

THE FOURTH INDUSTRIAL REVOLUTION: RELEVANT SKILLS REQUIRED TO SURVIVE AND THRIVE IN THE FOURTH INDUSTRIAL REVOLUTION



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The Fourth Industrial Revolution is generating fundamental technological change that will impact all disciplines, economies and industries. The importance of skills development to survive and thrive in the Fourth Industrial Revolution is presented in this paper. The Fourth Industrial Revolution is characterised by technologies that is blurring the lines between the physical, digital and biological spheres, commonly referred to as cyber-physical systems. The rapid technological innovations associated with the Fourth Industrial Revolution will change the way we interact with the world and revolutionise the very nature of the work we currently do. One of the biggest impacts of the Fourth Industrial Revolution will likely result from a single source, empowerment. The resulting outcome is a lifetime of skills training and retaining, in real time. Relevant skills development is therefore a vital component to empowerment, realising the ability to create the framework for thinking about the technological revolution that outlines the core issues and highlights possible responses.

Keywords: fourth industrial revolution, technological change, skills development, cyber-physical, empowerment.

1. INTRODUCTION

The Fourth Industrial Revolution is characterised by technologies that are blurring the lines between the physical, digital and biological spheres, commonly referred to as cyber-physical systems. The rapid technological innovations associated with the Fourth Industrial Revolution will change the way we interact with the world and revolutionise the very nature of the work we currently do.

With the increased utilisation of robotics, automation and artificial intelligence, it is worth noting that in 2018 the global unemployment rate fell to 5.2%, the lowest level in 38 years [1]. The strong correlation between the Fourth Industrial Revolution and high employment rates should therefore instil a sense of optimism as we move towards a time when jobs will be more accessible, more flexible and more liberating.

Our ability to not only survive, but to thrive during the Fourth Industrial Revolution is dependent on the fundamental issue to understand what makes us as humans different from technology. This moulds the core from which our emotions and knowledge stem. It is essential to understand that technology does not foster a need for survival, nor does it possess any true emotions.

In an employment landscape that is rapidly evolving, it is important to understand that not only jobs are changing, but also the required skills to perform these jobs. It is therefore crucial that we prepare by continuously improving ourselves through strategic skills development.

It is inevitable that we will experience fundamental technological change. The challenge however will be to guide our actions to ensure the best, most inclusive outcomes for all.

2. BACKGROUND

The word “revolution” denotes abrupt and radical change. We can therefore say that various Revolutions have occurred throughout history when new technologies and our perception of the world triggered profound change in economic systems and social structures [2].

The first profound shift in our way of living is referred to as the agrarian revolution. This revolution combined the efforts of animals with those of humans for the purpose of production, transportation and communication [2].

The agrarian revolution was followed by a series of industrial revolutions that began in the second half of the 18th century. For a better understanding of the principles of the Fourth Industrial Revolution, it is important to

understand the history and the origins of the other industrial revolutions that precedes the fourth.

2.1 The First Industrial Revolution

The First Industrial Revolution is characterised by the shift from our reliance on animals, human effort and biomass as primary sources of energy to the use of fossil fuels and the mechanical power this enabled [3]. Mechanization, steam and the prolificacy of water power became the order of the day during the later stages of the 18th century. The First Industrial Revolution spanned from approximately 1760 to 1840 [2].

2.2 The Second Industrial Revolution

The Second Industrial Revolution occurred between the end of the 19th century and the first two decades of the 20th century [3]. This industrial revolution is seen by many as the period which introduced the most changes. The technological advancement which led to the Second Industrial Revolution unlocked major breakthroughs in the form of electricity distribution. Rapid advances in the creation of steel, chemicals and electricity helped fuel production, including mass-produced consumer goods and weapons [4]. The Second Industrial Revolution was characterised by the rapid growth of cities, prominence of public transport and the number of factories that began, people's lives became regulated by the clock rather than the sun.

2.3 The Third Industrial Revolution

The Third Industrial Revolution began in the 1960s. This revolution is often referred to as the computer or digital revolution because it was catalysed by the development of semiconductors, mainframe computing (1960s), personal computing (1970s and 80s) and the internet (1990s). [13]. The information technology (IT) age with the development of digital systems, communication and rapid advances in computing power enabled new ways of generating, processing and sharing information [4].

2.3 The Fourth Industrial Revolution

We are in the inception stages of a new industrial revolution that according to Klaus Schwab (Founder of the World Economic Forum) will not just change what we do and how we do it, it will change us [5]. The Fourth Industrial Revolution is characterised by technologies that is blurring the lines between the physical, digital and biological spheres, commonly referred to as cyber-physical systems [3].

The complexity of these technologies and their emergent nature makes many aspects of the Fourth Industrial Revolution feel unfamiliar and, to many, threatening. The foundation of the technology of the Fourth Industrial Revolution is reliant on the infrastructure of the preceding industrial revolutions. This revolution will

however represent new ways in which technology becomes embedded within societies and even our human bodies [3].

Some of the most notable technologies shaping the Fourth Industrial Revolution include genome editing, artificial intelligence (AI), new materials, 3D printing, Internet of Things (IoT), Big Data, blockchain, genetic sequencing and synthetic biology. The technologies can all be clustered into three distinct categories: physical, digital and biological, hence the reference to cyber-physical systems.

The Fourth Industrial Revolution is often seen as a very abstract concept with massive disruptive potential. It is however a true reflection of our desires and choices to shape a better future.

3. POTENTIAL IMPACT OF 4IR

An industrial revolution is generally characterised by advancements in technology that is applied to improve the process of production. The Fourth Industrial Revolution however has the potential to be so much more than just some improvements in a production process.

With every industrial revolution comes refining shifts to social, economic, environmental and political systems that truly alter the course of humanity [6]. It is important to understand that some of these shifts are foreseen, and other are completely unforeseen. It is therefore essential that we focus on upskilling with the aim of empowering ourselves to thrive in the Fourth Industrial Revolution. As Schwab says: "There has never been a time of greater promise, or one of greater potential peril" [3].

While the fact that we are still at the beginning stages of the Fourth Industrial Revolution means that it is impossible to know the precise impact, four key impact areas should be considered.

3.1 Technology

Some of the technologies that will shape the Fourth Industrial Revolution and define the next-generation human enterprise, connectivity and lifestyles are already here, but have not been scaled to everyday utilisation. This is due to the fact that the regulatory environment, legal considerations and other issues currently outweigh the benefit to innovate [7].

The developments of physical, digital and biological technologies are three fundamental technological drivers of the Fourth Industrial Revolution. The basis of the Fourth Industrial Revolution is not only vested in new breakthrough technologies within the respective areas of technology, but the fusion with each other. These three technological drivers are summarized in Table 1 [8].

Table 1: Technological drivers for the Fourth Industrial Revolution [8].

Technology Drivers	Fields
Physical	Autonomous Vehicles 3D Printing
Digital	The Internet of Things (IoT) Artificial Intelligence Machine Learning (AI) Big Data Cloud Computing
Biological	Genetic Engineering Neurotechnology

3.2 Economic

The Fourth Industrial Revolution will have a monumental impact on the global economy, of which the effect will be so vast and multifaceted that it makes it difficult to examine individual aspects. There are four factors of production that fuel economic growth: land, labour, capital and enterprise. Today, the world is attaining 52% of its entrepreneurial capacity, and this number is declining year on year [6].

The world's population is forecast to expand to 8 billion by 2030 and 9 billion by 2050 [2]. Another powerful demographic trend is the overall ageing of the world's population. Ageing is an economic challenge in the fact that retirement ages will have to be increased so that older members of society can continue to contribute to the workforce.

3.3 Social

Technology and the Fourth Industrial Revolution will continue to change societal values. More than 36% of the workforce in the United States of America currently functions as freelancers [6]. The shift in societal values are often fuelled by autonomy, flexibility and additional income. It is estimated that within the next 10 years more than half of the American workforce will be freelancers. The societal shift introduced by the Fourth Industrial Revolution will therefore not only change the way we work, but also how we interact with other humans.

3.4 Education and Training

The technological advancements often associated with the Fourth Industrial Revolution will impact our ability to access training for employment. Education and training is directly correlated to economic growth and will therefore be one of the major drivers for the Fourth Industrial Revolution. We are also migrating to a system where students are less interested in stale curriculums and keener to complete shorter, skills-based training that is more relevant to today's workplace. The acquiring of "on-demand" skills will become very relevant which will allow employees to adapt to their changing roles and

responsibilities required by employers to ensure that they remain not only competitive, but relevant [6].

4. FUTURE OF JOBS

With each new industrial revolution new jobs are created and old jobs destroyed. A much debated topic regarding the Fourth Industrial Revolution revolves around the fear that with technological advancements and increased automation, the Fourth Industrial Revolution might increase unemployment significantly.

Common to these recent debates is an awareness that, as technological breakthroughs rapidly shift the frontier between the work tasks performed by humans and those performed by machines and algorithms, global labour markets are likely to undergo major transformations. The challenge lies within the managing of these transformations to ensure good work, good jobs and improved quality of life for all. If the transformations are not managed wisely, the Fourth Industrial Revolution poses the risk of widening skills gaps, greater inequality and broader polarisation. In many ways, the time to shape the future of work is now [9].

According to the latest Quarterly Labour Force Survey (QLFS) results released by Statistics South Africa (Stats SA), South Africa had an unemployment rate of 27.6% in the first quarter of 2019 [10]. Approximately 60% of the Country's unemployed, don't have a Grade 12 Certificate, and those seeking further education are gravitating towards business, economics and social sciences [11].

It is further estimated that by 2020, as many as 80 per cent of all future jobs will require a STEM (Science, Technology, Engineering and Mathematics) education [11]. The high unemployment rate of South Africa, accompanied by the relevant low level of education and further lack of interest in STEM education will leave a significant deficit in the country's skills reserve.

A common trend of the Fourth Industrial Revolution is disruption. Disruptive changes to business models will have a profound impact on the future of the South African employment landscape. It is estimated that the disruptive nature of the Fourth Industrial Revolution may range from significant job creation to job displacement, and from heightened labour productivity to widening skills gaps. By one popular estimate, 65% of children entering primary school today will ultimately end up working in completely new job types that don't exist today [12].

Many of the in-demand occupations or specialities of today did not exist ten years ago, and the pace of change is set to only accelerate. It is therefore essential to understand that future jobs will increasingly require complex problem solving, social, people and systems skills.

5. THE TRIUMPH OF MANKIND

Our thirst for knowledge is vested in our emotional intelligence that stem from our basic instinct to survive. As we expand our knowledge, we establish the ability to interact without exposing ourselves to the shortfalls of emotional weaknesses.

It is essential that we understand that we, as humans, are fundamentally different from machines. Humans behave according to their consciousness, whilst machines only perform as they are taught. Our actions are based on knowledge and therefore humans perform activities as per their own intelligence. In direct contrast to this, machines only have artificial intelligence. Maybe the most striking difference between humans and machines lies in our creativity, which allows us to do anything original whereas machines can't act on a set of creative skills.

The Fourth Industrial Revolution will usher in an era where machines will replace human effort in more aspects than ever seen before. It is important for us to understand where machine working hours will replace human working hours. But even more important is our fundamental understanding and exploration of the aspects where machines will not replace the efforts of humans. These areas of skills will become critical for our survival. Figure 1 and 2 below illustrates the ratio of human-machine working hours for 2018 and 2020 respectively.

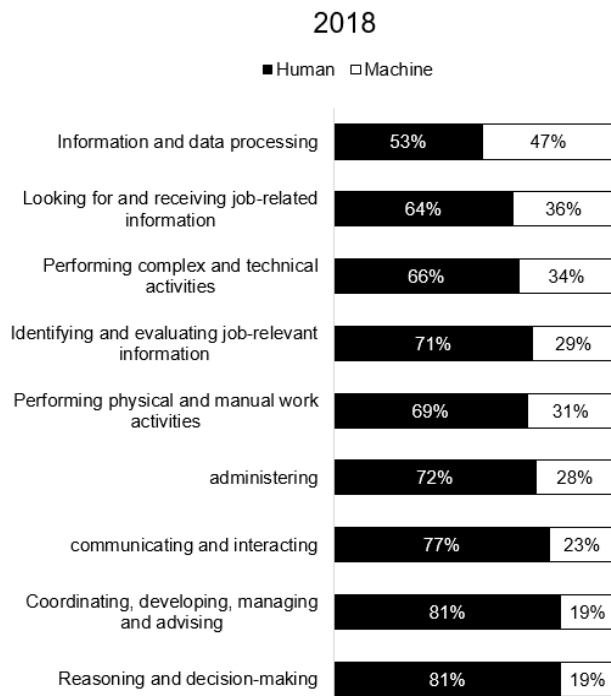


Figure 1: Ratio of human-machine working hours for 2018 [9]

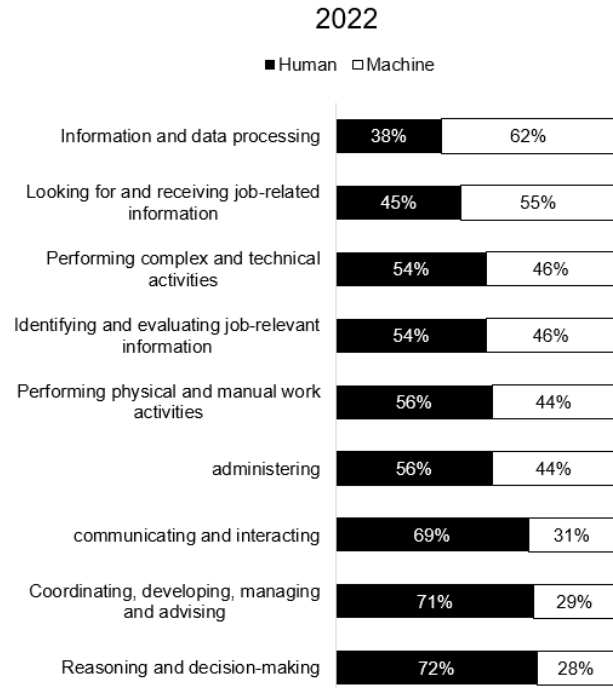


Figure 2: Ratio of human-machine working hours for 2022 [9]

From the above figures it can be seen that communication, coordination, reasoning and decision making will remain tasks heavily reliant on humans. It is essential that we understand that technology can be used for the benefit of all mankind. The challenge will however be to embrace technology, but not to become it.

It is essential that we identify these relevant areas where we need to develop our skills for the complete integration of our emotions with our knowledge.

6. SKILLS DEVELOPMENT

In such a rapidly evolving employment landscape, the ability to anticipate and prepare for future skills requirements, job content and the aggregate effect on employment is increasingly critical for businesses, governments and individuals in order to fully seize the opportunities presented by these trends and to mitigate undesirable outcomes. [12]

Performance evaluation is one of the most important communication tools an organization can use. Performance evaluation creates awareness around key strong performance areas and less strong areas that can be improved on. It also enhances team integration and performance [13].

Employers surveyed for the Future of Jobs Report 2018 estimate that, by 2022, no less than 54% of all employees will require significant reskilling and upskilling. Figure 3 shows the proportion of employees relevant to the scope of reskilling required [9]. Although the graph shows that 46% of all employees will require no reskilling, it also

shows that approximately 19% of employees will require reskilling in excess of 6 months. It is therefore crucial that employers focus their attention on the reskilling of their employees to ensure that technological disruption does not sacrifice jobs.

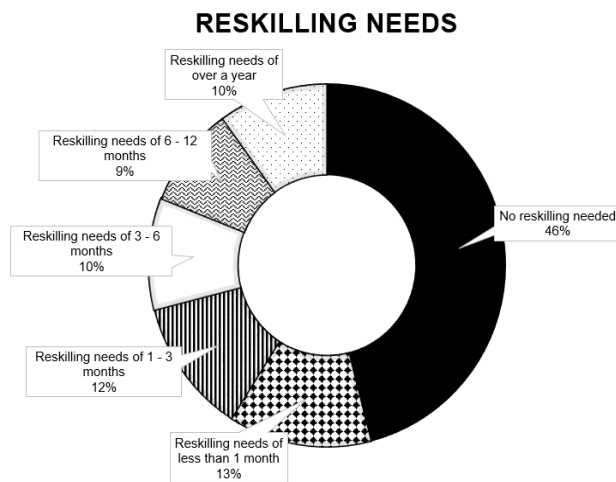


Figure 3: Reskilling Needs [9]

The increase in the reliance on technology accompanied by automation pose the question whether or not robots will replace human beings. While experts have warned that there will be an increase in job automation and artificial intelligence, specialists agree that human beings will never be made completely obsolete [14]. It is however important to understand that there are certain skills that will grow in importance as technology becomes more influential. The following is a list of skills that when developed will form a holistic competence level which is required to address the challenges posed by the Fourth Industrial Revolution.

6.1 Critical Thinking Skills

To see the essence of what needs to be resolved and the ability to resolve it without a delay. Critical thinking skills refer to the analytical ability of a person, the talent to connect the relevant dots to see the bigger picture.

6.2 Technical Skills

Superior practical technical solutions to correct standards and needs. Technical skills allow you to be the master of your craft. These skills refer to knowledge supported by relevant capability.

6.3 Project Management Skills

Delivering a successful product/project start to finish, including servicing its lifecycle purpose. Project management is the practice of initiating, planning, executing, controlling, and closing the work of a team to achieve specific goals and meet specific success criteria at the specified time.

6.4 People Skills

Bringing out the best in people while achieving together. People skills create trusting relationships that do not discriminate in terms of gender, race, culture, politics, religion (or any other stereotyping). Well-developed people skills ensure that personal needs do not compromise professional relationships created in the work environment.

6.5 Personal Skills

The ability to know, understand and manage your own emotions to deliver in the work environment. Personal skills are embedded in emotional intelligence, the capacity to be aware of, control, and express one's emotions, and to handle interpersonal relationships judiciously and empathetically.

6.6 Management Skills

To deliver through people. Management skills entails the understanding of integration, planning, implementation, monitoring and feedback. The goal is to utilise skills to manage people to achieve required results within outcome indicators.

6.7 Leadership Skills

To influence people to the desired outcome. The essence of leadership revolves around understanding the problem to be solved, whilst leading people to support the cause or action required to solve the problem. On your way to becoming a leader it is about you and your successes, once you are a leader, it is about the successes of those around you.

6.8 Business Skills

People, Product, Profit and Systems Integration. The purpose of developing Business Skills is to create a business mindset, focussed on vision, mission, strategy, structure and securing the future. Relevant business skills will allow an individual to keep it simple and understand the value and contribution of every implemented system.

6.9 Financial Skills

Refers to the efficient and effective management of money in such a manner as to accomplish the objectives of the organization. Financial skills refer to those skills required to keep score for the company in the most beneficial way, whilst ensuring clean, legal and well documented systems and procedures.

6.10 Drive and Will

To be aware, active, alive and participating in achieving company goals. Drive and Will is directly related to understanding your passion and purpose, in essence doing what you love. A person with drive and will is energetically and enthusiastically engaged, an inspiration to others and future self.

7. CONCLUSION

The Fourth Industrial Revolution is characterised by new technologies with a disruptive nature which will change the way we work, live and interact with each other. The challenge is to ensure the best, most inclusive outcomes for all mankind.

The Fourth Industrial Revolution is often seen as a very abstract concept with massive disruptive potential. It is however a true reflection of our desires and choices to shape a better future.

As we enter a new revolution we will experience refining shifts to social, economic, environmental and political systems that will truly alter the course of humanity.

The Fourth Industrial Revolution is associated with major technological advancements and the increasing reliance on machines. It is essential that we understand that we, as humans, are fundamentally different from machines. Our thirst for knowledge is vested in our emotional intelligence that stem from our basic instinct to survive.

It is however important to understand that there are certain skills that will grow in importance as technology becomes more influential. We therefore need to accept that we are migrating to an era of continuous upskilling in order to empower ourselves to take advantage of the innovation of the Fourth Industrial Revolution.

Nelson Mandela famously said, "May your choices reflect your hopes, not your fears." There has never been a time where we had to make more important choices than the present. We all have a choice between fear for what the future and technological advancement might bring, or hope that through our unique set of skills we can embrace innovation to create a better world for all.

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