resources, some officials are reluctant to grant them more funding. Although in

9 Koba, M. (2018). *Education tech funding soars -- but is it working in the classroom?*. [online] Fortune. Available at: <http://fortune.com/2015/04/28/education-tech-funding-soars-but-is-it-working-in-the-classroom/> [Accessed 1 Feb. 2018].

10 Purcell, K., Heaps, A., Buchanan, J. and Friedrich, L. (2018). *How Teachers Are Using Technology at Home and in Their Classrooms*. [online] Pew Research Center: Internet, Science & Tech. Available at: <http://www.pewinternet.org/2013/02/28/how-teachers-are-using-technology-at-home-and-in-their-classrooms/> [Accessed 1 Feb. 2018].

11 Livingston, P. (2018). *More Than Half of U.S. Public Schools Don't Have Adequate Wireless Access*. [online] The Atlantic. Available at: <https://www.theatlantic.com/education/archive/2013/11/more-than-half-of-us-public-schools-dont-have-adequate-wireless-access/281410/> [Accessed 1 Feb. 2018].

some cases government policies reflect such belief, authorities may think that areas less well-off are in need of more urgent fund. Such as aids in drinking water, textbooks and toilets.

Digital literacy is a crucial skill. Familiarity with technology is directly connected with the opportunities available for a student. However, many educators fail to realise this and are unenthusiastic about keeping up with the technology. Due to the high cost of such funds, taxpayers are unwilling to pay for what they deem as gimmicks and frills. The government need to incentivise individuals and institutions in order to modernise teaching equipment. The new generation of students needs to be prepared for the future world of rapid development.

Many enterprises recognize the link between education quality and the economy. An outdated education system would be a burden too heavy to bear for the country. According to researchers, students that are technology-savvy can quickly adapt to the job market. Therefore, entrepreneurs believe that making donations will be beneficial for the education industry and eventually the companies themselves. To many, business partnership is an ideal choice. Working together on a pilot program in which schools get to use products for free or at a lower price. Companies can help to fund schools directly, like IBM's involvement with P-Tech, a school in Brooklyn that emphasizes teaching students technology¹². School infrastructure is also a significant issue. Businesses may do their job to fund computer labs, technology centres and so on. These partnerships are beneficial for industry, as well as for the students that gain greater access to technology. The challenge is successfully persuading companies to invest and make it convincing for them to do so. Authorities are obligated to build well-functioning platform to relevant parties to exchange information.

Governments with a limited budget can encourage private companies to make donations and grant them with some "privilege", for example, friendly tax policy. When companies make their donations, it demonstrates that they have a sense of responsibility. In a community where reciprocal values are prized, such companies should be rewarded. As more and more individuals join in and make their donations, the burden on government budget can be significantly alleviated.

However, there are many problems to be considered when the government is attempting to fund schools. Many argued, there are backlashes when such policies are implemented. It is evident that such policies can heighten the disparity between wealthy schools and poor schools, even placing disadvantaged students in an even more disadvantaged position because of lacking access to these technologies.

Some research show that teachers believe the high-tech teaching methods are distracting. Students are then glued to the electronic screens, making the teachers irrelevant. "Education technology can be beneficial, but it must meet students' needs and

¹² [Www-03.ibm.com. \(2018\). IBM and P-TECH. \[online\] Available at: https://www-03.ibm.com/press/us/en/presskit/42300.wss](https://www-03.ibm.com/press/us/en/presskit/42300.wss) [Accessed 1 Feb. 2018].

enhance curriculum and should support, not supplant teachers," said Randi Weingarten, president of the American Federation of Teachers¹³.

There has been a heated argument on whether or not students should pay for or afford at least a portion of the products. With that being the case, it will imminently lead to a digital divide between students. Low-income students are unable to afford the latest technology products.

Cooperation in Multiple Forms

Government is still the primary source of fund for many schools till this day. There are many kinds of cooperation between the governments of different countries. International collaboration often takes place between developing countries and developed countries. Developed countries own the latest technology, therefore possessing a greater say in such relations. This assistance or cooperation do not come at a low price. Though many are interest-free loans or even donations, there are likely to be political motivations behind such actions and approaches. Although some developing countries are willing to sacrifice their interest for the funds, the fact that foreign money can be potentially detrimental could never be neglected.

Some turn to their government instead. However, requiring extra funding from the authorities has been proved to be, in many cases, a tedious and low-efficiency attempt. Government is cautious when dealing with funding application since they may give rise to further inequality and sentiments of resentment. With that being the case, schools often seek other alternatives that are much less time consuming and bureaucratic.

There are many questions to be considered before an agreement of cooperation can be reached. For example, what resources are available at present in schools, and how are they distributed? These questions may seem minor but play an essential role in determining the way and scale of the cooperation. Authorities and other relevant parties should conduct a thorough census and have a more precise grasp of the situation. Such census would require a professional team and an impartial point of view.

At the multi-district and multi-state/province levels, the school can negotiate more favourable prices with companies by buying with others seeking similar devices. Public-private partnerships are what educators occasionally seek. Cross-sector collaboration is often proven to be mutually beneficial. Allocating local resources is much more budget friendly than asking for international cooperation. Local companies are stakeholders in ensuring students graduate digitally literate and may be willing to partner in funding, device donation or training.

Schools being active members of the local community should also seek help within the community. In the case of device refurbishment, repairing, upgrading, and reusing devices

¹³ Koba, M. (2018). *Education tech funding soars -- but is it working in the classroom?*. [online] Fortune. Available at: <http://fortune.com/2015/04/28/education-tech-funding-soars-but-is-it-working-in-the-classroom/> [Accessed 1 Feb. 2018].

that the local community no longer needs can create both an educational opportunity and a source of low-cost devices. Utilizing high technology in classrooms doesn't mean all equipment is the latest product. Otherwise, the cost may be too heavy to bear. Local community members are most likely to be incentivized to help the schools in need. Technically speaking, their children are most likely to attend a local school and receive a diploma from that school. A school obsolete will be a disgrace to the entire community and eventually undermine the quality of local education.

After the utilization of high technology in classrooms, many activities or resources are no longer needed. Areas to consider include paper textbooks, printers, fax machines and paper supplies. Environmentalists would be most willing to promote these changes. It would not be hard to depict a campus so environmentally friendly. However, such programs would require aids from multi-parties. Seeking assistance from other NGOs would greatly benefit the faculty and the students.

Relocation of Professional Educators

More professionals are needed in schools than ever especially when it comes to innovative technology. According to recent surveys, the number of students who wish to become teachers plummeted drastically. Though many calls for the implementation of artificial intelligence in teaching, it has been proven AI are not fit for all occasions, at least for the time being. Perhaps in the next several decades, we are able to witness such historic changes. Wise decision makers would need to consider the potential repercussions of surging unemployment by then.

Therefore, the relocation of professional educators is still our focal point now. Local authorities need to make policies that can attract the educators. Such policies may include but not limited to favourable tax rates, free training programs and better social welfare system. Some educators are hesitant to teach in schools with innovative technology products that they are unfamiliar with. Local government should try their best to take down these barriers. A professional teacher can bring great benefits. He or she is inspirational, giving students the continuous motivation to carry on with their studies. A teacher that is technology-savvy can use the latest equipment effectively and better educate his or her pupils. It would not be hard to imagine that the students of a teacher that is passionate about teaching with innovative technology would too be obsessed with technology. We can then see a virtuous circle whereas more and more innovative technology products can be put into use.

Attracting professional educators is almost the same as attracting other talents. However, decision makers would need to find out what do these educators crave for the most and what make their needs so unique. Training programs might be a must since classrooms with high technology would be completely different from those old-fashioned ones. As technology are put into use (potentially AI in the future), educators would have a much more flexible working time. This could be used as a shining point among many to recruit a larger faculty.

International cooperation plays a crucial role in attracting educators. The free flow of information and talents enable educators to search for posts they want across the globe. There are already existing exchange programs for teachers. For example, the Fulbright program and so on. It would be wise to make use of existing programs and platforms but at the same time making major adjustments to better suit new changes.

Local authorities could consider a more favourable working condition for professional educators. Better infrastructure, higher payment and more opportunities for promotion. This would help distinct educators from other positions. Even though pouring much money into the education industry may not seem lucrative for the time being, researchers have found that this would be a rewarding investment.

Country Positions

The United States

The US has fully recognized the strategic significance of artificial intelligence, hence focusing attentively on technical research and development about this subject. It has accelerated its AI overall arrangement on a national strategic basis. With the help of its outstanding technical research institutions and all sorts of laboratories relevant with the study of "cognition", the United States has achieved a great deal in terms of AI innovation.

Since 2013, the US released a number of AI project plans. In 2016, it sped up developing AI and announced dozens of strategic projects. In particular, in December 2016, the National Science and Technology Commission consecutively published "Preparing for the Future of Artificial Intelligence" and "The National Artificial Intelligence Research and Development Strategic Plan". They laid out a magnificent blueprint for the AI development of the United States.

On one side, the United States Department of Defence now intends to readjust the layout on the battlefield by adopting more automated machines, with automation on the front and men in the back. On another side, the four technical giants Google, Microsoft, Facebook and Apple are fuelling AI with brilliant ideas and insights.

Now the US is not only facing a question about how to harness AI's full potential, but also a question about how to mitigate the risks posed by AI proliferation at home and abroad.

At the same time, the US governments endeavours to enhance the educational system by all possible means, which includes the use of cutting-edge technologies in the school and classroom. The current administration, led by Donald Trump, implicates his policy of anti-globalization. He does not only withdraw the USA from Paris Agreement, he also withdraws from UNESCO. Under Trump administration, even though the USA shows the negative attitude towards the cooperation based on the international organizations, the administration has attempt to enhance the educational system within the USA. In 2017, the administration raised the budget and fund U.S. Department of Education 204.7 billion dollars for educational purposes¹⁴. Today, the USA endeavours to reinforce the educational system. Furthermore, the USA has great resources and powers in the development of innovative technologies, and the USA is active to apply the latest technologies in education.

¹⁴ U.S. DEPARTMENT OF EDUCATION (2017). U.S. DEPARTMENT OF EDUCATION. Washington D.C.: U.S. Department of Education, pp.1-2.

China

Chinese government, corporations and the public are well-aware of the comments concerning its impending rise to global dominance and are investing heavily in cutting-edge technologies, particularly artificial intelligence.

Considering that the current AI spring is largely facilitated by the improvement of computer capacity, China's supercomputer advantage offers the best opportunity for the advancement in AI. Meanwhile, China is heading software algorithm innovation with tremendous momentum.

In fact, according to a special report given by the White House, China is now ranking the first in terms of deep learning research, if counted by publications that have been cited at least once.

The Chinese top three leaders---Baidu, Alibaba and Tencent, together with a number of start-ups, have demonstrated great potential and dynamism in the development of artificial intelligence. Although China's military has remained relatively understated, there exists relevant research working inside the People's Liberation Army and the Chinese defence industry.

Notably, China's 13th Five-Year Plan (2016-2020) is calling for breakthroughs in artificial intelligence. The new initiative is known as the "China Brain Plan" that seeks deeper understandings of human brain. What's more, the Internet Plus and Artificial Intelligence, a three-year plan for artificial intelligence (2016-2018) is emphasizing on the development of artificial intelligence applications.

Also, China is the world's largest education market, with more than 400 million students¹⁵. Digital education is a solution to many of China's educational needs. It could increase access to education while lower costs and promote a more high-tech economy. At the same time, the rise of digital education could extend the digital divide within China. 80 percent of students use the Internet at home, but in rural areas, only two percent of students have internet access in their homes.¹⁶ A large student population, rapidly rising incomes and increasing educational attainment levels have all increased demand in China for education technologies. Government policy is also positive towards foreign investment in education, although competition for this market will be increasingly fierce. The Chinese government has been attempting to utilize innovative technology in education industry

¹⁵ Yang, C. and Du, M. (2018). *Booming online education brings chances, challenges in China - People's Daily Online*. [online] En.people.cn. Available at: <http://en.people.cn/n3/2018/0208/c90000-9425144.html> [Accessed 9 Feb. 2018].

¹⁶ Chan, J. (2018). *Digital education in China | British Council*. [online] Britishcouncil.org. Available at: <https://www.britishcouncil.org/voices-magazine/digital-education-china> [Accessed 17 Feb. 2018].

Europe

In general, Europe has a growing and thriving artificial intelligence industry. The United Kingdom now possesses the most vibrant AI ecosystem among all European countries, ahead of Germany, France and Spain.

One of the most striking features European AI companies have in common is that their data analytics capability is fairly competent, probably owing to the Cloud and Big Data trends in recent years. On the contrary, robotics companies are quite scarce in Europe, the number of which is increasing at a relatively low rate.

The European Parliament Legal Affairs Committee used to present a report on civil law rules concerning robotics. As there has been an increasing public debate about artificial intelligence, this initiative came out at the right time and raised important questions for the European Union.

Many aspects of the report were directly responding the Digitizing European Industry Strategy launched in April 2016. It identified AI as cornerstone technology, addressed new legal challenges related to robots and autonomous AI-based systems, and highlighted issues related with professional skills.

In addition, the EU also set up SPARC, a public-private partnership for robotics in Europe, for the purpose of drawing on civil wisdom. SPARC is by far the largest civilian research program concerning AI in the world.

Europe has always been in a strong position, both commercially and scientifically. Approximately half of all ministrant robots and one quarter of all industrial robots are produced in Europe. Recent breakthroughs such as DeepMind's AI software marks European labs' noteworthy progress.

The European Union has been working to enhance the utilization of innovative technology. Education is a topic repeatedly mentioned in the European Council. In recent years, many Europeans have been dealing with the connectivity divide by supporting high capacity broadband in all schools. Europe is a pioneer in providing a framework for issuing digitally-certified qualifications. Recently, more emphasis is put on students to learn digitally-acquired skills. This framework will align with the European Qualifications Framework for Lifelong Learning (EQF) and the European Classification of Skills, Competencies, Qualifications and Occupations (ESCO). The EU has been seeking the development of a Europe-wide platform for digital higher education which will offer online learning, blended mobility, virtual campuses and exchange of best practices among higher education institutions.

Africa

AI's unprecedented significance and remarkable growth are not restricted to some specific regions but rather have a broad impact on all continents, including Africa. However, many African nations are still striving to accomplish first, second and third industrial revolutions to gain access to electricity, manipulate production line and fulfil transition to automation. Therefore, entering into the new era of the fourth industrial revolution, some African countries are too stressed out to catch up with the advancement in technology.

On account of Africa's cheap abundant labour and natural resources, this continent seems devoid of the basic requirements of the fourth industrial revolution that consists mainly of large sums of capital, research and development (R&D), and plentiful well-educated talents. Nevertheless, the ongoing industrial revolution presents an opportunity to the African people as well, if properly taken advantage of, the Africa can unleash a storm of momentum.

Africa adopts technology in a way that sets it apart from other regions. In many sectors, African countries wisely embrace new technologies and instil them through various means. In particular, the agriculture and healthcare sectors are greatly empowered by new science.

Today, Africa is becoming a magnet for innovation and entrepreneurship. Its legacy systems are no longer hindering businesses from setting roots or developing their own models. Therefore, the mainstream AI technologies now are provided with the chance to explore and exploit a new territory.

African regions are less economically developed, and also eager to develop its educational system by promoting the use of technologies in the school. African regions are relatively poor compare to other developed countries, and the total GDP of African region is only 2545 billion dollars¹⁷. The poor education system in African regions would have negative impact on its bureaucratic system that people lacking professional knowledge work in the government. In addition, the limited educational resources make people in African regions have limited access to education. Even though Africa shows active attitude towards the application of ICT in the educational system, the expenditure is their biggest concern. Therefore, countries in African regions may ask developed countries for both technological and economic aid, for improving the educational system of African regions.

¹⁷ Statista. (2018). Gross domestic product (GDP) of Africa from 1995-2016 | Statistic. [online] Available at: <https://www.statista.com/statistics/240665/gdp-of-africa/> [Accessed 9 Feb. 2018].

Questions to Consider

1. How to allocate the funds and talents in AI research?
2. How to protect privacy contained in the big data used in AI learning and analysis?
3. Is there any better solution to resettle the unemployment caused by AGI?
4. If the personification of AI is recognized by man, what responsibility and legitimate rights should they possess ?
5. How to cope with the relations between mankind and AI?
6. How to increase the efficiency of application of innovative technologies in the education?
7. Do countries need to concentrate on promoting existing technologies or creating new technologies concerning education?
8. How can developing countries keep up with the trend of innovative technology?
9. Is the existing mechanism helpful or is it detrimental?
10. How to protect students' right of privacy, should they wish not to leak any personal information when faced with such massive trend of data use?

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