

THE FOURTH INDUSTRIAL REVOLUTION AND BUDDHISM

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This paper aims to discover what the fourth industrial revolution is, whether the fourth industrial revolution optimistically will improve the human condition or it could lead to greater inequality, disruption of labor markets because of “low-skill/low-pay” and “high-skill/high-pay” workers and other negative consequences. It also addresses how Buddhism can contribute its part to reduce the adverse effects of the fourth industrial revolution.

The first industrial revolution occurred from the 18th to 19th centuries in Great Britain and North America as the most successful industrial revolution, when mostly agrarian, and rural areas became industrial and urban ones. The textile and iron industries, the development of the water wheel, as well as the steam engine played essential roles in the first industrial revolution (Deane, 2000).

The second industrial revolution occurred before World War I between 1870 and 1914, when steel, oil and electricity were mass produced. Major technological inventions during this period include the telephones, phonographs, internal combustion engines, and light bulbs in many cities such as Chicago, Paris, London, Berlin, and Tokyo (Levin et al, 2010).

The third industrial revolution, or the digital revolution can be understood as the advancement of technology in the 1980s from analog electronics to the digital technology that is dominant to-

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day. The advanced technologies of the Third Industrial Revolution encompass the personal computer, the internet, as well as the information and communication technology that quickly spread to countries in Asia, Africa, and the Americas (Rifkin, 2011).

The fourth industrial revolution can be defined as the fourth major industrialization that is blurring the lines among the physical, digital and biological spheres, as cyber-physical systems from the early 2000s. The fourth Industrial Revolution is characterized by innovated technology breakthroughs, such as robotics, artificial intelligence, nanotechnology, quantum computing, biotechnology, the Internet of Things, decentralized consensus, fifth generation wireless technologies, additive manufacturing/3 D printing and fully autonomous vehicles, and others (Groscurth, 2018).

Professor Klaus Schwab, the executive chairman of the World Economic Forum, (January 11, 2016) claimed that the effects of digitization and artificial intelligence on the global economy, and the broader role for advances in biological technologies are disrupting almost all industries in all countries in the world. These tremendous changes forewarn the transformation of entire systems of production, governance, and management in the world.

Schwab (2016) also mentions the fourth industrial revolution as emerging technology breakthroughs in various fields, such as artificial intelligence, robotics, the Internet of Things, autonomous vehicles, nanotechnology and 3D printing that may create high potential of disruptive effects on human history. The survey report with the title *Deep Shift-Technology Tipping Points and Social Impact* was publicized in September 2015 about 23 technology shifts, including their expected arrival to market and the tipping points of their novel technologies.

Shift 1. Implantable Technologies: The first implantable mobile phone will be available by 2025. Individuals will be connected to devices, which are directly connected to their bodies. Therefore, devices will not only be worn, but also be implanted into individuals' bodies. Pacemakers and cochlear implants were only the beginning of the implantable technologies. The future devices will be able to sense the parameters of diseases that will enable people to

act, submit data to monitoring centers, and automatically release healing medicine as immediate and appropriate treatment (Skilton & Hovsepian, 2018).

Shift 2. Our Digital Presence: Now, individuals' digital presence can be considered as their digital interactions and traces through multiple online platform and media, such as Twitter, Facebook, LinkedIn, Instagram and so on. The digital presence allows individuals to present themselves to the world through fashion, words and acts. The digital life also enables them to express their ideas and emotions, look for information and share it to others, as well as maintain and develop relationships virtually everywhere in the world (Schwab, 2016).

Shift 3. Vision as the New Interface: 10 percent of the reading glasses will be connected to the internet by 2025. Google glass will produce a variety of glasses, eyewear/headsets and eye-tracking devices can become very intelligent and lead to visions and eyes connected to the internet and other devices. People's experience can be increased, mediated or completely enhanced to provide different, immerse reality by direct access to internet application and their data through the vision (Schwab, 2016). Moreover, the devices can feed information through visual interfaces, as well as eyes can be the source for interacting with and responding to the information with emerging eye-tracking technologies (Schwab, 2016).

Shift 4. Wearable Internet: 10 percent of wearing clothes will be connected to the internet by the year 2025. Computer technologies were increasingly located in large rooms, next to desks, and on individuals' laps, and now in their pockets. In the near future, Apple Watch will be replaced by clothing and other equipment that will be embedded chips connecting to the Internet (Schwab, 2016).

Shift 5. Ubiquitous Computing: 90 percent of the global population will regularly access to the Internet and services in the cloud by the year 2025. 1.2 billion smart phones were sold in 2014. In 2015, sales of tablets took over sales of personal computers, while all mobile phone outpace computers by six to one. Soon, wireless technology will enable individuals easily to access the Internet and information easier than ever before because it requires less infra-

structure than any other utilities (Schwab, 2016).

Shift 6. A Supercomputer in Our Pocket: 90 percent of the world's population will use smartphones by 2025 that contains supercomputer power compared to previous ones. Global smartphones are overly subscribed in 2019 to more than 3.5 billion that equate to 59 percent smartphone penetration by the world population. The shift in devices has taken place in various countries across different continents, in which Asia leads the current trends because more individuals are using their smartphones instead of traditional personal computer (Schwab, 2016).

Shift 7. Storage for All: 90 percent of individuals will have free and unlimited storage by 2025. Although storage capacities have evolved in the last few years, a variety of companies will offer free and unlimited storage to their clients as a part of the services benefits. Therefore, users will produce increasing amount of their content without bothering to delete it to make room for the current contents (Schwab, 2016).

Shift 8. The Internet of and for Things: One trillion sensors will be connected to the Internet by 2025. Because of the increasing computer power as well as the fall in intelligent sensors and hardware prices, all things will be smartly connected to the internet to facilitate greater communication and new data services based on augmented analytic capabilities. A recent study revealed how sensors can be applied to monitor animal health and their behaviors. The study proposed how sensors wired in cattle can communicate with each other through a mobile phone network and can report real-time data about cattle conditions from everywhere (Schwab, 2016).

Shift 9. The Connected Home: More than 50 percent of Internet traffic will be delivered to homes for appliances and devices by 2025. Very rapid changes are happening in home automation, enabling individuals to control lights, shades, air conditioning, ventilation, audio and video, security system, and other home appliances. Additional supports are accumulated by connected robots for a variety of services, such as vacuum cleaning, dishwasher, and so on to save more energy and time (Schwab, 2016).

Shift 10. Smart Cities: The first city with 50,000 inhabitants without traffic light will take place by 2025. Many smart cities will connect their services, utilities and road to the Internet. Singapore and Barcelona are smart cities that are implementing various data-driven services, smart trash collection, intelligent parking solution, and intelligent lighting. Smart cities are continuously progressing their network of sensor technology and working on their data platforms that will formulate the necessary core for connecting a variety of technology projects and adding future services based on previous data analytics and predictive modelling (Schwab, 2016).

Shift 11. Big Data for Decisions: The first government will replace its demographic census with big-data resource by 2025 because they will enable more accurate and updated data about communities than ever before. Therefore, the government will use the current programmes from big-data technologies and apply new and innovative approaches to serve its citizens and customers. Leveraging big-data will facilitate faster and better decision-making in a wide range of industries and applications. The automated decision-making process not only can reduce complexities for citizens, but also generate governments and businesses to offer real-time services and support for multi-services, such as customer interactions, automatic tax filings and payments (Cukier & Mayer-Schoenberger, 2013).

Shift 12. Driverless Car: 10 percent of driverless cars will commute on US roads by 2025. Trials of driverless cars from giant companies, such as Audi and Google occurred; and various other enterprises are preparing to develop new solutions. These vehicles will be safer and even more efficient than before because they will reduce congestion and emission, as well as upend existing models of transportations and logistics (Schwab, 2016).

Shift 13. The Artificial Intelligence and Decision-Making: The first Artificial Intelligence machine on a corporate board of director will be established by 2025. The Artificial Intelligence can learn from previous experiences to provide input and automate the complex future decision processes easily and rapidly to arrive at concrete conclusions based on data and past situations. This initiative innovation will lead to less bias, rational and data-driven decisions

(Cukier & Mayer-Schoenberger, 2013).

Shift 14. Artificial Intelligence and White-Collar Jobs: 30 percent of corporate audits will be performed by Artificial Intelligence by 2025. Artificial Intelligence excels in automating processes and matching patterns that makes the technology liable to many functions in large organizations. Artificial Intelligence will replace a range of essential and complicated functions performed today by white-collar professionals, such as doctors, surgeons, lawyers, tax accountants and so on. An Oxford Martin School study proposed the susceptibility of jobs to computerization from Artificial Intelligence and robotics, and conclude some sobering results. The study predicted that 47 percent of US jobs in 2010 will become computerized in the next one or two decades (Gleason, 2018).

Shift 15. Robotics and Services: The first robotic pharmacist in the US will be officially established by 2025. Robotics will undoubtedly influence many jobs from agriculture to manufacturing, and retail to services. According to the International Federal of Robotics, the world includes 1.1 million active robots, and machines are working in car manufacturing plants. Robots are streamlining supply chains to produce more predictable and efficient business results (Schwab, 2016).

Shift 16. Bitcoin and the Blockchain: 10 percent of the global gross domestic product is stored on blockchain technology. Digital currencies and Bitcoin are based on the idea of a distributed trust mechanism named the Blockchain, a way of trusted transaction and keeping track in a distributed fashion. The current total worth of bitcoin in the blockchain is around 20 billion dollars, or around 0.025 percent of the global gross domestic product of about 80 trillion dollars (Schwab, 2016).

Shift 17. The Sharing Economy: Globally there will be more trips or journeys by car sharing than in private cars by 2025. The new technology enables individuals' preference for access over ownership, peer to peer, sharing of personal assets versus corporate assets, increased social interaction, ease of access, collaborative consumption and officially shared user feedback

(Schwab, 2016).

Shift 18. Governments and the Blockchain: Tax will be collected for the first time by a government via a blockchain by 2025. The blockchain evidently generates both opportunity and challenges for many countries because it is unregulated and uncontrolled by any banking institution. Moreover, the blockchain can generate the ability for a new taxing mechanism to be developed into the blockchain itself (Schwab, 2016).

Shift 19. 3D Printing and Manufacturing: The first 3D-printed car in production will be presented by 2025. 3D-printing or additive manufacturing can be understood as the process of creating a physical object by printing its layer upon layer from a digital 3D model. 3D-printing obtains the potential capacity to create extremely complex products without complicated equipment. Various types of materials, such as plastic, aluminum, ceramic, stainless steel, and advanced alloys will be used in the 3D-printer. The printer eventually will be able to perform what a whole factory was once required to accomplish. 3D-printing is actually being used to make wind turbines and toys. 3D-printer will overwrite the challenges of cost, speed, and size and become more prevailing in the worldwide market economy (Schwab, 2016).

Shift 20. 3D-Printing and Human Health: The first transplant of a 3D-printing liver will occur by 2025. A process named bioprinting will enable 3D-printers to create human organs that are printed layer by layer from a digital 3D model. The material used to print a human organ will be original, such as titanium powder for making human bones. 3D-printing has tremendous potential to perform custom design needs because the human body is very particular and unique with many intricate details (Skilton & Hovsepian, 2018).

Shift 21. 3D-Printing and Consumer Products: 5 percent of consumer products will be printed in 3D by 2025. Since 3D printing can be performed by any individual with a 3D printer, it will generate opportunities for typical consumer products to be printed locally on demand. A 3D-printer can be in an office or at home. This process will increase the availability of the 3D-printed objects and reduce the cost of accessing consumer. (Schwab, 2016).

Shift 22. Designer Beings: The first human genome was deliber-

ately and directly edited and born. The cost of sequencing an entire human genome has continuously fallen from 2.7 billion dollars in 2003 to 100 thousand dollars in 2009, and now it costs only one thousand dollars for researchers to pay a lab specializing to sequence a human genome. The development of the CRISPR/Cas9 approach generates higher effectiveness and efficiency as well as lower cost than the previous method (Schwab, 2016).

Shift 23. Neurotechnologies: The first human being with fully artificial memory implanted in the brain was accomplished. Over the past few years, the most two funded research programs: The Human Brain Project funded by the European Commission and President Obama's Brain Research Through Advancing Innovative Neurotechnologies was successfully achieved (Fernandez et al, 2015). These programs are focused on medical and scientific research that proves the quick development of neurotechnology. The neurotechnologies include monitoring brain activities and observing how the brain changes and interacts with the environment. For instance, the affordability and portability of neuro-headsets create unique possibilities such as a neuro-revolution and societal-revolution in 2015 (Schwab, 2016).

Adverse Impacts: the computing power found in the fourth industrial revolution in which, many professionals, such as journalists, financial analysts, lawyers, doctors, librarians, insurance underwriters and others are being replaced by robots and artificial intelligence. This disruption forces workers to become unemployed or retrained to afford new jobs with their new skills. Increased demand for technical skills may exacerbate gender inequalities because male workers tend to dominate mathematic, computer science, and engineering professions. The fourth industrial revolution may further increase social tensions and conflicts, and generate a less cohesive as well as injustice world because of the discrepancies in living conditions between different countries that may create other negative impacts (Schwab, 2016).

Positive impacts, such as new revenue sources, rapid growth in financial returns, preserving resources, lowering costs, clean natural environment are beneficial results from the fourth industrial revolution. New technologies also allow social groupings and virtual in-

teractions to exercise influence that would have been unimaginable just a few years ago. Governments apply web technologies to help public administrations, and modernize their overall performance from strengthening the process of e-governance to fostering better transparency, engagement, and accountability between the government and its citizens (Schwab, 2016).

The fundamental nature of this revolution will impact and be influenced by all economies, countries, sectors and individuals. Therefore, it is critical that energy and attention in multistakeholder cooperations, such as academic, social, political, national, industrial, and religious boundaries. These collaborations and interactions are critical to creating a positive and hope-filled future, facilitating all worldwide groups and individuals to participate in and benefit from the ongoing transformation with great leadership (Schwab, 2016).

Two traits of good leadership characterized the 11 chief executive officers who led their companies to great success. The first trait was “being modest and humble”. The second important trait was “extreme persistence” or “fierce resolve” (Collins, 2001). Additional evidence suggests that most good leaders commonly have decisiveness, integrity, competence, and vision that manage organizations and industries through dramatic shifts. All leaders and their followers need to embrace change and realize that what their responsibilities are today might be dramatically different in the near future. Their education and retraining systems need to adapt to better prepare all individuals for the flexibility and critical thinking skills that they will need late on (Schwab, 2016).

According to Baumeister and Busman (2017), beliefs help individuals understand the world around them; especially when they experience serious problems, such as disasters or misfortune. The general terminology for how individuals attempt to deal with dramatic traumas and return to functioning effectively is “coping”. Therefore, the study of “coping” in critical and vulnerable times for social psychologists is to comprehend beliefs (Baumeister & Busman, 2017).

Buddhism, over 2500 years ago was founded by Buddha who proposes the Middle Path that avoids the two extremes of self-in-

dulgence and self-mortification with a practical philosophical system (Huxley, 1945). The Middle Path is the central platform to develop the Noble Eightfold Path. The Noble Eightfold Path, such as (1) right understanding (*samma-ditthi*), (2) right thought (*samma-sankappa*), (3) right speech (*samma-vaca*), (4) right action (*samma-kammanta*), (5) right livelihood (*samma-ajiva*), (6) right effort (*samma-vayama*), (7) right mindfulness (*samma-sati*), and (8) right concentration (*samma-samadhi*) are the best solutions for all problems of all ages that are categorized into three groups: morality, concentration and wisdom (Piyadasi, 1991). (A) The wisdom group includes (1) right understanding and (2) right thought; (B) The morality group encompasses (3) right speech, (4) right action, and (5) right livelihood; and (C) The concentration group consists of (6) right effort, (7) right mindfulness, and (8) right concentration.

(1) Right understanding (*samma-ditthi*) can be defined as the correct understanding of oneself and the world as they really are, and comprehending of the Four Noble Truth, which includes (a) suffering, (b) the cause of suffering, (c) the end of suffering and (d) the path leading to the end of suffering. Right understanding is the first and highest importance in the Eightfold Noble Path because if individuals understand clearly and correctly, they will possess the right speech and actions that lead to their happier and more successful life (Yin & Ho, 2002). Right understanding belongs to (A) the wisdom group. Likewise, if worldwide leaders and their communities have accurate and clear understanding of the positive and negative impacts of the fourth industrial revolution, they will have appropriate speech and actions to lead this revolution to benefit the humanity and the world.

(2) Right thought (*samma-sankappa*) can be regarded as being unselfish, loving, and non-violent. These thoughts can be cultivated and extended towards all beings regardless of their race, sex, religion, political viewpoint, social class, educational level, and cultural background (Piyadasi, 1991). Right understanding also belongs to (A) the wisdom group. With the non-frontier compassion through right thought, we can overcome all the obstacles of hatred, racism, discrimination, prejudice and differences to collaborate and to ben-

efit from this revolution.

(3) Right speech (*samma-vaca*) means to abstain from lying, tale telling, gossiping, backbiting, scandal/rumor, and harsh words (Yin & Ho, 2002). Right speech belongs to (B) the morality group. Buddha taught, “Pleasant speech is as sweet as honey; truthful speech is beautiful like a flower; and wrong speech is unwholesome like filth.” Therefore, if worldwide leaders and their communities speak or write words that are meaningful, truthful, and compassionate, everyone will feel happy to listen and to cooperate with them closely leading to the full cooperation towards the mutual welfare and benefit in the fourth industrial revolution.

(4) Right action (*samma-kammanta*) means individuals should conduct themselves in moral, peaceful and honorable manners that abstain from killing, stealing, sexual misconducts, lying and intoxicants (Piyadasi, 1991). Right action belongs to (B) the morality group. Right action can be considered as self-regulation or self-control that refers to the individuals’ capacity to alter their own responses because human beings essentially adapt to various demands. Self-regulation encompasses three components, such as moral standard (concepts of how things should be), self-monitoring (keeping track behaviors), willpower/capacity for change (bringing behaviors up to standard line) (Baumeister & Busman, 2017). Thus, if worldwide communities possess the right actions and self-regulation in this revolution, they will get the most benefit and avoid many unnecessary disruptions.

(5) Right livelihood (*samma-ajiva*) is the member of (B) the morality group that abstains from trading in weapons, human beings, animals for slaughter, intoxicating drinks, poisons, and drugs (Yin & Ho, 2002). Buddha taught, “Do not earn your living by harming others. Do not seek happiness by making others unhappy.” The purpose of the right livelihood is to bring about happiness to the individuals and the society and to promote harmonious solidarity among communities at large (Piyadasi, 1991). Therefore, if leaders and communities in the fourth industrial revolution apply the right livelihood as Buddha taught, human beings will receive prosperity and happiness in the future.

(6) Right effort (*samma-vayama*) is the persevering endeavor (1) to prevent the presence of evil and unwholesome thoughts, which have not arisen yet; (2) to erase all evil thoughts, which have arisen; (3) To develop the wholesome thoughts, which have not arisen yet; (4) To maintain and promote thoughts, which have already existed (Piyadasi, 1991). Right effort belongs to (C) the concentration group. Similarly, if worldwide leaders and communities are ready to follow the Buddha's teaching to possess the persevering endeavor to maintain and develop the wholesome and good thoughts and initiatives to serve the universal peace and development of the humanity and the environment, they will definitely gain the full result in the fourth industrial revolution.

(7) Right mindfulness (*samma-sati*) is being attentively conscious of what one is thinking, saying, or doing (William, 2000). Right mindfulness also belongs to (C) the concentration group. Right mindfulness can be understood as the constant and complete awareness of all phenomena as impermanence (*anicca*), dissatisfaction (*dukkha*), and non-ego (*anatta*) (Kabat-Zin, 2013). When everyone is attentively conscious of what they are thinking, saying, and doing, as well as clearly are aware that all things in the universe are impermanent, unsatisfactory, and non-ego, they will forgive each other, as well as love each other more and care for mutual happiness and global sustainability in the fourth industrial revolution.

(8) Right meditation (*samma-samadhi*) means the complete and steady concentration or unification of mind on one single object. Right meditation evidently belongs to (C) the concentration group that leads to pure equanimity (Gunaratana, 1995). Buddhist meditation is divided into two systems: (a) the concentration of mind (*Samatha*), and (b) insight (*Vipassana*). The purpose of (a) the concentration of mind (*Samatha*) into one-pointed mind is to attain the calmness and tranquility. Whereas, the purpose of (b) insight (*Vipassana*) is to see the true nature of things as they are (Dhammananda, 1996). However, (b) the insight (*Vipassana*) cannot exist and be developed without (a) the concentration of mind (*Samatha*). Thus, if worldwide leaders and their followers will practice the right meditation, they will possess their pure equanimity, calmness, and tranquility to observe the true nature of the fourth

industrial revolution as it is. They will deliberately apply their utmost insights from the right meditation to resolve all negative impacts of this revolution with equanimity, calmness, and tranquility.

Although the fourth industrial revolution poses various dilemmas of challenges, and opportunities, all worldwide leaders and citizens already comprehended this reality. We need to be proactive in shaping this novel technology and disruption. All businesses and companies should network together with trust and love. Global cooperation should mindfully reshape our cultural, social, economic, and individual lives according to the Buddhist noble eightfold path to pacify the world for the humankind in the fourth industrial revolution.

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