



International
Labour
Organization



The Fourth Industrial Revolution, Artificial Intelligence, and the Future of Work in Egypt



► JUNE 14, 2021

Dr. Nagla Rizk
Dr. Ayman Ismail

The American University in Cairo School of Business

Nagla Rizk is Professor of Economics and Founding Director, Access to Knowledge for Development Center, American University in Cairo School of Business

Ayman Ismail is Associate Professor and Abdul Latif Jameel Endowed Chair of Entrepreneurship at AUC School of Business, and Founding Director of AUC Venture Lab and AUC Innovation Hub

Copyright © International Labour Organization 2021

First published 2021

Publications of the International Labour Office enjoy copyright under Protocol 2 of the Universal Copyright Convention. Nevertheless, short excerpts from them may be reproduced without authorization, on condition that the source is indicated. For rights of reproduction or translation, application should be made to ILO Publishing (Rights and Licensing), International Labour Office, CH-1211 Geneva 22, Switzerland, or by email: rights@ilo.org. The International Labour Office welcomes such applications.

Libraries, institutions and other users registered with a reproduction rights organization may make copies in accordance with the licences issued to them for this purpose. Visit www.ifrro.org to find the reproduction rights organization in your country.

The Fourth Industrial Revolution, Artificial Intelligence, and the Future of Work in Egypt, International Labour Office – Cairo: ILO, 2021

ISBN: 9789220348383 (web pdf)

Also available in Arabic: الثورة الصناعية الرابعة والذكاء الاصطناعي ومستقبل العمل في مصر

ISBN: 9789220348390 (web pdf), Cairo, 2021.

The designations employed in ILO publications, which are in conformity with United Nations practice, and the presentation of material therein do not imply the expression of any opinion whatsoever on the part of the International Labour Office concerning the legal status of any country, area or territory or of its authorities, or concerning the delimitation of its frontiers.

The responsibility for opinions expressed in signed articles, studies and other contributions rests solely with their authors, and publication does not constitute an endorsement by the International Labour Office of the opinions expressed in them.

Reference to names of firms and commercial products and processes does not imply their endorsement by the International Labour Office, and any failure to mention a particular firm, commercial product or process is not a sign of disapproval.

Information on ILO publications and digital products can be found at: www.ilo.org/publns.

This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of the ILO and do not necessarily reflect the views of the European Union.

For ILO publications in Cairo:

9 Dr. Taha Hussein St., Zamalek, Cairo, Egypt

Tel: (+202) 27350123

Visit our website: www.ilo.org/cairo

Printed in Egypt



FOREWORD

Throughout the ILO 101 years, the world of work has been witnessing several technological advancements. According to the ILO's "Inception Report for the Global Commission on the Future of Work" of 2017, the world of work is experiencing transformative change, driven mainly by four mega trends, namely, globalization, technological innovations, demographic shifts and climate change. In 2013, the ILO's Director-General Guy Ryder proposed the Future of Work initiative as one of the seven centenary initiatives, to reflect on the main challenges emerging from new technologies and to address its implication on the ILO mandate.

Since the launch of the initiative in 2015, the ILO embarked on a four-year journey that began with a series of national dialogues. This was followed by the report of an independent Global Commission, concluding with the adoption of the Centenary Declaration on the Future of Work at the 108th International Labour Conference in 2019. The commission's work outlines a vision for a human-centered agenda that is based on investing in people's capabilities, institutions of work and in decent and sustainable work, which aligns impeccably with the core of the ILO mandate of promoting social justice and decent work.

Many opinions exist around the impact of the Fourth Industrial Revolution (4IR), artificial intelligence (AI) and new technologies generally between positive impacts and risks. While many praises its advantages including creating new job opportunities, generating potential higher productivity, and hence reducing working hours. On the contrary, other research highlight the risks of new technological advancements being substituting for labour, diminishing people's creativity and increasing inequality. Moreover, with the COVID-19 pandemic crisis repercussions hitting all economies with no exceptions, the importance of the use of technology increased in almost all types of work, became of more significance like never before. It has brought the adoption of technological solutions to unprecedented levels and emphasized the critical importance of digital literacy.

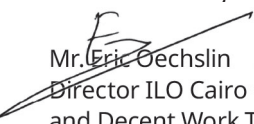
Certainly, each country will have its specificity in dealing, adopting and mitigating the impact of new technologies on the economy and in relation to their development needs, which implies the adoption of an approach that examines the impacts of past trends and predicts future waves, in addition to measuring benefits and risks to develop tailored policies.

Egypt is no exception to the challenges of the Fourth Industrial Revolution sweeping the globe. A surge of new technology-based solutions and innovation-driven startups are leading the trend introducing the Fourth Industrial Revolution technologies into key local sectors. Therefore, the main sectors in Egypt are all being affected by the Fourth Industrial Revolution, albeit to various extents and with different outcomes. Sectors like transportation and logistics have been reacting positively by embracing new technologies on almost all fronts, while other sectors such as agriculture and manufacturing have potential to make a stronger impact, yet it still needs to introduce tech-based solutions and an adoption speed. Thus, the impact of new technologies requires close monitoring and the development of intervention schemes by the government, industry leaders and policy makers together to face the challenges that may arise from the labour market.

The importance of this study comes in light of the efforts of the Egyptian Ministry of Manpower to keep abreast of the economic and technological transformations and developments emerging on the labour market, especially in light of the Fourth Industrial Revolution, digital transformation and smart cities. This requires preparing a generation that is geared with technological skills and knowledge-based, scientific and practical technological capabilities; that enables it to contribute to the strengthening of the developed technical and digital infrastructure and to increase the competitiveness of the economic and industrial sectors of the Arab Republic of Egypt. In addition to the importance of the collaboration between the public and private sectors to develop new strategies that cater for the workers, support the development of their skills and draft social protection policies for workers affected by technological development.

No one can accurately predicts the net impact of such technologies on the economies. Instead, in this study, we attempt to analyze the impact of the introduction of new technologies on the Egyptian economy and particularly on the industrial sector, to provide policy advice to decision-makers on how to maximize the gains and ensure positive collective results and shared gains within the society.

The preparation of this study comes within the framework of the collaboration between the ILO Cairo office, particularly the project "Advancing the Decent Work Agenda in North Africa (ADWA)" – funded by the Swedish International Development Agency (SIDA) – and the Egyptian Ministry of Manpower. The study aims to support the Ministry to develop and update its national strategy on the future of jobs in light of the expected impact of artificial intelligence and the advance in Information and Communication Technology (ICT), through the provision of an analytical vision of the Egyptian labour market, the impact of the Covid-19 pandemic in Egypt and the impact of the technological development on the various economic activities.



Mr. Eric Oechslin
Director ILO Cairo Country Office
and Decent Work Team for North Africa



H.E. Mr. Mohamed Saafan
Minister of Manpower

▶▶▶ Table of Contents

1. EXECUTIVE SUMMARY	07
2. INTRODUCTION	08
2.1. PURPOSE OF STUDY	08
2.2. METHODOLOGY	08
3. THE FUTURE OF WORK IN THE GLOBAL CONTEXT	09
3.1. THE FOURTH INDUSTRIAL REVOLUTION: KEY TERMS, TECHNOLOGIES, AND DRIVERS OF CHANGE	09
3.2. PRODUCTIVITY AND JOB MARKETS	10
3.3. SOCIAL IMPLICATIONS AND THE WAY FORWARD	12
4. THE EGYPTIAN LABOUR MARKET	15
4.1. COVID-19 RESPONSE IN EGYPT	15
4.2. THE SUPPLY SIDE	15
4.3. THE DEMAND SIDE	20
4.4. INTERMEDIATION BETWEEN SUPPLY AND DEMAND	21
5. THE FUTURE OF WORK IN THE EGYPTIAN CONTEXT	23
5.1. A BRIEF DIGITAL OVERVIEW	23
5.2. KEY SECTORS	25
6. INSIGHTS AND RECOMMENDATIONS	31
6.1. KEY TRENDS AND INSIGHTS	31
6.2. POLICY RECOMMENDATIONS	32
7. ANNOTATED BIBLIOGRAPHY	35
8. ANNEX A	43
LIST OF EXPERTS INTERVIEWED	43

▶▶▶ List of Figures

▶ Figure 1	Jobs Most and Least Prone to Automation	11
▶ Figure 2	Employment Rates in Egypt	16
▶ Figure 3	Unemployment Rates in Egypt	17
▶ Figure 4	Unemployment Rates in Egypt by Education	18
▶ Figure 5	Precarious Employment Rates in Egypt	19
▶ Figure 6	Automation Potential in 6 Middle Eastern Countries	24



1. Executive Summary

The Fourth Industrial Revolution (4IR) is a technological shift affecting cultures and economies all over the globe. It reflects the creation and advancement of a wide range of modern technologies that are stirring breakthrough innovations and inventions across sectors while changing fundamental aspects of culture and society as we know it. Elements of 4IR's include technologies like artificial intelligence (AI), machine learning, robotics, internet of things (IoT), big data, blockchain, quantum computing and 3D printing.

The uniqueness of 4IR, according to modern economists and thought leaders, stems from its scope, the abundance of its interrelated technologies, and the speed by which it is spreading across the globe. Many modern technologies that were merely introduced a decade or so ago are already being adopted on large scale industrial levels. The COVID-19 pandemic has further accelerated certain technological applications and their adoption rates.

The effect that such technological disruptions will have on labour markets is a matter of considerable interest, and concern. A number of estimates have been ventured, albeit with wide variations. Some jobs will be created, some will be augmented, and some will be destroyed. New modes of job intermediation, like platform-based solutions, redefine the traditional employer-worker relationship and challenge labour legislation. While substantial productivity gains are foreseeable, there will be gainers and losers, both within and between countries. How labour markets and economies take advantage of such opportunities in an inclusive, sustainable manner is largely a factor of the policies that are put in place, and their timeliness.

Egypt is no exception to 4IR forces sweeping the globe. Locally, a surge of new tech-based solutions is leading the introduction of 4IR technologies in key local sectors. Additionally, more impact is stemming from multinational companies' reaction to global innovations in whether they choose to layoff, replace or up-skill their local workforce. The COVID19 pandemic is accelerating the digital revolution across economies and societies. Businesses, consumers, educators, public authorities are learning to live with the epidemic by finding new ways to make use of online and digital technologies, in ways that will alter behaviors beyond the current crisis.

Egypt's key sectors are all being impacted by 4IR, albeit to various extents and with different outcomes. Sectors like transportation and logistics have been embracing new technologies on almost all fronts, while the potential of tech-based solutions in agriculture and manufacturing remains largely unexplored. Across sectors, "digitally literate jobs", i.e. jobs that involve the use of information and communication technologies, are rapidly growing.

The rapidly rising demand for ITC skills and for ITC literacy require a transformation of educational supply. There is a clear need for digital literacy and core skills across the board, continuous education options, and a culture of lifelong learning. Primary, secondary and tertiary education need to expose more children and youth to not just being consumers of digital applications, but to their productive utilization. Digital solutions offer major opportunities for the educational system to reform itself, expand its outreach and diversify its services, including to benefit historically under-served segments of the population, such as rural youth or women working from home.

Prior "industrial revolutions" in history, with dramatic economic and social transformations, have accentuated inequalities and economic insecurity and thus carried risks to sociopolitical stability. Substantial social policy reforms are required to balance risks across the society, in particular the introduction of universal unemployment insurance, linked with opportunities to re-skill, to allow workers to adapt to an increasing pace of labour market change.

This document also highlights the essential role for the State in shaping the "data environment" in Egypt, not only with respect to ITC infrastructure investments, but also as far as regulating transformations in data production and use. On the basis of the investigations conducted with the Egyptian ITC industry, the paper also points to ways to accelerate the creation of tech start-ups and the accumulation of local R&D, and thus allow the local industry to claim a wider market share in the regional and global spaces.



2. Introduction

2.1. Purpose of Study

Since the turn of the century, advances in information and telecommunication technologies (ICTs) have profoundly transformed world economies. Massive increases in storage capacity, such as cloud computing and processing power has meant that advances in the field of artificial intelligence (AI) are permeating all aspects of economies and societies. Related to these are new technologies like blockchain, 3D printing and internet of things, all of which are part of what is now termed the “Fourth Industrial Revolution”¹. Like their predecessors, these technologies have tremendous potential for development, but also trigger great concerns, especially in the context of developing countries. At the heart of this debate is the conversation over the future of work, which is integral to the discourse on the ethics of AI for development and inclusion. As well, it is aligned with fulfilling the sustainable development goals of inclusive and sustainable growth and decent work opportunities (8), inclusive and equitable education (4) and gender equality (5).

Given the above, governments must be proactive in harnessing these transformative changes to suit their unique developmental needs. Accordingly, this study is undertaken in collaboration with the International Labour Organization with the purpose of providing insights to Egypt’s Ministry of Manpower to help develop its perspective on the challenges and opportunities for the future of work in Egypt in light of the expected impact of AI and related ICT innovations. The study draws on a review of the literature as well as perspectives from the ground received from key stakeholders and informants. It will provide conclusions on how to best utilize the promise and mitigate the perils of these technologies. The study recommendations consider dimensions of public policy in the areas of education and skills, public investment and fiscal incentives, as well as other potentially relevant areas such as key private sector and civil society initiatives.

2.2. Methodology

The study draws on a broad review of main contributions to international literature, with focus on developing economies, concerning digitalization/AI trends and their economic and social impact as well as skills needs and lifelong learning requirements. A synthesis of the main trends is provided.

This has been supplemented by interviews² with key stakeholders and informants in industry, technology, and policy. Policymakers in positions where they are aware of, and/or able to influence policies related to jobs, technology, future of work and AI have been consulted. A second group includes industry leaders, managers and experts in the Egyptian industry, with a focus on employers who may be affected by the future of work upcoming trends. The third group includes practitioners in the technology space, including tech-startups as well as large innovation driven corporations, who are engaged in activities that would be affected by the future of work.

¹ Schwab, Klaus. “The Fourth Industrial Revolution: what it means, how to respond”. World Economic Forum, January 2016. <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>

² A full list of experts interviewed is available as Annex A.



3. The Future of Work in the Global Context

3.1. The Fourth Industrial Revolution: Key Terms, Technologies, and Drivers of Change

The 'Fourth Industrial Revolution' is a term that was first introduced on the world stage by Klaus Schwab, the founder and executive chairman of the World Economic Forum (WEF). It was then popularized with the release of his book carrying the same title in early 2016³.

The Fourth Industrial Revolution (also commonly referred to as 4IR) is a way of describing the simultaneous technological breakthroughs in a wide range of fields while denoting their unprecedented cross-pollinating nature. In his book Schwab attributes our era's industrial revolution to developments and technologies that have one key feature in common, and that is harnessing the ubiquitous power of digitization and information technology in a way that was not made possible before.

Schwab expects this technological transformation to be driven by a fusion of technologies that build on and amplify each other. Some of the key breakthroughs that he mentions cover a wide range of fields including artificial intelligence (AI), robotics, the internet of things (IoT), quantum computing, energy storage, autonomous vehicles, 3D printing, nanotechnology, biotechnology, and materials science. Development in many of these fields is heavily reliant on advancement in others, and many fields have a symbiotic relationship with each other in which one industry's existence is contingent upon another's.

ILO's inception report for the Global commission on the Future of Work of 2017 identified four main mega trends affecting the future of work, namely globalization, technology, demography, and climate change. Globalization, according to the report, has been the most defining feature of the world economy over the last several decades, covering the internationalization of production, finance and remittances, trade, and migration. Technological innovations in 4IR technologies are continuing to transform the nature of work; for example, the number of operational industrial robots has increased by 9 per cent on average per year between 2010 and 2017, according to the same report. The data showed that the deployment of robots has been highly concentrated in the manufacturing sector and within developed economies. Demographical changes also pose a significant impact on the future of work. The changing dynamics and the increasing proportions of young populations entering the labour market not only fuels urbanization and contributes to international migration, it also holds significant opportunity to leverage the potential of young talent and accelerate economic growth. The last mega trend according to the same report is climate change. A lot of the progress in the world of work has been achieved at the expense of environmental health, however, a strong consensus that the future of work and society must be grounded on environmentally sustainable development has been around for several years now, and it is common knowledge amongst policy and industry leaders that continued environmental degradation is now likely to destroy jobs and livelihoods with the effects felt most severely among already vulnerable groups.

ILO's inception report for the Global commission on the Future of Work of 2017 identified four main mega trends affecting the future of work, namely globalization, technology, demography, and climate change. Globalization, according to the report, has been the most defining feature of the world economy over the last several decades, covering the internationalization of production, finance and remittances, trade, and migration. Technological innovations in 4IR technologies are continuing to transform the nature of work; for example, the number of operational industrial robots has increased by 9 per cent on average per year between 2010 and 2017, according to the same report. The data showed that the deployment of robots has been highly concentrated in the

³ Schwab, Klaus. "The Fourth Industrial Revolution: what it means, how to respond". World Economic Forum, January 2016. <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>

manufacturing sector and within developed economies. Demographical changes also pose a significant impact on the future of work. The changing dynamics and the increasing proportions of young populations entering the labour market not only fuels urbanization and contributes to international migration, it also holds significant opportunity to leverage the potential of young talent and accelerate economic growth. The last mega trend according to the same report is climate change. A lot of the progress in the world of work has been achieved at the expense of environmental health, however, a strong consensus that the future of work and society must be grounded on environmentally sustainable development has been around for several years now, and it is common knowledge amongst policy and industry leaders that continued environmental degradation is now likely to destroy jobs and livelihoods with the effects felt most severely among already vulnerable groups.

WEF's future of jobs report of 2018 identified another four technological advances as the main drivers of change; worldwide high-speed mobile internet, AI, widespread adoption of big data analytics, and cloud technology. But beyond the technological aspect, there are other trends impacting the future of work as well like the accelerated adoption of these new technologies, trends in robotization, the changing geography of production, distribution, value chains, and the rapidly changing nature of employment.

Finally, despite stirring a global economic recession by shutting down entire industries and bringing global supply chains to a halt, COVID-19 seems to be expediting the ever-increasing global rates of technology adoption, according to an article⁴ by the Nielsen Corporation - a multinational marketing research giant that specializes in consumer insights and behavior. The article attributes three main factors to this sudden change in technology adoption across new demographics; a) restricted store visits force consumers to resort to online shopping channels, b) interrupted retail supply chains drive consumers directly to manufacturers, and c) the absence of tangible shopping experiences leading customers to rely on Augmented Reality (AR)/Virtual Reality (VR) technology to replicate reality.

Citing Alibaba as its source, the article mentions that grocery orders placed by Chinese users born in the 1960s was four times higher than normal during Spring festival (Chinese New Year). The article continues to cite MissFresh, another online retailer in China, in its claim that users aged 40 years and older have risen by 237% during the COVID-19 period.

Nielsen's recent consumer and market insights led their expert team to believe that technology will be one of the most significant game changers for fast moving consumer goods (FMCG) retailers and manufacturers in the immediate (amidst COVID-19) and longer term. The Common Thread Collective - a U.S.-based cutting-edge marketing growth agency- have put together a constantly updated ecommerce data report⁵ with staggeringly high sales figures across sectors, highlighting the unprecedented state of today's markets and urging all businesses keen on survival to think technology and ecommerce now.

3.2. Productivity and Job Markets

Despite opportunities for economic growth and productivity, the unprecedented magnitude of change and innovation in the last two decades has created high levels of uncertainty and anxiety, the magnitudes of which are still unclear. With much media attention focusing on how rapid technological advances are a source of worry and fear for employees and societies, governments and companies must not only make swift decisions on how to integrate technology at work to keep up with global demands, but also how to appease the fears of their employees and communities. While many have written on the impact of technological progress on economies, others posit that the impact on employment is not well understood or fully appreciated and highlight the key potentials rapid technological advancement has on the world of work⁶.

The EU commission's AI report⁷ states that the outcomes of the current wave of automation are not predetermined, but rather will be shaped by the policies and decisions made by governments individually and collectively. While the report does not doubt that new technologies will have a significant impact on jobs in the short and longer term, it still finds the net effect unclear, especially with regards to the replacement and augmentation of work. On the other hand, the World Economic Forum's (WEF) Future of Jobs report⁸ offers a more vivid outlook on the

⁴ Covid-19: The Unexpected Catalyst for Tech Adoption". Nielson, March 2020.

<https://www.nielsen.com/us/en/insights/article/2020/covid-19-the-unexpected-catalyst-for-tech-adoption/>

⁵ Orendorff, Aaron. "Coronavirus Ecommerce Opportunities, Data & Strategies: Online Shopping in the Age of COVID-19 [Updated]" Common Thread Collective, June 2020.

<https://commonthreadco.com/blogs/coachs-corner/coronavirus-ecommerce#coronavirus-ecommerce-data>

⁶ Brynjolfsson, Erik. McAfee, Andrew. "Race Against The Machine: How The Digital Revolution Is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and The Economy". MIT Sloan Management, January 2012.

http://ebusiness.mit.edu/research/Briefs/Brynjolfsson_McAfee_Race_Against_the_Machine.pdf

⁷ "The future of work? Work of future!" Shaping Europe's digital future – European Commission May 2019

<https://ec.europa.eu/digital-single-market/en/news/future-work-work-future>

impact of 4IR on jobs. It reports that 75 million jobs are expected to be displaced by 2022 in 20 major economies, but that 133 million new roles will be made available, mostly driven by large-scale growth in new products and services that will demand humans to work with machines and algorithms to meet the demand. Since the report was published in 2018, it is unclear how these figures would change now given the COVID-19 situation that is bringing the world economy to a halt, but at the same time fueling the adoption of technological market solutions to unprecedented rates.

In his book *The Fourth Industrial Revolution*⁹, Schwab categorizes outlooks around the impact of emerging technologies on the labour market into two camps: those who believe that technology will offer us a new age of immense collective prosperity, and those who believe that it will lead to a state of chaos and desolation driven by mass unemployment. He then adds that historically the outcome is usually somewhere in the middle, and that it is up to our collective actions to determine the extent of each side.

Two researchers from the University of Oxford's research and policy school published a paper¹⁰ in 2013 where they quantified the potential effect of technological innovation on unemployment. They ranked 702 different professions on a scale from least to most susceptible to the risk of automation and concluded that 47% of total employment in the US was at risk. Figure 1 shows a table that Schwab used in his book to give an example of professions from both ends of the spectrum.

Figure 1: Jobs Most and Least Prone to Automation

Most Prone to Automation	
Probability	Occupation
0.99	Telemarketers
0.99	Tax preparers
0.98	Insurance Appraisers, Auto Damage
0.98	Umpires, Referees, and Other Sports Officials
0.98	Legal Secretaries
0.97	Real Estate Brokers
0.97	Farm Labour Contractors
0.96	Secretaries and Administrative Assistance, Except Legal, Medical, and Executive
0.94	Couriers and Messengers
Prone to Automation	
Probability	Occupation
0.0031	Mental Health and Substance Abuse Workers
0.0040	Choreographers
0.0042	Physicians and Surgeons
0.0043	Psychologists
0.0055	Human Resources Managers
0.0065	Computer Systems Analysts
0.0077	Anthropologists
0.0100	Marine Engineers and Naval Architects
0.0130	Sales Managers
0.0150	Chief Executives

Source: Carl Benedict Frey and Michael Osborne, University of Oxford, 2013.

⁹ Schwab, Klaus. *The Fourth Industrial Revolution*. Geneva, World Economic Forum, 2016.

¹⁰ Frey, B. Carl. Osborne, A. Michael. "The Future of Employment: How susceptible are jobs to computerisation?" September 2017 https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

The full list of scrutinized professions is annexed with the actual paper, but the general trend was leaning towards greater labour market polarization. Employment seemed to have potential to grow in high-income cognitive and creative jobs, as well as low-income manual occupations, but it looked bleak for middle-income routine and repetitive jobs.

Similar to other industrial revolutions, Globalization 4.0 has left many feeling uncertain of the future, however, amongst the novelties we are seeing is how far reaching this industrial revolution is in terms of disrupting white collar jobs. As the distribution of tasks traditionally performed by humans are increasingly rendered redundant and inefficient by the performance of machines and algorithms, the global market has posed many challenges for workers, and for companies on how to manage the transition and govern and address workers' uncertainty. Servos¹¹ cites many examples of jobs that have encroached on traditional labour skills, such as of the work of assistants, drivers, lawyers, security guards, sales assistants, call center operators, etc. The study shows how the role of these workers may still be necessary, but their number may be reduced and the content of their tasks become more sophisticated, requiring a higher level of skills in order to work in tandem with the vast efficiency of technology.

Increased labour decentralization and securing the rights of workers of the informal economy and carefully accounting for their transition will also be a challenge for governments, despite the number of creative opportunities this may create as the world enters an economic process of increased self-employment, freelance and platform-enabled work. Such work set-ups will allow workers to find and connect with demand more efficiently. It can also create economies of scale and scope that further boost productivity, generating more modes of income for workers across borders and based on their skills. However, this will pose a challenge for governments to enforce regulations on workers to access social protection, potentially harming the ability of employees to access health and pension schemes later in life. Additionally, the displacement of work away from traditional employer-worker relations towards a granular labour market that is moderated by IT platforms undermines the very basis of labour legislation. Governments will then have to look into tax schemes, social protection mechanisms, and invest properly in administrative and institutional bodies to effectively implement enforcement mechanisms to regulate potential risks.

While much literature has been written on the impact of technology on the future of work, the majority has been through the perspective of advanced economies, and while their experiences and best practices are helpful to consider in the cases of emerging and developing economies, further research must be conducted with specific reference to the contexts of countries' particular economic and political structures, education levels, welfare schemes, demographic trends, access to internet, as well as the availability and potential of safety nets and investment opportunities to support existing workforces to safely and productively transition into work with highly-skilled technology.

3.3. Social Implications and the Way Forward

One of the biggest risks for developing and emerging economies would be to miss out on the technological revolution and fail to properly take advantage of technological progress for growing more rapidly than before. The magnitude of such an impact must be carefully accounted for, particularly as markets grow increasingly interconnected, and susceptible to unforeseen consequences and inequality on a global level. This is especially the case as the digital divide may leave emerging countries in uncharted territories and inequality as technology increases outsourcing or cross-border competition. The digital divide and unequal access to technology may threaten to create a greater rift in economic inequality along many lines and will require careful study into the nuances and opportunities across age, gender, and social, education and economic dimensions.

The EU Commission's AI report¹² suggests that the success of the AI revolution from an economic perspective will be contingent upon how societal transformations are handled. It highlights that the single most important factor at hand will be managing short-term labour market transitions, and that unlike the move from farms to factories, the complexity of the current automation challenge stems mainly from the need to retrain mid-career workers. Given the pace by which the transformation is taking place, adapting one's skills to market demands will be a matter of necessity and the act of taking up a parent's occupation might no longer be relevant. Despite the net effect of automation on job creation still being unclear, the report suggests that it will be heavily and

¹¹ "The future of work? Work of future!" Shaping Europe's digital future – European Commission May 2019
<https://ec.europa.eu/digital-single-market/en/news/future-work-work-future>

primarily influenced by the pace at which displaced workers could be retrained and ready for the newly created jobs, confirming the crucial role that education will play in determining the outcome of this transition.

The ILO's 2017 Inception Report¹³ for the Global Commission on the Future of Work tackles the topic from different angles, including the exploration of work's relationship with the individual and society in light of the Fourth Industrial Revolution while also looking at new job dynamics and related policy issues. The report highlights certain challenges that stand in the way of developing "employment-friendly" macro policies and sheds light on key related factors like financialization and equality. The report defines financialization as the increasing role of finance in economic activities and mentions that it affects all three levels of the economy: industry, firm, and workers (including their households). When not sustainably regulated this global phenomenon of financialization can impose volatile and vulnerable conditions upon the economy and the labour market. Incentivizing and prioritizing short-term profits, according to the report, often has negative implications over the medium to longer term with respect to employment creation, productivity, and enterprise sustainability.

Inequality, on the other hand, has traditionally been considered a social and normative issue according to the same report, but it is now being increasingly recognized as an economic one. It has an inverse relationship with economic growth¹⁴ due to its tendency to trigger political instability, which eventually leads to economic uncertainty and consequently discouraging investments and job creation. Inequality can also lead to public resistance to pro-growth policies like trade and technology, according to the same report, and it can depress consumption and weaken aggregate demand.

An integrative policy framework for full and productive employment, according to ILO's Inception Report, is one that creates enabling conditions for strong growth and supports workers and firms to transition to new areas of activity. While education and skills policies are of critical importance to that effect, the report also highlights that targeting growth will not be sufficient if trends in inequality and financialization are not reversed.

The World Economic Forum's 2018 Future of Jobs report identified three obvious main players whose actions will determine the outcomes of 4IR: governments, industries, and workers. The report placed the onus on governments on almost everything related to educational interventions. They have the responsibility of upgrading educational policies that cover school curricula, teacher training, and vocational schools by bringing more focus to STEM and non-cognitive soft skills, and by broadening the appeal of vocational education beyond the traditional segment of low and medium skilled occupations.

According to the report, governments also bear the responsibility of stimulating job creation by leveraging public funds and by incentivizing private investments through methods like blended finance and government guarantees. The report then suggests that governments might have a renewed capacity to improve social safety nets by leveraging the increased tax revenues resulting from productivity and income boosts due to new technologies and labour augmentations.

The report then proposes different ways through which industries could capitalize on the opportunities brought forth by 4IR. It highlights how competition for scarce talent could intensify and become more costly over the years, and that businesses might have to reposition themselves as learning organizations to ensure a sufficient pool of talent in the market. They could even receive support from quite a range of stakeholders if they truly intend to contribute to the re-skilling and up-skilling of labour.

Workers on the other hand, according to the same report, will have to bear an unquestionable responsibility for their own lifelong learning and career development endeavors. This comes at a time where many have been stuck with risky working arrangements, little pay, and limited or no access to social protection. This occurs despite the strong potential offered by the digital revolution for overall economic growth.

OECD Employment Outlook¹⁵ discusses the concern of "hollowing out" of the middle-class as technological advancements have spurred many lower-quality and risky jobs. They cite that in some countries, non-standard workers are 40-50% less likely than standard employees to receive any form of income support when they are out-of-work. This is particularly important for emerging economies, characterized with a large amount of low-skilled jobs and a large informal economy.

¹² "The future of work? Work of future!". Shaping Europe's digital future – European Commission, May 2019. <https://ec.europa.eu/digital-single-market/en/news/future-work-work-future>

¹³ "Inception Report for the Global Commission on the Future of Work". International Labor Office, 2017. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---cabinet/documents/publication/wcms_591502.pdf

¹⁴ Ostry, D. Jonathan. Berg, Andrew. Tsangarides, G. Charalambos. "Redistribution, Inequality, and Growth" International Money Fund, Feb 2014. <https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2016/12/31/Redistribution-Inequality-and-Growth-41291>

Despite concerns, many global organizations and experts¹⁵ argue that “if managed wisely, these transformations could lead to a new age of good work, good jobs and improved quality of life for all; if managed poorly, they pose the risk of greater inequality and broader polarization”. A smooth transition into the Fourth Industrial Revolution will require heavy investments and strong policies to fully take advantage of this golden opportunity for economic growth and social transformation and to manage cultural perceptions and employment anxiety and workers’ fears of technology encroaching on their rights, particularly as many middle-skilled jobs could disappear due to automation and robotization, as well as increased cross-border competition.

While the challenges of the digital shift may seem overwhelming for emerging economies, it can be effectively managed to ensure a strategic and effective transition. There is a need for global interdependent structures to offer workers, companies and governments the chance to take advantage of many opportunities, including multilateral co-operation and regional integration to pool in capital and expertise for educating a greater number of workers cost-efficiently. Provided that governments take fast and decisive strides towards inclusive growth, technology can also allow countries to take advantage of more widespread and sustainable methods of growth by integrating more vulnerable segments of the economy during the re-education process of human-machine interaction.

The shift from lower-and middle-skilled employment to automation can allow many eligible members of society to learn online or on-the-job. For example, as intelligent machines and software are integrated into everyday workplace, workflows, and workspaces, low-skilled workers can be trained to assist with questions or troubleshooting. Societies are also able to utilize the gender gap disparity by helping women quickly become trained for more high-skilled jobs during the process of re-education. One of the most important factors for success will be for governments to manage public perception during the transition and help promote proper understanding of the potential for human-machine interaction.

In light of the Fourth Industrial Revolution and its expected impact on work, skill development becomes a key priority issue. As the world is embarking on a point in time when technological advances and shocks are increasing by the day, the nature of work and labour is constantly changing as both workers and employers struggle to keep up with rapid technological changes and their effects on the labour market. Here, dynamic skill development becomes crucial in mitigating the effects and meeting the potential of these technological shocks. The need to re-skill workers to adapt to the Fourth Industrial Revolution is also in line with the fourth sustainable development goal which stresses the need to increase the number of youth and adults that have relevant skills and acquire the knowledge and skills needed to promote sustainable development, employment, decent jobs and entrepreneurship¹⁷.

¹⁵ “OECD Employment Outlook 2019: The Future of Work,” OECD Publishing, Paris, OECD (2019), <https://doi.org/10.1787/9ee00155-en>.

¹⁶ “Dialogue Series on New Economic and Social Frontiers: Shaping the New Economy in the Fourth Industrial Revolution” World Economic Forum, Jan 2019. <https://www.weforum.org/whitepapers/dialogue-series-on-new-economic-and-social-frontiers-shaping-the-new-economy-in-the-fourth-industrial-revolution>



4. The Egyptian Labour Market

The Egyptian labour market has been thoroughly studied by scholars over the recent years. This section will cover some of its main issues by looking at the labour market's supply side, demand side, and the intermediation efforts that match supply to demand.

4.1. COVID-19 Response in Egypt

According to a report released by the Egyptian Ministry of International Cooperation¹⁸, Egypt is entering the COVID-19 crisis with strong fiscal and foreign exchange buffers. Nevertheless, remittances are expected to decline as oil prices drop and employees get dismissed, particularly from the Gulf countries, and revenue from tourism and the Suez Canal has also significantly dropped as global mobility came to a halt. Since these factors have a profound impact on GDP, the Egyptian government and its central bank introduced some interventions on the policy, fiscal, and monetary frontiers in an effort to curb the economic implications of the pandemic on the private sector.

Alongside the expected deep contraction of GDP growth and the increase in unemployment and underemployment, COVID-19 is also expected to catalyze the digitalization of product and service consumption across sectors. Businesses are forced to innovate their product offering for survival purposes, and consumers are pressured to adopt digital means of consumption for health and safety concerns. It is still too early to determine or predict accurate results given the volatility of the situation in Egypt and all over the world; however, all evidence derived from shifts in collective behavior is pointing towards a rapidly accelerating pace of embracing new digital means of operating.

4.2. The Supply Side

The main issues with the supply side of the labour market have to do with the quality of human capital provision, and that stems from the deteriorating quality of education and training. Despite quantitative data suggesting improvements on that front in terms of years of schooling, gender parity, and literacy rates, the qualitative findings regarding issues like job satisfaction and production quality have actually been suggesting the complete opposite, according to Dr. Mona Said¹⁹.

The quality of the Egyptian labour market's human capital remains problematic for different reasons. The majority of working adults are receiving wrong signals and pursuing qualifications that are no longer relevant. Credentialism and the pursuit of the public sector is still very prevalent amongst the young population, which is one of the most crucial and fragile segments of the labour market, while the public sector is no longer hiring²⁰ as it used to and the skills acquired are irrelevant to the new work opportunities available, adds Dr. Said.

¹⁷ Rizk, Nagla. "Egypt's Knowledge Economy", Position Paper to Egypt's Vision 2030, Sustainable Development Strategy Update, May 2019.

¹⁸ MoIC 2020 "Covid-19 Response and Rebuild", 4 April 2020: enterprise.press/wp-content/uploads/2020/04/MOIC-COVID-19-April-4.pdf

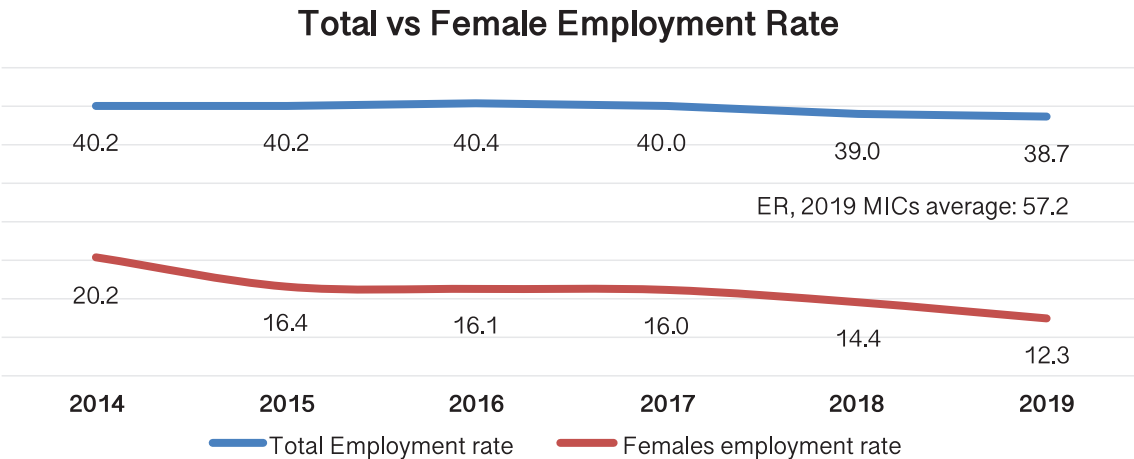
¹⁹ Said, Mona. Interview by Ismail, Ayman (Zoom). Fourth Industrial Revolution: Artificial Intelligence and Future of work in Egypt. 27 April

²⁰ Barsoum, Ghada. Abdallah, Dina. "Still the Employer of Choice: Evolution of Public Sector Employment in Egypt". Economic Research Forum (ERF), April 2020 <https://erf.org.eg/publications/still-the-employer-of-choice-evolution-of-public-sector-employment-in-egypt/2020>

In a 2019 press release to Al Ahram²¹, a government-majority owned and the most circulated daily newspaper, the Minister of Planning stated that female participation rate has reached an all-time low in 2018 at 19%, and that the government had plans to boost that number up to 35%. This low number, according to Dr. Said, could be a symptom and a cause of bigger issues that exist within the labour market that often consist of a mixture of economic and non-economic aspects. Cultural aspects for one -including the dominance of a patriarchal family structure and the stereotyping of women in certain jobs- could, according to her, play a big role in affecting their preferences and how they're generally discriminated against in the labour market.

Official labour force statistics show an alarmingly low labour market participation rate at 39% (compared to the average rate of 57% for other middle-income countries) and that is mostly driven by the falling female participation rate as shown in Figure 2 below.

Figure 2: Employment Rates 2014-2019



Source: ILO 2019 annual report for Egypt based on CAPMAS Labour Force Statistics

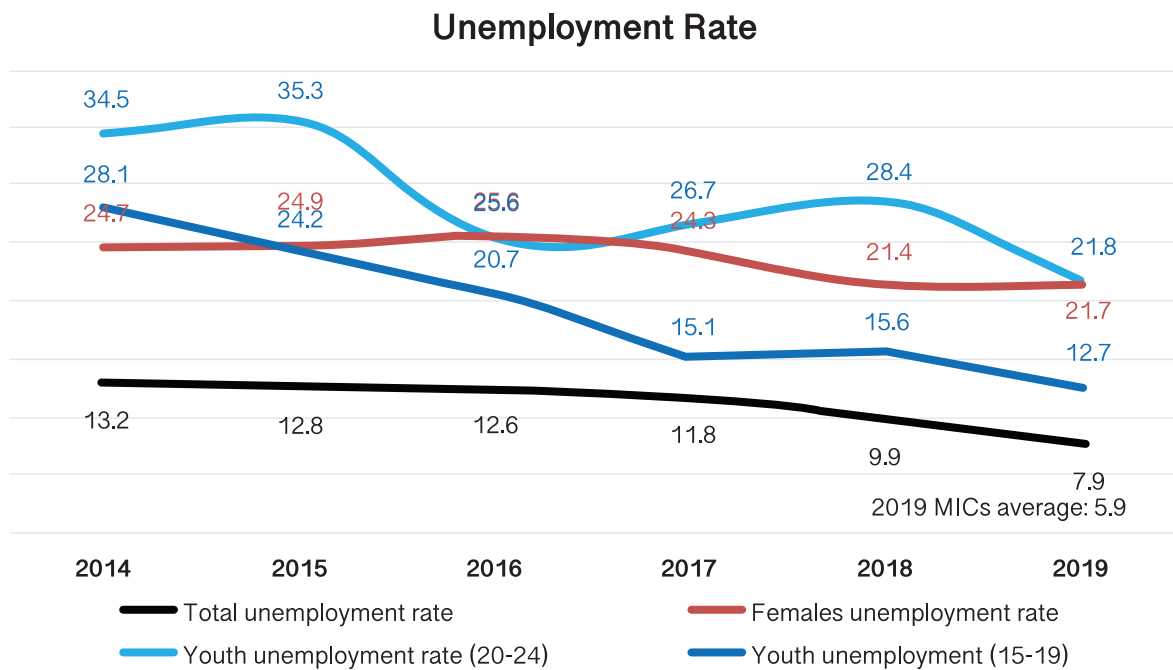
The same report's data regarding unemployment rates in figure 3 shows that numbers have gone down in 2019 to pre-crisis (2008) levels. The general decline started in 2014 on the wake of global economic recovery and the post-uprisings rebound, however, the data shows that females are still about three times as likely to be unemployed as compared to their male counterparts.

In partnership with UNICEF, the Abdul Latif Jameel Poverty Action Lab (J-PAL) at AUC held a seminar in October 2019 to discuss the topic of overcoming youth unemployment with evidence-based policy making²². The event was attended by three Nobel Prize winning economists, including J-PAL's cofounders. Panelists revealed that the six key barriers for youth unemployment in Egypt as per their findings were 1) lack of information for job seekers on reality of labour markets, 2) high costs of job searching, 3) complexities of job searching, 4) lack of information for youth about quality of the job, 5) poor matching between job seekers and employers, and 6) lack of information for firms about quality of applicants. A comment was added by Dr. Samir Radwan, Egypt's former finance minister, attributing the general lack of skills in the labour market to the high demand for unskilled labour by the private sector.

²¹ Soliman, Mohamed. "Women's participation in labor market could increase household income by 25%: Egypt's planning minister". Ahram Online, Oct 2019 <http://english.ahram.org.eg/NewsContent/1/64/352996/Egypt/Politics-/Womens-participation-in-labor-market-could-increa.aspx>

²² Selim, A. Tariq. "Youth Unemployment in Egypt: Why is it so high and what can be done to tackle it?". Business Forward AUC October 2019. <http://businessforwardauc.com/2019/10/27/youth-unemployment-in-egypt-why-is-it-so-high-and-what-can-be-done-to-tackle-it/>

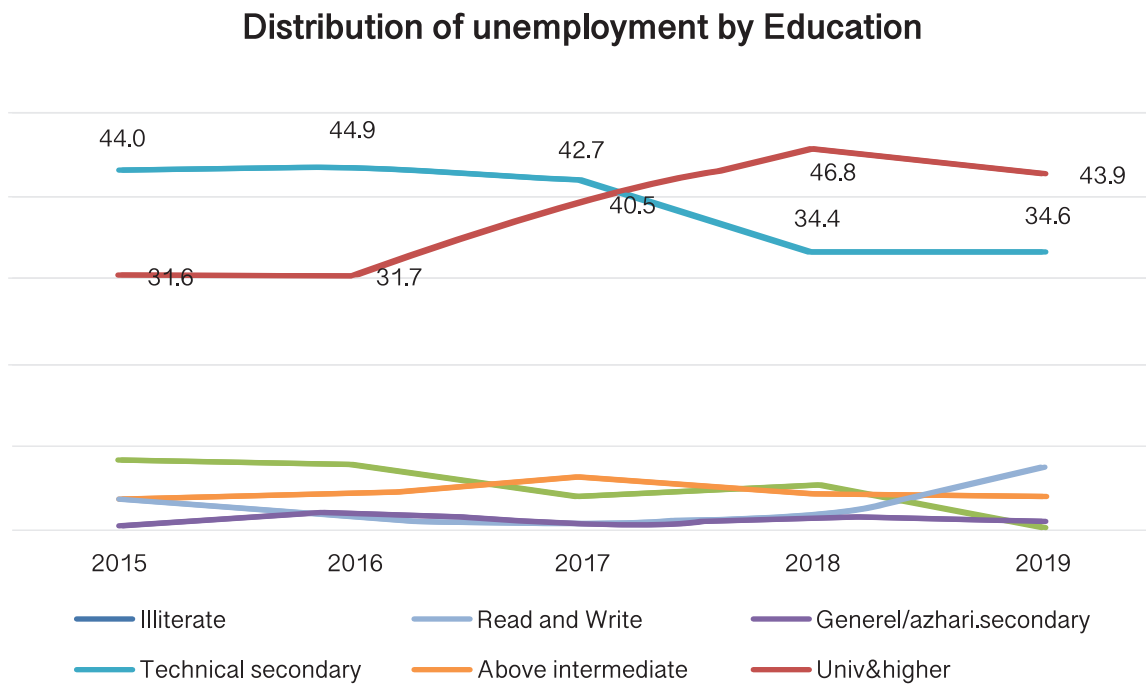
Figure 3: Unemployment Rates (MICs average at 5.9%)



Source: ILO 2019 annual report for Egypt based on CAPMAS Labour Force Statistics

In terms of distribution of unemployment by education, the numbers amongst tertiary graduates remain extremely high according to the same ILO report. Figure 4 below shows that 2019 graduate unemployment was twelve points higher than the 2016 numbers, which is consistent with the general decline of higher-pay jobs observed since then. The report considers the high unemployment rates amongst graduates of technical education to be reflective of their demands for better pay and working conditions, as a well as a clear indicator of the misalignment between skills supply and labour market needs deeming it a possible case of structural unemployment.

Figure 4: Unemployment Rates by Education



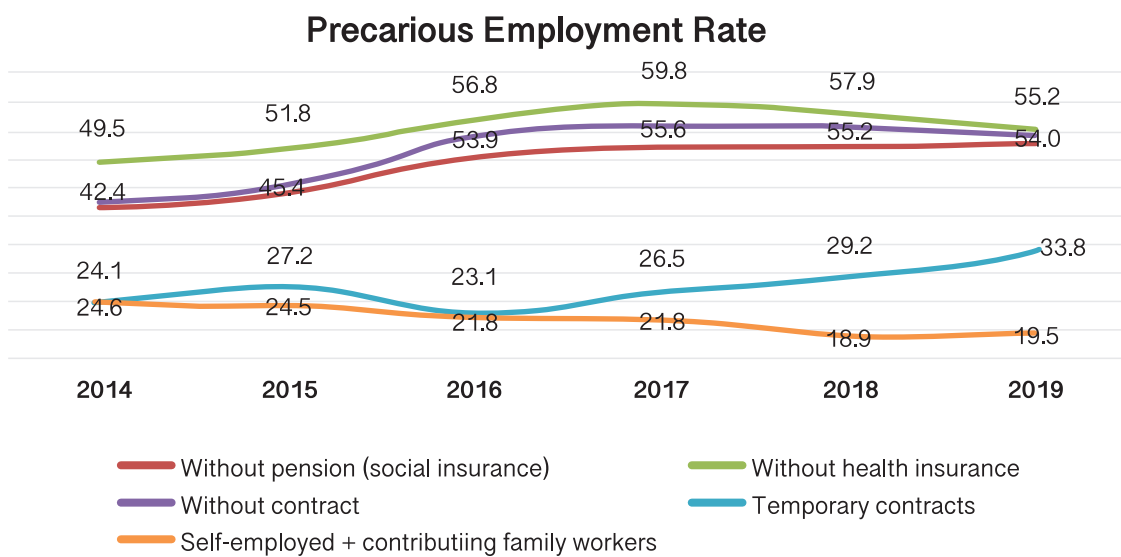
Source: ILO 2019 annual report for Egypt based on CAPMAS Labour Force Statistics

A significant portion of Egypt's labour supply is occupied by informal workers. These represent 50% of workers in the non-agricultural sector, and more than 60% of workers with agriculture included. Informal work is mostly concentrated in the micro and small enterprises, with the informal sector contributing to almost 40% of Egypt's Gross Domestic Product²³. While previously shielding Egypt against external and internal shocks like the 2008 financial crisis and political turmoil starting 2011, respectively, this time the informal sector is severely hit by the COVID-19 pandemic and necessitates immediate attention in planning for Egypt's future of work.

The ILO's 2019 annual results report shows that conditions of work have been deteriorating since 2014 as shown in figure 5. Workers without contracts or health insurance have increased by 10 to 20 points by 2017 and only slightly improved since then. The data shows that more than half of the employed are working without a contract, pension, or health insurance, and the increase in formal work is possible related to the increase in temporary contracts.

²³Abla Abdellatif, "The Informal Sector in Egypt", presentation at the Gerhart Center Webinar, April 29, 2020.

Figure 5: Precarious Employment Rates



Source: ILO 2019 annual report for Egypt based on CAPMAS Labour Force Statistics

Beyond traditional labour supply mechanisms, today's world is seeing a boom in online training portals like Udemy, Coursera, and EdX on the global sphere, and Nafham, Edraak, and Rwaq on the regional level. While these digital platforms can offer great opportunities for many, they still exclude Egypt's most vulnerable segments who lack access to these solutions due to frail or non-existent connectivity, absence of digital skills, and other cultural, technical, and infrastructure-related barriers. These platforms can focus on a wide variety of issues from small tactical skills to complete online diplomas and certificates. More and more local and regional players in that space are expected to surface in the upcoming period, particularly with the governmental efforts of digitizing education and making students more digitally literate.

According to their CEO, half of the technical team of Wuzzuf's - Egypt's largest online recruitment platform and one of its most prominent technology companies- is self-taught. They relied on MOOCs and online training platform solutions to pick-up and build the technical skills they needed to compete and excel in today's tech-driven job market. He also revealed that while the market demand for software engineers and computer scientists is on the rise, their supply remains short. Every accounting job opening on Wuzzuf receives between 200 to 300 applications on average, while that range drops to 20 to 30 applications for tech-related positions.

An ITIDA-sponsored white paper²⁴ by IDC in 2018 revealed that major enterprises like Cisco and Microsoft were initiating partnerships with educational institutions to complement technology student's theoretical knowledge with practical training programs and internships, particularly focusing on mobile development, big data, and IoT. The paper also mentioned that universities and higher education institutions were collaborating with leading technology providers to update their curricula and their labs and research programs. The American University in Cairo started an undergraduate program offering a bachelor's degree in data science, and Nile University also offers diplomas in big data, machine learning, and analytics to students. Additionally, in June 2020 the Ministry of Communications and Information Technology announced a collaboration²⁵ with Amazon Web Services (AWS) to design and launch an AI and machine learning training program for 500 employees at small and medium-sized enterprises while acquainting them with cloud computing and other emerging technologies.

²⁴ Bhanja, Sourav. Roby, Eman. Rajan, Ranjit "Egypt: The Journey Toward Becoming the Preferred Offshoring Hub" IDC Analyze the Future May 2018 <http://beta.itida.gov.eg/En/Brochures/IDC%20whitepaper%20-%20May%202018.pdf>

²⁵ "Building technical skills and capabilities in machine learning (ML) and artificial intelligence (AI) in cooperation with Amazon Web Services (AWS)". 'Masr Lil Rakeema' <https://digitalopportunity.itida.gov.eg/Arabic/Pages/default.aspx#/projectDetails/003f89e1-b3ad-4e4f-be7d-87674f49e4a8>

4.3. The Demand Side

The demand side of the labour market has its own problems too. The growth rate of certain sectors is insufficient to create the necessary jobs for young adults and women, who are both considered to be amongst the most highly impacted segment of the negative labour market forces.

Government and industrial policies have recently been favoring the promotion of megacities and other major investment projects. While this focus on mega-projects might offer support to the already steady construction sector and more work opportunities to unskilled workers, it disfavors other segments of the labour market, including the mid and higher-skilled workers as these public investments have a low employment intensity.

In a conversation with Alternative Policy Solutions - a public policy research project at the American University in Cairo - Dr. Ragui Assaad²⁶ shed some light on the difference between job creation and labour absorption, pointing that Egypt's current economy is more conducive to labour absorption than it is to the creation of new jobs. Labour absorption, according to Dr. Assaad, is when qualified youth cannot find jobs that suit their qualification levels and resort to taking any other available ones on the market. They typically end up being over-qualified, under-paid, and dissatisfied.

In a paper²⁷ of his about the Egyptian economy's ability to create jobs, Dr. Assaad mentioned that employment-to-population ratios have responded somewhat positively between 1998 to 2010; however, that has not been the case since then. GDP has been increasing steadily since 2013 while employment-to-population ratios have continued to decline. And while the employment share of the formal private sector has increased marginally, it was not sufficient to make up for the decline in the public sector's contribution.

The most rapidly growing category has been informal wage employment outside fixed establishments, and that to a very large extent is a reflection of the rapid growth of construction and transportation over the past decade or so. Dr. Assaad described the increasing share of construction, transportation, and trade jobs away from agriculture, mining, and manufacturing as a continuing structural shift in employment towards "non-tradable sectors". He added that the informalization of employment and its growing share outside fixed establishments is associated with an overall deterioration in job quality. Beyond the traditional demand for labour, technology-enabled and technology-driven jobs are causing major shifts in the labour market too.

The Egyptian Ministry of Communications and Information Technology (MCIT) had plans to build a massive datacenter cluster at the 60,000 squared meters Borg El Arab Technology Park²⁸. The idea was to capitalize on Egypt's nexus status between Asia, Africa, and Europe, and its favorability as an offshore BPO for many global giants. Some of the prominent players who invested in data centers in Egypt include CloudFare, Giza Systems, and Bright Computing who provides cloud services such as infrastructure as a service (IaaS), platform as a service (Paas), and software as a service (SaaS) to the Egyptian academic community.

In a live interview²⁹ on national radio in 2018, Wuzzuf cofounder and CEO Ameer Sherif mentioned that 25% of all jobs listed by the 20,000+ companies using his platform at the time (now over 40k) are technology and software related, deeming it the most in-demand category by far. He also mentioned a significant increase in demand for digital marketing, sales, and business and financial analysts' positions, noting that the market demand for these jobs far exceeded the supply, and that it is projected to continue doing so for the years to come.

The prevalence of technology companies is indeed increasing demand for white collar jobs, but many of the solutions they offer rely on the blue-collar workers' ability to acquire digital skills to use and embrace technology in their service delivery mechanisms. By observing the current transformations in the transportation and logistics sectors, it becomes fairly evident to point that the willingness and capacity of blue-collar workers to pick-up new skills and adopt novel working conditions is a very achievable goal.

²⁶ Assaad, Ragui. "Video Commentary: Job Creation vs. Labor Absorption" Alternative Policy Solutions, December 2018. <http://aps.aucegypt.edu/en/commentary-post/job-creation-vs-labor-absorption/>

²⁷ Assaad, Ragui. AlSharawy, Abdelaziz. Salemi, Colette. "Is the Egyptian economy creating good jobs? Job creation and economic vulnerability from 1998 to 2018" Economic Research Forum (ERF), October 2019. <https://erf.org.eg/publications/is-the-egyptian-economy-creating-good-jobs-job-creation-and-economic-vulnerability-from-1998-to-2018/>

²⁸ Bhanja, Sourav. Roby, Eman. Rajan, Ranjit "Egypt: The Journey Toward Becoming the Preferred Offshoring Hub" IDC Analyze the Future May 2018 <http://beta.itida.gov.eg/En/Brochures/IDC%20whitepaper%20-%20May%202018.pdf>

²⁹ "Exclusive Interview with WUZZUF Founder & CEO Ameer Sherif" Nile FM, May 2018.

4.4. Intermediation Between Supply and Demand

As the main force that matches between supply and demand of the labour market, intermediation plays a pivotal role, particularly in a market like Egypt's.

The sterility of the intermediation is evident by looking at the amount of unemployment amongst active job seekers alongside the number of firms that are continuously struggling to fill their vacancies. Many companies have expressed severe labour shortages in a wide range of areas, despite the availability of these demanded roles in the supply side, at least by qualification, but they are not matched together. The reason could be attributed to several factors including the reliance on traditional intermediation efforts, dysfunctional programs and mechanisms, and insufficient public spending on intermediation services.

However, many digital and technologically reliant solutions are already here to disrupt the intermediation space. Online digital matching platforms like Wuzzuf, Forasna, and Shaghalni are here to match respectively white, blue, and grey collar jobs with job seekers. They allow workers to create a profile, upload their resumé, and browse available job listings, while allowing companies also the chance to create a profile, post their available vacancies, and browse candidates. They all rely on smart data and algorithms to optimize the matching process, but each platform has its own functional nuances depending on the profile of workers and companies they were brought up to serve. Shaghalni, for example, runs frequent activations on-the-ground in an effort to lower access barriers for potential employees from vulnerable segments who might have difficulty with tech-based products and/or digital connectivity. They partner with governmental entities like the Ministry of Social Solidarity³⁰ and with international organizations like USAID³¹ to organize employment fairs and meet with job seekers in person. This not only makes it accessible for the non-tech savvy to be included in their database, it also creates a layer of trust and validation from the workers and the companies' sides.

Other hybrid organizations like Sprints³² are also starting to emerge. They offer hands-on practitioner-led tech education to aspiring new entrants or career shifters moving into the technology space with a guaranteed job placement component. Their aim is to bridge the gap between universities and the increasing unmet market demands by offering quality and up-to-date tech skills and curriculums in an agile learning environment with flexible financing options. Their programs currently revolve around IoT, data science, and AI technologies, but given the current landscape their growth prospects can be perpetual.

<https://nilefm.com/video/55/exclusive-interview-with-wuzzuf-founder-amp-ceo-ameer-sherif>

³⁰ "Shaghalni organizes second employment fair" Arab Finance, August 2017.

<https://www.arabfinance.com/en/news/details/egypt-companies/412430>

³¹ "Shaghalni Career Fair November 30, 2018" USAID's Strengthening Entrepreneurship and Enterprise Development (SEED) Project, 2018.

<http://www.seedegypt.org/portfolio-posts/shaghalni-career-fair-november-30-2018/>

³² 'Sprints' <https://sprints.ai/>

Case Example: BasharSoft, the developer of Wuzzuf and Forasna

Ameer Sherif and Mohamed Al Garhy started working on BasharSoft in 2009 with the objective of solving the labor market's intermediation inefficiencies. The internet in Egypt back then did not have as much rich content or as many dynamic applications as it does today, so they knew their idea was up against a lot of challenges and resistance from many different angles.

They launched the first version of their first online platform -Wuzzuf- in January 2011, a week before the uprisings. The political instability, the failing connectivity, and the poor digital infrastructure all posed huge obstacles for the company to overcome during its initial post-launch phase. They were on the verge of closing down twice in 2011 and 2012, but luckily they were offered a lifeline extension when [careermideast.com](#), an established yet outdated recruitment player at the time, proposed a merger of resources. BasharSoft had the vision, the algorithms, and the tech awareness, while [careermideast.com](#) had market intelligence and a populated albeit declining user base. Their bootstrapping efforts, however, started paying off when they joined 500 Startups' acceleration program in Silicon Valley by early 2014.

The company had just 12 employees on board at the time and they had only matched 1500 companies with 10,000 employees, a relatively moderate number to make an impact, but it was a good enough sign of the great potential they would later pursue.

In 2015 BasharSoft launched another recruitment platform called Forasna to target the blue collar (and the much larger) segment of the labor market. They ended the year by closing a Series A funding round of USD 1.7 million that was led by Vostok New Ventures and UK-based Piton Capital.

By late 2016 Wuzzuf as a platform announced its acquisition of job assessment platform Viriphi for an undisclosed amount, making a rare deal in a region where mergers and acquisitions among startups was still fairly uncommon. The merger was part of a larger plan to launch new products to enhance the recruitment experience for job seekers while also helping job providers hire the skills they need more effectively.

In 2017 Ameer was selected as a Young Global Leader by the World Economic Forum, and in 2018 BasharSoft raised USD 6 million in its Series B round, the largest ever disclosed Series B round for an Egyptian startup at the time. The round was led by the European Bank for Reconstruction and Development, Vostok Ventures, Endure Capital, and Kingsway Capital.

By May 2018 Wuzzuf had a user-base of 1 million jobseekers, 15,000 companies, and it facilitated the hiring of 180,000 candidates. Together with Forasna these numbers stood at 2 million, 25,000, and 250,000 respectively. In 2020 BasharSoft has a team of more than 250 employees, and their platforms are serving more than 5 million job seekers and 40,000 companies across Egypt.



5. The Future of Work in the Egyptian Context

5.1. A Brief Digital Overview

5.1.1. Internet and Connectivity in Egypt

In a 2016 report³³ by Digital McKinsey about the potential digital transformation of key Middle Eastern economies, Egypt scored second to lowest and faced medium to high barriers in terms of internet accessibility, despite being the country with the highest population on the list. In a 2015 report²⁴ by the Ministry of Communications and Information Technology (MCIT) the vast majority of surveyed households (69%) indicated that regular service disconnection counted as the single most significant challenge affecting their internet connectivity, followed by low internet speed.

Another report³⁵ by MCIT in November 2018 showed that the number of mobile subscribers has declined 5.5% year-over-year in October 2018 to reach 94.3 million. This brought Egypt's mobile phone penetration rate down to 102.4%, a 7.8% year-over-year drop. The report showed, however, that the number of ADSL subscribers had increased by 25% from the previous year to reach 6.3 million users in October 2018. Mobile internet, according to the same report, rose by 8.45% to reach almost 36 million in October 2018.

A third report³⁶ issued by MCIT in February 2020 shows that total mobile internet users by January 2020 stood at 42.3 million with an annual change rate of +7.67%, while ADSL subscribers were at 7.24 million with an increase of 9.37% from the year before.

A report³⁷ on the state of mobile connectivity funded by the UK government shows that just over 40% of low- and middle-income countries (LMIC) population are connected to mobile internet, compared to almost 75% of the population in high-income countries, which brings Egypt to be almost on-par with the collective LMIC average. However, the report also states that more than 40% of LMIC's populations will still be offline if current trends continue, highlighting the challenges involved with connecting the large remaining offline population, particularly given that they tend to belong to the most vulnerable and marginalized groups and are disproportionately rural, female, illiterate, and/or elderly.

³³ "Digital Middle East: Transforming the region into a leading digital economy" Digital McKinsey, October 2016.

<https://www.mckinsey.com/~media/mckinsey/featured%20insights/middle%20east%20and%20africa/digital%20middle%20east%20transforming%20the%20region%20into%20a%20leading%20digital%20economy/digital-middle-east-final-updated.ashx>

³⁴ "Measuring the Digital Society in Egypt: Internet at a Glance Statistical Profile 2015" Arab Republic of Egypt Ministry of Communications and Information Technology, 2015.

http://mcit.gov.eg/Upcont/Documents/Publications_1272015000_Measuring_the_Digital_Society_in_Egypt_12_.pdf

³⁵ "ICT Indicators in Brief November 2018 | Monthly Issue" Arab Republic of Egypt Ministry of Communications and Information Technology, 2018.

http://www.mcit.gov.eg/Upcont/Documents/Publications_1012019000_En_ICT_Indicators_in_Brief_November_2018.pdf

³⁶ "ICT Indicators in Brief February 2020 | Monthly Issue" Arab Republic of Egypt Ministry of Communications and Information Technology, 2020. http://www.mcit.gov.eg/Upcont/Documents/Publications_2942020000_ICT_Indicators_in_Brief_February_2020%20_English.pdf

³⁷ "The State of Mobile Internet Connectivity 2019" Connected Society – GSMA, 2019. <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/07/GSMA-State-of-Mobile-Internet-Connectivity-Report-2019.pdf>

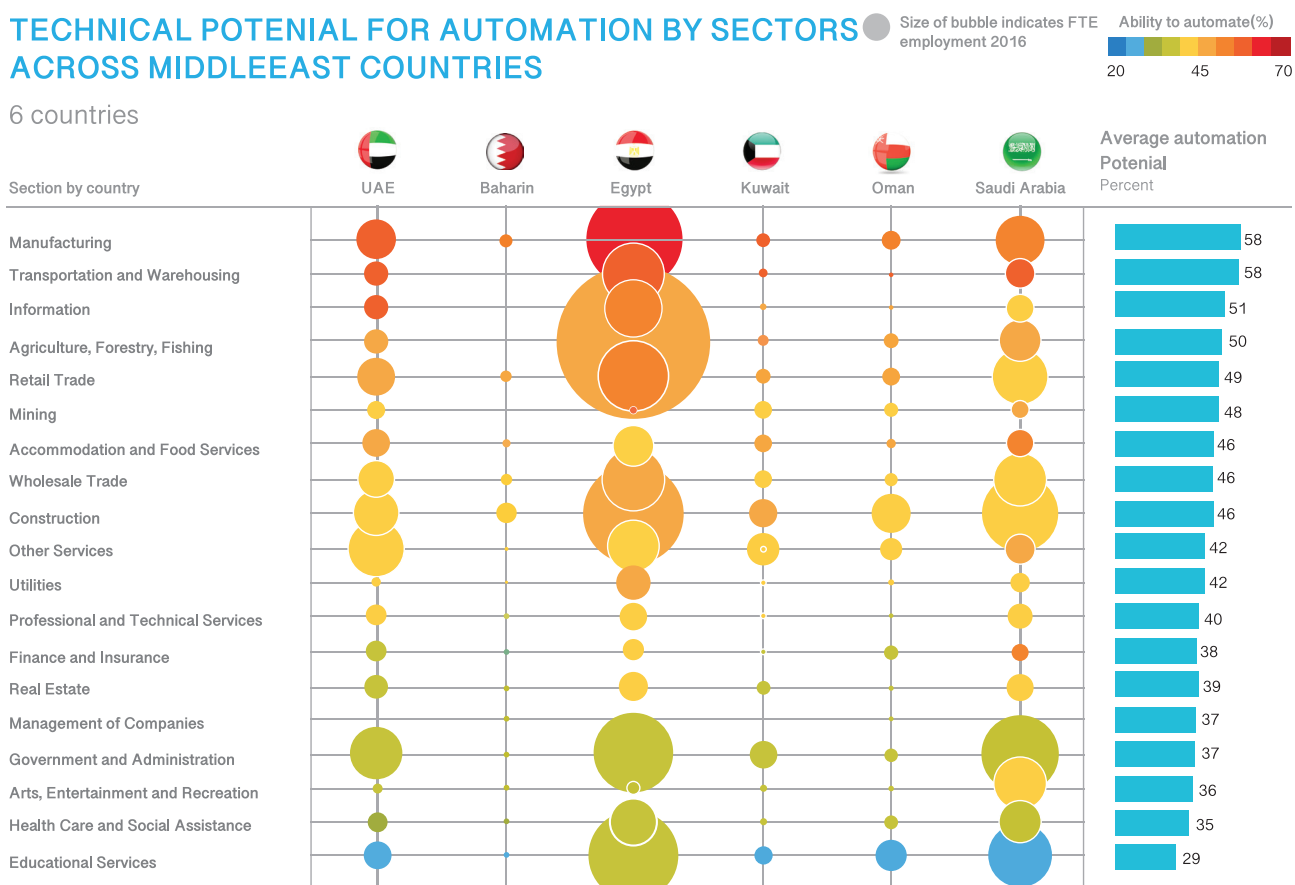
Given the growing demand for digitally skilled jobs in Egypt and the necessity of re-skilling local labour, it is essential to put issues like connectivity under the microscope and treat potential obstacles related to training, education, and knowledge dissemination, particularly as it concerns vulnerable segments the most. Connectivity issues pose an extra layer of inequality by hindering a portion of the population's ability to acquire knowledge, learn new skills, and train for better jobs. Factoring the informal sector into the picture only exacerbates the associated implications even further. This becomes even more pertinent given the increasing need for functioning remotely during and post the COVID-19 crisis.

5.1.2. A Regional Glimpse of the Future of Work in Egypt

Figure 6: Automation Potential in 6 Middle Eastern Countries

In a 2018 report³⁸ about the future of jobs in the Middle East by the World Government Summit and McKinsey & Company, a study was conducted using McKinsey Global Institute's (MGI) automation model to gauge the potential for workforce automation in 6 Middle Eastern countries, including Egypt. From the 20.8 million full-time employees across the 6 countries whose jobs were technically automatable, 11.9 million were from Egypt. The report attributes the country's rather high share of automation potential in relation to others in the region to its larger absolute and relative workforce in key sectors like manufacturing and agriculture.

Figure 6 below shows "Exhibit 4" from the same report, and it demonstrates the technical potential for automation by sectors across the 6 Middle Eastern countries examined by the study. Sectors with heavy routine tasks like manufacturing, transportation, and warehousing appear to be at the forefront of the automation potential spectrum.



Source: ILO 2019 annual report for Egypt based on CAPMAS Labour Force Statistics

Source: The Future of Jobs in the Middle East Report³⁹

³⁸ Moore, P. Jan. Chaundrau, Vinay. Schubert, Jorg. "The Future of Jobs in The Middle East" McKinsey & Company, January 2018. <https://www.mckinsey.com/~/media/mckinsey/featured%20insights/middle%20east%20and%20africa/are%20middle%20east%20workers%20ready%20for%20the%20impact%20of%20automation/the-future-of-jobs-in-the-middle-east.ashx>

³⁹ Moore, P. Jan. Chaundrau, Vinay. Schubert, Jorg. "The Future of Jobs in The Middle East" McKinsey & Company, January 2018. <https://www.mckinsey.com/~/media/mckinsey/featured%20insights/middle%20east%20and%20africa/are%20middle%20east%20workers%20ready%20for%20the%20impact%20of%20automation/the-future-of-jobs-in-the-middle-east.ashx>

The same report suggests that the likelihood of automation technology affecting employees with low to medium levels of education and experience is almost double that of bachelor's and graduate degree holders, noting that almost 57% of employed workforce across all 6 countries fall within the vulnerable segments.

5.2. Key Sectors

This section will present various ways through which technologies of the Fourth Industrial Revolution are currently disrupting some of Egypt's key sectors by offering more local perspectives and connecting global sectoral advancements to events taking place on the local ground.

The same report suggests that the likelihood of automation technology affecting employees with low to medium levels of education and experience is almost double that of bachelor's and graduate degree holders, noting that almost 57% of employed workforce across all 6 countries fall within the vulnerable segments.

5.2.1. Agriculture

The agriculture sector contributes 15.2% of the country's GDP⁴⁰, provides more than 17% of all jobs, including over 55% of jobs in Upper Egypt⁴¹. And while their participation rates remain low, 45% of employed women work in agriculture.

Globally, AI is being used to analyze a variety of important agriculture elements like weather conditions, temperature, water usage, and soil conditions collected from each individual farm. It is then used to help farmers optimize planning to generate higher yields by determining the best crop choices for the given set of conditions, the best type of hybrid seed, and advice on how to optimize use of their existing resources. AI solutions can also cut costs while significantly increasing harvest yield and quality by relying on what is now referred to as precision agriculture. By more easily and accurately identifying plant diseases, a farmer can optimize the deployment of labour and herbicides in a more efficient manner.

In the case of Egyptian high-end farming, technologies like IoT and AI can allow farm owners to more effectively conform to certain local or global regulations. Embracing technological innovations in the case of exportable products specifically results in better quality and a competitive advantage over others who still rely on more traditional methods of monitoring and production, whether that competition is local or global.

Although the sector in Egypt is dominated by small farms using traditional agricultural practices, the nuances to its 4IR disruption susceptibility are endless, explains Dr. Sally Golestan Radwan, advisor to the Minister for Egypt's AI strategy⁴². If not by drones and ground sensors, smartphones and IoT technologies can simply educate, inform, and empower farmers and change the way they work to the better. Simple tactics like enhancing small farmers' access to key information through mobile internet, including real time pricing of goods at a very local level, weather alerts, or advice on pest containment measures in real time can each have a significant impact on the nature of their work. Finding smarter and more efficient ways around particular tasks could eventually lead farmers to dispense with the need to pull children out of schools, consequently offering their offspring a better opportunity to compete in the labour market by virtue of dedicating more time to their education.

AbuErdan⁴³ is an example of a local company that is currently building innovative solutions to disrupt and revolutionize the poultry sub-sector within agriculture. They are leveraging the latest cloud technologies, business analytics, mobile technology, IoT, and machine learning to enable different stakeholders of poultry businesses to monitor their operations, spot irregularities, and report them to the responsible parties to take preventive actions and benefit from best practices. Another example is FreshSource⁴⁴, a startup introducing a tech-enabled B2B platform for agricultural goods, connecting farms to businesses and providing last mile solutions.

⁴⁰"Economic Indicators" Gafi <https://gafi.gov.eg/English/whyegypt/Pages/Economical-Indicators.aspx>

⁴¹"Agriculture and Food Security" USAID, May 2020. <https://www.usaid.gov/egypt/agriculture-and-food-security>

⁴²Radwan, G. Sally, Interview by Ismail, Ayman (Zoom). The Fourth Industrial Revolution, Artificial Intelligence, and the Future of Work in Egypt. April 27 2020.

⁴³Abuerdan' <https://abuerdan.com/>

⁴⁴ 'Fresh Source Global' <https://freshsourceglobal.com/>

5.2.2. Manufacturing and Industry

A recent survey⁴⁵ by the WEF has cited global manufacturing leaders referring to the high cost of scaling and lack of short-term impact as top reasons preventing full adoption of 4IR technologies. Nevertheless, the space is still considered very fertile ground for disruption, both globally and locally.

One of the 4IR's main strong points is its accessibility and relative affordability. By making smart data connections and software integrations, for example, and by leveraging the already wide-spread IoT devices, companies can generate invaluable insights from their vast amounts of actionable data. And while that does require a notable amount of effort and awareness, according to a 2019 WEF article⁴⁶, it often leads to optimized processes, shortened cycle times, better quality output, reduced energy losses, shorter maintenance time, improved overall equipment status and effectiveness, and other positive outcomes that are of particular interest to the manufacturing and industrial sectors.

The article continues to explain that by looking at more capital-intensive 4IR investments like advanced robotics and machinery we find that the market prices of robots and automation are falling, their capabilities are increasing, while the cost of labour is going up. That in turn suggests that the cost/benefit is continuing to move in favor of manufacturers embracing these technologies. Additionally, as the costs of integrating 4IR technologies continue to fall, the international labour market will no longer be a decisive factor in choosing the location of production. Manufacturers will eventually have the flexibility to move locations of production and sale closer together and fundamentally change the design of future value and supply chains.

In terms of the Egyptian economy, manufacturing sides along agriculture and wholesale & retail trade as a main contributor to the economy's health. It accounted for 16.4% of GDP in 2018⁴⁷, and that number would stretch to 27.3% when including the extractive sector. In 2018, utilities, manufacturing, and the mining sectors provided 14% of all jobs to employed individuals between the ages of 15 to 64⁴⁸. However, the sectors' employment contribution has been steadily declining from the 1998 figure of 18%.

While the impact of 4IR on local manufacturing is inevitable, the short-term adoption of these technologies seems to be highly unlikely. In a media interview released on May 20th 2020, the CEO of Luna Cosmetics revealed that robotics seemed like a far-fetched idea for her business to embrace at the moment⁴⁹. Despite the company employing over 650 workers across its two branches and factory, she expressed that robotics providers in Egypt have not yet crossed her radar and that many automatable functions within her facility will continue depending on manual labour.

5.2.3. Wholesale & Retail Trade

Wholesale & retail trade is a significantly important sector for the global economy. Some of the technological trends driving the future of retail include the use of big data to understand and analyze consumer and organizational behavior, industrial IoT applications creating an interactive retail experience across platforms, cloud computing that allow sharing of crucial data in real-time, robotic applications for in-store warehouse management and delivery services, and augmented reality for different functions like selecting warehouse parts, sending repair instructions, and virtually trying out new merchandise.

The retail sector in Egypt accounts for almost 14% of the Egyptian GDP⁵⁰ and it employs 16% of the entire labour market as of 2018, just a 3% increase from employing 13% in 1998. Demand for data analysts and data scientists from big companies and startups is already surfacing, according to Dr. Amr Kais⁵¹, and some local players have started to leverage big data and IoT applications to tackle opportunities and inefficiencies within the retail and distribution sectors.

MaxAB is an example of a Cairo-based startup that is leveraging both data and IoT to optimize the supply-chain network for Egypt's food and grocery retailers. The company built a digital platform to manage procurement

⁴⁵"The Next Economic Growth Engine Scaling Fourth Industrial Revolution Technologies in Production" McKinsey & Company, January 2018. http://www3.weforum.org/docs/WEF_Technology_and_Innovation_The_Next_Economic_Growth_Engine.pdf

⁴⁶Cronin, Ian. Widner, Adrian. Diaz, H. Diego. "4 myths about manufacturing in the Fourth Industrial Revolution" World Economic Forum, Feb 2019. <https://www.weforum.org/agenda/2019/02/4-myths-about-the-fourth-industrial-revolution-and-how-they-are-holding-you-back/>

⁴⁷"Economic Indicators" Gafi <https://gafi.gov.eg/English/whyegypt/Pages/Economical-Indicators.aspx>

⁴⁸Assaad, Ragui. AlSharawy, Abdelaziz. Salemi, Colette. "Is the Egyptian economy creating good jobs? Job creation and economic vulnerability from 1998 to 2018" Economic Research Forum (ERF), October 2019. <https://erf.org.eg/publications/is-the-egyptian-economy-creating-good-jobs-job-creation-and-economic-vulnerability-from-1998-to-2018/>

⁴⁹"#WhatNow: How Will COVID-19 Change the Future of Jobs?" WAYA, May 2020. <https://waya.media/whatnow-how-will-covid-19-change-the-future-of-jobs/>

⁵⁰"Economic Indicators" Gafi <https://gafi.gov.eg/English/whyegypt/Pages/Economical-Indicators.aspx>

⁵¹ Kais, Amr. Interview by Ismail, Ayman (Zoom). Fourth Industrial Revolution: Artificial Intelligence and Future of work in Egypt. April 29, 2020.

and delivery of grocery products to small-scale retailers in Egypt who represent almost 90% of the USD 50 billion retail market⁵².

GoodsMart, an Egyptian technology company that allows users to order grocery items through a mobile application, has experienced a 300% demand surge overnight once the partial COVID-19 curfew was imposed, according to a press release by their data analyst⁵³. In that case, not only is technology formalizing distribution channels and promoting financial inclusivity, it is also improving supply chain efficiency and reducing product and margin leakages.

5.2.4. Transportation and Logistics

Shifts within the global transportation sector have leveraged a combination of trends and technologies like IoT, big data, cloud computing, machine learning, and modern geospatial frameworks just to name a few. Although proving to be more challenging than expected, self-driving vehicles are already being piloted in the United States, but the prospects are still unclear. Sectoral disruption, however, has been considerably felt through the increasing popularity of sharing economy platforms like Uber and Lyft for ride hailing, Turo for car rentals, and a wide range of e-commerce powered logistics providers.

The MENA region has received these new technologies very well on its home turf, and Egypt in particular managed to rank amongst Uber's top 10 markets globally with 90,000 active drivers operating in around half of its 27 governorates⁵⁴. Uber has also introduced bus services to compete with the Cairo-based SWVL before moving on to launch motorbikes as a faster navigation solution to the city's notorious traffic problem.

A study of Uber drivers in Egypt⁵⁵ showed that the platform has offered a new form of work and an independent alternative to informal employment, especially for the educated and the youth, and a supplementary source of livelihood for many. Another study of women in ridesharing⁵⁶ showed that women have utilized technologies and engaged in the platform as drivers. This empowered the women not only by their ability to provide for their livelihood, but also by their success in breaking social taboos and learning to utilize digital technologies to ensure their safety.

Technology-enabled food delivery has also been seeing growing popularity in Egypt until the COVID-19 situation halted many in the restaurant and food service businesses. The pandemic forced Uber Eats to shut down their country (and regional) operations and leave the field to the locally founded competitors like Elmenus and Halan. The latter leverages a combination of 4IR technologies and uses motorbikes to deliver food, tuk-tuks to transport passengers, and cargo tricycles to move goods around. The company, according to one of its cofounders⁵⁷, has already partnered with some mega food chains and the model's popularity is proving to be cost-effective and convenient for the relevant parties.

Another key example of disrupting a traditional operation is Trella, a Cairo-based trucking marketplace that is building on the success of ride-hailing startups to improve freight efficiency throughout the supply chain. By leveraging IoT and other technologies the platform allows shippers to reduce costs by improving load utilization/efficiency and offering transparent pricing and adds significant value to carriers by connecting them with a wide pool of shippers to improve their truck's utilization rates and enhance their overall efficiency.

Transportation is a relatively large sector in Egypt, accounting for 4.6% of the GDP and employing around 9% of the labour force. The widespread adoption of technology in the transportation sector so far has resulted in an increased demand on a variety of these services, and it has improved the efficiency of labour working in that space.

⁵²Bright, Jake. "MaxAB raises \$6M seed round to optimize Egypt's B2B grocery markets". Tech Crunch, September 2019. <https://techcrunch.com/2019/09/25/maxab-raises-6m-seed-round-to-optimize-egypts-b2b-grocery-markets/>

⁵³ElDeeb, Leena. "#WhatNow: How can the pandemic change the shopping experience?" WAYA, May 2020. <https://waya.media/whatnow-how-can-the-pandemic-change-the-shopping-experience/>

⁵⁴Saba, Yousef, "Ride-hailing market revs up in Egypt" Reuters, November 2019. <https://www.reuters.com/article/us-egypt-economy-transportation/ride-hailing-market-revs-up-in-egypt-idUSKBN1XG20M>

⁵⁵Rizk, Nagla, A Glimpse into the Sharing Economy: An Analysis of Uber Driver-Partners in Egypt (February 22, 2017). Available at SSRN: <https://ssrn.com/abstract=2946083>

⁵⁶Rizk, Nagla, Nancy Salem and Nadine Weheba. 2018. "A Gendered Analysis of Ridesharing: Perspectives from Cairo, Egypt" In *Urban Transport in the Sharing Economy Era - Collaborative Cities*. Fernando Bercovich, ed. Buenos Aires: Center for the Implementation of Public Policies Promoting Equity and Growth with the International Development Research Centre and the Multilateral Investment Fund, Inter-American Development Bank.

⁵⁷ElDeeb, Leena. "#WhatNow: How can the pandemic change the shopping experience?" WAYA, May 2020. <https://waya.media/whatnow-how-can-the-pandemic-change-the-shopping-experience/>

5.2.5. Financial Services

The widespread usage of technology in global finance is epitomized by the emergence of new blockchain-driven cryptocurrencies and by the inception of the financial technology sector, also known as fintech. This constantly evolving sector has attracted significant demand and attention from keen investors to exploit existing inefficiencies and deliver innovative propositions to tally with clients' evolving needs and expectations.

Fintech is changing the face of consumer and corporate banking on all fronts, including mobile banking, payments, lending, currency exchange, and financial management. It is also changing asset management by driving the rise of what is now being referred to as WealthTech, and that includes financial advice and portfolio management solutions, along with micro-investing, research, and brokerage. The reshaping of the industry and the growing complexity of the regulatory environment has bred a new generation of highly specialized technology-driven solutions referred to as RegTech. These apply 4IR technologies like AI and blockchain to offer solutions for regulation and compliance related challenges.

Digital payments were on an upwards curve before the Covid-19 pandemic, but the global lockdown resulted in share prices of companies like Paypal, Square, and Ayden leaving quite an impact on the equity market at large. PayPal had its largest single day of transactions ever on May 1st 2020, pulling ahead of heavy shopping days like Black Friday and Cyber Monday⁵⁸.

Unlike in North America where fintech is led by banks and large financial institutions, in Egypt it is mostly driven by innovative startups led by high-caliber youth and backed by the region's most reputable investors and venture capital funds. Local fintech startups are mostly gearing their services towards those outside the banking system, who according to a report⁵⁹ by AlexBank make up more than 60% of the population at the least. While fintech offers immense and unprecedented opportunities for financial inclusion, it does not come without issues which require new forms of financial oversight and regulation.

Paymob is an example of a startup that saw potential in leveraging new technologies to extend banking services to the vast majority of the Egyptian population that is largely under-served and under-banked. They provide an assortment of payment solutions to digital financial service providers across MENA by mostly relying on innovative mobile wallet technologies while offering tangential services like agent banking, disbursements, fraud and risk management, merchant acceptance, and business intelligence.

Other startups like Faydety and Khazna are also starting to emerge by leveraging IoT and big data to offer financial education and basic banking services to the largely underserved and underbanked Egyptian segments, while other technology companies are starting to pivot their expansions into the sector amidst the pandemic. Halan for one has launched its e-wallet product HalanPay and officially stepped into the fintech sector⁶⁰.

Local banking experts generally share the perception that the sector is undergoing a large expansion, and that a wide variety of digital and technical skills will be demanded to fulfill this expansion, according to Islam Zekry⁶¹ of CIB. Many elements related to branch operations are likely to be automated, but other digitally enabled jobs are expected to increase.

Digital payments and financial inclusion are essential catalysts for growth of other services and sectors, so the development of the financial services sector is likely to yield positive outcomes across many other facets of the local economy. Financial services currently account for almost 5% of national GDP⁶², and alongside professional and information services they employ around 2.5% of the labour force⁶³.

⁵⁸Detrixhe, John. "The pandemic's impact on digital payments and cash, in five charts". Quartz https://qz.com/1853139/coronavirus-is-boosting-digital-payments-and-weakening-cash/?utm_source=email&utm_medium=daily-brief

⁵⁹"Financial Inclusion in Egypt" December 2017 https://www.alexbank.com/document/documents/ALEX/Retail/Research/Flash-Note/AR/Financial-Inclusion_Dec17.pdf

⁶⁰ElDeeb, Leena. "#WhatNow: How can the pandemic change the shopping experience?" WAYA, May 2020. <https://waya.media/whatnow-how-can-the-pandemic-change-the-shopping-experience/>

⁶¹Zekry, Islam. Interview by Ismail, Ayman (Zoom). Fourth Industrial Revolution: Artificial Intelligence and Future of work in Egypt. April 27, 2020.

⁶²"Economic Indicators" Gafi <https://gafi.gov.eg/English/whyegypt/Pages/Economical-Indicators.aspx>

⁶³Assaad, Ragui. Krafft, Caroline. Rahman, W. Khandker and Selwaness, Irène. "Job Creation in Egypt: A Sectoral and Geographical Analysis Focusing on Private Establishments 1996-2017" Economic Research Forum (ERF), December 2019. <https://erf.org.eg/publications/job-creation-in-egypt-a-sectoral-and-geographical-analysis-focusing-on-private-establishments-1996-2017-2/>

5.2.6. Healthcare

Global healthcare is undergoing two major shifts as a result of embracing 4IR technologies. Firstly, it will be delivered as a “seamless continuum of care” rather than the familiar clinic-centered point of care model⁶⁴, allowing more focus on prevention and early intervention mechanisms. Secondly, healthcare delivery will be much more responsive to the unique needs of people and patients and drive the progress of what is now being referred to as consumerization of healthcare.

The impact of 4IR on health and healthcare is immense. From the decreasing costs of genome sequencing and precision medicine to the increasing trends in telemedicine, 4IR technologies are not only driving medical discoveries, they are also increasing the interconnectivity between global healthcare systems to unprecedented levels and completely transforming the fundamentals of their structure.

Egypt spends 1.2% of its GDP⁶⁵ on healthcare while the sector employs around 13% of the labour force. It is a labour-intensive sector by nature, and while it had huge potential for growth already, the global pandemic has certainly added an extra spotlight.

There is a huge shortage of trained labour in the sector both in Egypt and the rest of the world. That includes doctors, nurses, lab technicians, and other technology-driven jobs that are emerging within the sector. As many western countries face the problem of an ageing population and global healthcare demands continue to increase, technology is nowadays offering a huge opportunity to emerging countries with a growing young population like Egypt by making the remote deployment of healthcare workers feasible.

Several technology-based companies have been making waves in the Egyptian healthcare ecosystem like Vezeeta and Rology. Vezeeta leverages IoT and big data to offer a digital healthcare booking platform and practice management software while leading the shift to automated physician, clinic, and hospital booking. Rology is a tele-radiology platform solving the problem of radiologists' shortage and high latency in medical reports by matching cases from hospitals all over the world with the optimum radiologist remotely and instantly, decreasing reporting time by using AI-enabled medical viewing software.

Especially given the COVID-19 crisis, the healthcare sector in Egypt is expected to receive significant attention and is fertile land for economic growth and both, job creation and augmentation. The crisis has highlighted the dire need for accurate data on citizens in general, and on health in particular. Investment and work in health and technology, together, should be a priority area for state and private entities in the immediate and longer term in Egypt.

5.2.7. Maintenance and Services

Services account for 4.9% of GDP⁶⁶ and employ around 9% of the labour force⁶⁷. The global ascent of shared-economy platforms has been well received in Egypt across multiple sectors. The local market has embraced internationally developed platforms like Uber and AirBnb, and local innovators also started developing new custom ones to cater for local needs.

Newly founded platforms have the potential of organizing a traditionally informal market whose workers often relied on network and word-of-mouth referrals, and integrating on-demand service using modern technologies that offer convenient, quality, and safe delivery of services.

Startups like Jinni and FilKhedma have already started to tackle the need for accessing cleaning and home services personnel through convenient technology channels like web and mobile apps. While Jinni focuses mostly on a variety of cleaning services, FilKhedma offers a wide range of technical labour that can fix and install elements related to plumbing, carpentry, electricity, air conditioning, satellite dishes, painting, and home improvement. More platforms in that space are surfacing and expected to grow, and that has the potential to restructure the sector's labour force and service delivery mechanism to a large extent.

⁶⁴“Health and Healthcare in the Fourth Industrial Revolution Global Future Council on the Future of Health and Healthcare 2016-2018” World Economic Forum, April 2019. http://www3.weforum.org/docs/WEF__Shaping_the_Future_of_Health_Council_Report.pdf

⁶⁵ “Views on The Crisis The Impact of the Crisis on the Health Sector” The Egyptian Centre for Economic Studies (ECES) April, 2020. http://www.eces.org.eg/cms/NewsUploads/Pdf/2020_4_23-16_23_3Health%20-%20English%20%28DR.Sahar%29.pdf

⁶⁶“Economic Indicators” Gafi <https://gafi.gov.eg/English/whyegypt/Pages/Economical-Indicators.aspx>

5.2.8. Telecom

Communication and information technology accounts for 2.3% of national GDP⁶⁸ and it employs less than 3% of the labour force⁶⁹. Egypt has one of Africa's largest telecommunication markets due to its large population size and solid telecom infrastructure.

Egypt started serving as a hub for information technology outsourcing (ITO) and business process outsourcing (BPO) in the early 2000s, and since then it has established its place as a reliable outsourcing destination for many North American, European, African, and Middle Eastern players. Egypt's attractiveness as an ITO/BPO hub stems from its reliable and scalable infrastructure, its large talent pool of low-cost multilingual candidates, a convenient time zone, and substantial governmental support to the sector. The industry workforce stood at 189,000 in 2018 and was projected to reach 240,000 in 2020⁷⁰.

While 4IR repercussions were looking bleak for call center operators, the relevant impact so far has been underwhelming. New functions are indeed being automated, but the need for human operators in that space are still on the rise. Additionally, Egypt's BPO services cover a wider range than just call centers, including functions of more complex and sophisticated natures like translation, HR, finance, engineering, and software development.

⁶⁷Assaad, Ragui. Krafft, Caroline. Rahman, W. Khandker and Selwaness, Irène. "Job Creation in Egypt: A Sectoral and Geographical Analysis Focusing on Private Establishments 1996-2017" Economic Research Forum (ERF), December 2019. <https://erf.org.eg/publications/job-creation-in-egypt-a-sectoral-and-geographical-analysis-focusing-on-private-establishments-1996-2017-2/>

⁶⁸"Economic Indicators" Gafi <https://gafi.gov.eg/English/whyegypt/Pages/Economical-Indicators.aspx>

⁶⁹Assaad, Ragui. Krafft, Caroline. Rahman, W. Khandker and Selwaness, Irène. "Job Creation in Egypt: A Sectoral and Geographical Analysis Focusing on Private Establishments 1996-2017" Economic Research Forum (ERF), December 2019. <https://erf.org.eg/publications/job-creation-in-egypt-a-sectoral-and-geographical-analysis-focusing-on-private-establishments-1996-2017-2/>

⁷⁰"Destinations Egypt: Outsourcing Destination Guide". Outsourcing Verband <http://beta.itida.gov.eg/En/Brochures/Outsourcing%20Destination%20Guide%20EGYPT.pdf>



6. Insights and Recommendations

6.1. Key Trends and Insights

In this section we present some key trends we have identified that are pertinent to the impact of the Fourth Industrial Revolution on Egypt.

6.1.1. The structure of the labour market and the relationship between employers and employees are changing

- ▶ Many blue-collar jobs are being transformed through platform-based models, and that includes areas like domestic services and maintenance. Demand for blue collar workers is shifting towards platform-based solutions like Uber, Careem, FilKhedma, SWVL, and Trella, so a large portion of the labour force is finding ways to up-skill and become platform ready.
- ▶ The growth of the gig economy is also affecting white collar jobs. A lot more workers are finding jobs through the gig economy rather than through traditional employment. Employment is becoming more short-term, indirect, and platform driven, and less about full-time, long term relations between employer and worker. This, along with the point above, raises concerns around matters like labour contracts, social insurance, and healthcare provision for those kinds of workers.
- ▶ The informal economy, which is dominant in Egypt, is following the transformation to the digital economy. Some informal vendors are moving from traditional selling points to informal selling on social media platforms.
- ▶ Rather than fixation on formalizing the informal economy, there is a need for creative thinking on how to engage with these activities for the benefit of the workers and the economy at large. One example would be partnerships with tax breaks and other incentives, including encouragement for businesses that cater to development priorities, such as health and education, and that employ women and other marginalized groups.
- ▶ Technology offers the possibility of flexible work, and hence can play a role in enabling work opportunities for women, increasing their participation in the labour force.

6.1.2. The skills demanded by the market are changing

- ▶ There is an increase in digitally literate jobs in most major sectors, including ones as traditional as manufacturing and agriculture. More and more jobs that require digital literacy are beginning to surface and the local labour is proving to be capable of adapting, e.g. it is possible for illiterate adults and those with middle-school certificates to navigate through an application like Uber on their smartphone.
- ▶ In a low salary country like Egypt, technology transformations are more likely to be driven by value and efficiency factors than they are by cost. In the context of local technology companies, replacing some white-collar jobs with technology will not only improve the quality of delivery, it will also generate more data for analytics and other purposes, deeming the value of replacement significantly higher than that of manual labour.

6.1.3. Some businesses are transforming, but many are not ready

- ▶ The ongoing redesigning of supply chains is seeing a lot of companies that have been traditionally doing B2B start to approach consumers directly, including vendors approaching consumer markets across borders.
- ▶ The awareness and knowledge of managing technological and digital transitions on an institutional and organizational levels is very minimal amongst those in leadership positions.

6.1.4. Some external factors are having a notable impact on labour demand

- ▶ Automation in other countries and markets might affect Egypt's local jobs. Multinationals outsourcing their call centers in Egypt are expected to eventually shut down their operations in the country if and when they automate that function elsewhere in the world. The same thing could apply to car assembly manufacturers and other sectors. Rather than using local manual labour, industrial giants might opt to benefit from automated solutions elsewhere to guarantee delivery time and quality of finished products, and that could eventually lead to the currently discussed deglobalization of supply chains, a trend the COVID-19 pandemic may intensify. Governments and private sector players worldwide are talking about potential deglobalization, and many countries want to have their supply chains become more valuable or strategic by localizing as much of it as possible rather than the complete reliance on efficient but global supply chains.
- ▶ The global economic repercussions of COVID-19 are prompting international companies to scout for relatively cheaper remote talent in markets like Egypt. This means that large international corporations and other global players will soon be competing with local Egyptian companies for the already scarce local software development and tech talent.

6.1.5. The supply side of labour is reacting but the gap between demand and supply in Egypt is growing

- ▶ Traditionally engineers and IT scientists would become more business minded throughout their careers, but now it works both ways. Domain experts⁷¹ from all disciplines are finding it more and more accessible to transform into tech roles due to the evolution of high-level programming languages and the accessibility of education and resources online and otherwise. There is a need for cross skilling between the different professions, tech and otherwise, to generate technology driven services, especially in areas such as health and education.
- ▶ The market has very little influence on educational institutions and there is a strong disconnect between the two. Prominent universities, for example, are large in size so their movements and reactions to the rapidly changing market demands tend to be slow.
- ▶ There's an inherent problem leading to having an unfit labour force with the needed skills, and that mostly results from weak education systems that gives graduates the entitlement of an education and a need for an office job without actually providing them with the skills demanded by today's labour market.
- ▶ With the slowdown of the economy due to the COVID-19 crisis, particularly the fall in revenues of tourism, Suez Canal and remittances, Egypt is likely to witness cyclical unemployment alongside its endemic structural unemployment.

6.2. Policy Recommendations

- ▶ Technologies of the Fourth Industrial Revolution will undoubtedly have an impact on the fundamental structure of the labour market. The way Egypt will be able to reap the benefits, in terms of increased productivity and growth, and mitigate adverse effects – inequality, job losses and precarious work, is decisively a factor of the policy reforms that will be introduced.

Developing the skills needed for the 4th industrial revolution in Egypt: private sector incentives, educational reform

- ITC expertise is in high demand and will continue to grow in the future. A key constraint to the development of competencies in the sector is the reluctance of companies to hire youth with no experience and invest in their

⁷¹Domain experts in the software and technology context are subject-matter experts who guide and educate the technology team throughout the development process. They often have deep expertise in the field of application and their input is crucial to the development of successful market-responsive technology products.

initial training and grooming. Such a reluctance is the function of short-term considerations among individual companies, as well as of the risk involved (in particular for smaller companies) in training workers that may then move to other jobs. Public incentives for the hiring of youth with no experience are thus economically justified. These can take the form of subsidies or fiscal deductions on wages and/or social insurance dues over the first year of employment.

- Digital skills should be included throughout all stages of academic programs; foundational technological knowledge and data science should become core university subjects across faculties.
- Increasing the digitalization of education delivery methods, and their accessibility
- Promoting collaboration and dialogue with the private sector at all levels, including in the design of curricula and to allow students more opportunities for work-based experiences before graduation; a new, more agile and responsive process for curricula adaptation and
- Public-private collaboration is called for; The government can also facilitate collaborations between private sector companies and educational institutions, public or private, to focus educational output and generate economies of scale;
- The pace of economic transformation has and will continue to accelerate in the future; the “skills of the future” place a large premium on adaptability; learning how to learn, the ability to transfer knowledge across domains, interpersonal competencies, creative problem solving and critical thinking, are increasingly important employability factors.
- Support industry driven re-skilling initiatives to promote new skills acquisition in the labour force, including through fiscal incentives and public-private collaborations such as subsidized apprenticeships and subsidized on-the-job trainings.
- Partial wage/social insurance subsidies/tax breaks, or training incentives can also incentivize companies that embrace automated solutions in redeploying and re-skilling their workforce.
- ITC lifelong learning programs on core ITC competencies for adults, both for white collar and blue-collar jobs, should be widely expanded; the culture of life-long learning itself would be worth public awareness raising campaigns.

A conducive data environment: ITC infrastructures, regulation

The 4th industrial revolution is driven by “data”, an unprecedented transformation in the production and use of (new and old) forms of information. The government has a key role to play in shaping the “data environment”.

- ▶ Clearly the ability for Egypt to ride the 4th industrial revolution wave is dependent on its IT infrastructure. Public investments in this sector, even more than in other sectors, require a close association with the ITC industry. Connectivity, bandwidth and cloud computing are essential to support growing local sectors and to attract global technology companies.
- ▶ Creating a regulatory framework for new technologies, particularly cloud computing and data governance, will unleash the growth of many local sectors like fintech and it will attract large global corporations to locate their technology operations and investments in Egypt.
- ▶ Encouraging competition in data driven innovation to avoid market concentration and ensure a level playing field for businesses that rely on data as their assets.
- ▶ Improve collection and curation of national data and increase digital access to public government data to allow private actors to better plan and operate.

Promoting tech start-ups and local R&D

- ▶ Expanding investments in technology-driven companies in the form of VC investments can accelerate the digitalization agenda and move the country towards realizing its development goals. Private funds can be leveraged and attracted through various mechanisms including the insertion of conditionality clauses in large government procurement contracts that would require global and regional private sector players to build the capacity of local companies, source local components for their projects, and transfer some of their knowledge to local businesses.
- ▶ More broadly, fiscal incentives for research and development and training of personnel to companies in the ITC sector are called for to stimulate the development of local knowledge and capacities and allow the local industry to claim a place on the regional and world stages.

Social protection

- The discussions on a universal basic income brought up during the COVID-19 crisis, and cash support to the most vulnerable, may be considered as a first step in the direction of increased public spending in social insurance and safety nets. The dramatic economic and social transformations that are before us may accentuate inequalities and economic insecurity. As witnessed in the history of prior industrial revolutions, very real risks to sociopolitical stability. Substantial social policy reforms are required to balance risks and opportunities across the society. A system of universal unemployment benefits, linked/conditioned to career guidance, re-skilling and placement, is thus a necessary corollary to a growing, rapidly transforming Egyptian economy.

Accelerating Digital Transformation

- Incentives for SMEs and large industrial corporations to digitize and adopt new technologies like ERP systems and other solutions that streamline their processes and operations by offering support and technical assistance.



7. Annotated Bibliography

1.	The Future of Work: Regional Perspectives (May 2017)	African Development Bank Asian Development Bank European Bank for Reconstruction and Development Inter-American Development Bank	This study is broken down into five chapters exploring the impact of technological progress on the future of work in developing and emerging economies, honing in on 1) Africa, 2) Developing Asia, 3) Emerging Europe, 4) Central Asia and Southern and Eastern Mediterranean, and in 5) Latin America and the Caribbean. The writers explore regional perspectives on how the role of technology can both aid in the potential of developing economies to grow faster and attain higher levels of prosperity in shorter timespans, but also considers the impact of such breakthroughs displacing human labour and inflating income inequality, as well as the role technology could play in aiding informal or contingent work. This body of work aims to contribute to the perspective of regional economies. It diverges from the dominant body of literature initiated from the perspectives of advanced economies, the results of which cannot necessarily apply to the economic, demographic, educational levels, and migration patterns of developing economies. One of the major arguments this paper makes is that the biggest risk for developing countries would be to miss out on the technological revolution and fail to properly take advantage of technological progress on growing faster and more rapidly than before. The paper grounds its review in this perspective, aiming to help countries maximize their opportunities, while addressing potential risks and challenges they may face. The authors argue that in order to manage the transition effectively, it is important to create additional fiscal opportunities as well as manage ways to redistribute income. The authors cite that new technologies can be used to help create these spaces for the policies, such as through (cashless) payments as well as creating strong tax administration and data security to avoid the potential of tax evasion. In regards to tax policies, the authors argue that governments should seek to find effective and efficient ways to redistribute income. One of the suggestions mentioned is putting a tax on robots, citing the work of Guerreiro, Rebelo, and Teles, 2018. Another suggestion is to provide an “implicit subsidy for job automation. Equality and fairness considerations may call for the opposite approach— phasing out subsidies for investment and implicit or explicit subsidization of jobs at risk of automation through lower taxes on labour and tax incentives for schemes enhancing human capital” (p. 22) However, finding the right balance will depend on country characteristics and preferences on growth and redistribution, as well as how finances can be used to bolster employee performance. Another tool is negative income taxes (NIT) and universal lump-sum transfers to all individuals financed through progressive income tax, also often called universal basic income (UBI). It is important to note how welfare costs may be higher in developing and emerging economies due to lesser-developed safety nets than in higher-income economies. As result, the risk of job dislocation is far higher for workers who do not have unemployment insurance or unemployment assistance, which will need to be managed carefully in policy considerations.
----	--	--	--

			The paper finds that with the increased transition of workers towards freelancing, self-employment and platform-enabled work such as Uber and Upwork allows workers to more productively and efficiently find work without wasting time searching for the right clients. While this offers ample opportunity for work, this type of workplaces the risk of access to social insurance. As it is more difficult to enforce and monitor self-employment workers in social security schemes or regulate tax control by law, governments will have to reflect on their level of enforcement to account for the extent platforms may increase labour decentralization and increase the ranks of self-employment, health and pensions coverage, which will likely be declining for a large portion of society.
2.	Race Against The Machine: How the Digital Revolution is Accelerating Innovation, Driving productivity, and Irreversibly Transforming Employment and the Economy (2011)	Erik Brynjolfsson Andrew McAfee	“Race Against the Machine” explores how the Digital Revolution is one of the most important driving forces in the economy today, accelerating innovation, driving production, productivity and growth, and transforming employment demands, labour skills, wages, and economies at large. While many have written on the impact of technological progress on economies, the authors posit that the impact on employment is not well understood or fully appreciated, and aim to highlight the key potentials rapid technological advancement has on the world of work, focusing on the role and impact of accelerating technology outpacing worker skills, leaving many workers worse off despite overall economic advancement. For example, the authors cite the example of the impact of the Great Recession on why important measures of American economic health stopped growing robustly are not only due to the repercussions of the recession and that the pace of technological innovation has slowed down, but rather that the pace of technological innovation has increased so rapidly it has left many workers behind, “at race against the machine.” The authors argue that the race against the machine - in particular, improvements in computer hardware, software, and networks - have not only encroached on and outpaced the ability of individual workers to keep up, but that technological progress have even outpaced the ability of present-day organizations, institutions, policies, and individual and societal mindsets. They continue to argue that this perspective is what has contributed to increased globalization, but rather than viewing it from a negative perspective, the authors recognize that digital technologies have made some skills obsolete and rendered many employees’ skills useless to their employers, but find that other human skills are more valuable than ever. The authors identify themselves as “digital optimists” and find “the root of our problems is not that we’re in a Great Recession, or a Great Stagnation, but rather that we are in the early throes of a Great Restructuring,” with potential opportunities found in increasing organizational innovation and equipping human labourers with the necessary skills to turn machines into allies. Some evidence-substantiated arguments made by the authors include that the economic consequences of rapid technological innovation are seen in the divergence between: - Higher -skilled and lower-skilled workers, - Superstars and everyone else, and; - Capital and labour. The study discusses the phenomena behind why employees and organizations are lagging behind technology to highlight opportunities and strategies available to “allow human workers to race ahead with machines instead of racing against them.”
3.	Dialogue Series on New Economic and Social Frontiers Shaping the New Economy in the Fourth Industrial Revolution (January 2019)	Centre for the New Economy and Society	This white paper is the summary of a set of international, multi-stakeholder dialogues organized by the World Economic Forum’s Centre for the New Economy and Society under the umbrella of the Dialogue Series on New Economic and Social Frontiers. The series includes the Centre’s three Global Future Councils as well as representative businesses, governments, members of civil society and the academic body to identify the most urgent challenges at the intersection of technology, economics and society, and to explore a range of potential interventions to address them.

			The paper finds that with the increased transition of workers towards freelancing, self-employment and platform-enabled work such as Uber and Upwork allows workers to more productively and efficiently find work without wasting time searching for the right clients. While this offers ample opportunity for work, this type of workplaces the risk of access to social insurance. As it is more difficult to enforce and monitor self-employment workers in social security schemes or regulate tax control by law, governments will have to reflect on their level of enforcement to account for the extent platforms may increase labour decentralization and increase the ranks of self-employment, health and pensions coverage, which will likely be declining for a large portion of society.
4.	The Future of Work? Work of the Future! On how artificial intelligence, robotics and automation are transforming jobs and the economy in Europe (2019)	Michel Servos	This paper presents a thoughtful assessment of current trends and implications of technological advancement in the present day. It highlights how artificial intelligence and technologies such as self-driving cars previously conceptualized as science fiction are rapidly manifesting into existing reality and require an immediate practical approach to safeguard the future of work. The author cites many example jobs that have encroached on traditional labour skills, such as of the work of assistants, drivers, lawyers, security guards, sales assistants, call center operators, etc. and show how their role may still be necessary, but their number may be reduced and the content of their tasks will become more sophisticated, requiring a higher skills level in order to work in tandem with the vast efficiency of technology. The paper presents an overview of previous labour market transformations and examines how automation is changing the environment. It also analyzes the specific impact of AI and robotics in labour markets, citing specific examples of the changing nature of the work force, as well as the implications such technological advancements have on education system and imagining new forms of work, such as the increased availability and use of massive open online courses (MOOCs) and its impact on qualification systems, as well as the need for more personalized provision of skills. In later chapters, the author discusses the AI ecosystems in Europe, and highlights how organization of work can be reorganized. The author also discusses the potential implications such changes may have on society. Important numbers: - Recent forecasts suggest that global spending on robots will be USD 188 billion in 2020, up from less than half that amount in 2016. - By 2025, the worldwide AI market is forecasted to grow to USD 59 billion, a significant increase from the USD 1.8 billion spent in 2016. While the extensive uptake of AI and robotics is likely to generate higher productivity growth, which is urgently needed in ageing societies, it will also bring certain challenges.
5	The Future of Work and Skills in ETF Partner Countries (2019)	European Training Foundation	This Issues Paper analyses the impact of global developments on skills demand in the ETF's partner countries and discusses implications for policy reforms to manage the transition of education, training and lifelong learning systems of the future. Some of the biggest future drivers impacting work and skills are digitalization, automation and robotics, especially in routine occupations, although uncertainties about the magnitude of the impacts remain. The paper states that the change in work and skills culture will require changes in human attitudes and behavior. It also cites the major challenges affecting the countries' ability to cope with such changes as: the relative size of the youth population, participation in tertiary education and public expenditure on education as a percentage of countries' gross domestic product (GDP), and employment by broad economic sectors. The paper finds that some of the specific challenges faced by the ETF's partner countries are: - Digitalization as a driver of diversification of economic structures; automation as a threat to foreign direct investments (FDIs) and offshoring; - Challenges of labour markets, especially youth and female unemployment and inequality; - Demographic challenges together with migration flows and 'brain drain'; - Impacts of climate change and diminishing natural resources; and - Increasing political instability.

			One of the important recommendations for further developing work and skills in these countries highlight the importance of creating a future-oriented culture, mindsets and corresponding foresight exercises. Improving the economy and mitigating socio economic issues, such as corruption and inequality, are also some of the key conditions the paper recommends studying in order to provide sufficient investments and achieve progress in education, vocational training and lifelong learning system reforms.
6.	The Future of Jobs and Skills in the Middle East and North Africa Preparing the Region for the Fourth Industrial Revolution (May 2017)	World Economic Forum	This Executive Briefing overviews education and work in the Middle East and North Africa by using available data through a research partnership conducted with LinkedIn to provide an overview of the region's education, skills and job agenda. The purpose of the study is to address reforms needed to ensure MENA's youth can take advantage of new opportunities coming their way, and include insight on how to create multi-stakeholder collaborations to help close skills and gender gaps in the region. Key statistics (extracted from page iii): - The World Economic Forum's Human Capital Index finds that the Middle East and North Africa (MENA) region as a whole currently only captures 62% of its full human capital potential (compared to a global average of 65%); - Three common themes characterize MENA's labour markets: - o Low but increasing levels of workforce participation by women; - o High rates of unemployment and under-employment, especially among the young and relatively well-educated; - o Large but decreasing shares of public sector employment. - o Marked differences between economies in the share of high, medium and low skilled jobs, the prevalence of informal work and the reliance on foreign workers. - Across the Middle East and North Africa, a number of countries have improved the educational achievement of their younger generations at notable rates and, by 2030, the region is set to expand its tertiary educated talent pool by 50%. However, youth unemployment in the MENA region stands at 31% and university graduates are making up nearly 30% of the total unemployed pool. - Workforce participation gender gaps currently remain wide across the region, ranging from just over 40% in Kuwait and Qatar to nearly 80% in Algeria and Jordan, reflecting an inefficient use of education investments. - Across the region, high-skilled employment stands at 21% on average, while middle-skilled roles account for 66% of all formal sector jobs. The United Arab Emirates (UAE), Egypt, Jordan and Saudi Arabia lead the way in the local availability of high-skilled jobs. - o Some of the most common types of high-skilled employment in the MENA region include commercial bankers, corporate finance specialists and accountants, schoolteachers and academics, engineers, quality assurance professionals and information, technology consultants, according to data from LinkedIn. - It has been estimated that 41% of all work activities in Kuwait are susceptible to automation, as are 46% in Bahrain and Saudi Arabia, 47% in the UAE, 49% in Egypt, 50% in Morocco and Turkey and 52% in Qatar. o In addition, whether jobs are declining, stable or growing, they are going through major changes to their skills profile. The World Economic Forum's Future of Jobs analysis found that, by 2020, 21% of core skills in the countries of the Gulf Cooperation Council and 41% of those in Turkey will be different compared to skills that were needed in 2015. o At the same time, across the MENA region, substantial potential exists for creating high value-adding formal sector jobs in a number of sectors, skills levels and work formats. The authors argue that preparing for changes in the market and current challenges require broad reforms and "agile, iterative public-private collaboration efforts," citing the Forum's New Vision for Arab Employment and Gender Parity Task Forces as one of the key initiatives helping pave the way to closing to closing skills gaps and gender gaps to help the region prepare for the future of work.

			It will be very important for countries to position themselves in global ICT-enabled services as well as the ICT-outsourcing sector. In order to achieve this Egypt and the MENA region will have to invest in vocational training.
7.	FUTURE POSITIVE: How Companies Can Tap Into Employee Optimism to Navigate Tomorrow's Workplace	Joseph B. Fuller Judith K. Wallenstein Manjari Raman Alice de Chalendar	This paper presents a thoughtful assessment of current trends and the unprecedented rate of change and innovation in the last two decades have created a lot of uncertainty and anxiety, with much media attention focusing in on how rapid technological advances are a source of worry and fear for employees and societies. This paper, conducted by Harvard Business School's Project on Managing the Future of Work and Boston Consulting Group's Henderson Institute, conducted two global surveys in order to map out the readiness of companies and workers to adapt to the changes of technology in the workplace. The first survey honed in on 15 major work force changes and included 11,000 middle-skills workers from 11 countries in order to canvas the impact felt by those with education levels less than four-year bachelor's degree, and the second survey polled 6,500 C-suite and senior business leaders in 8 countries in order to garner how companies were able to tackle 17 major shifts. Interesting findings: - Of the 15 forces, workers had low expectations of their governments playing a role in protecting them from technology (listed 15th). Instead, workers demonstrated a high sense of pragmatism, recognizing that their best defense against technological encroachment on their work lay in more training at work and more education. - Workers were more than twice (46%) as likely to hold themselves responsible for preparing for the future, rather than believing the responsibility lay with national governments (20%) or their employers (19%). The studies also found that the high awareness of challenges by survey members of the workforce, as well as their readiness to improve their skills was an untapped opportunity for companies to prepare for the future of work. The author suggests that business leaders and policymakers need to consider how they can support workers in realizing their ambitions for the future, and that companies would have to gain clarity about their current skills base and the skills they will require in the future.
8.	The economics of artificial intelligence: Implications for the future of work	Ekkehard Ernst Rossana Merola Daniel Samaan	This paper discusses the impact of technological change and AI on creating widespread fear of job losses and fear in the rise of inequalities, outlining the rationale for such fear, such as the role of automation and robotization of skills previously required by human labour. Despite challenges, the author finds that the greatest opportunity for technological advancement to developing countries is by capitalization on the reduced costs of capital and potential for increased production, especially among low-skilled workers. However, the risks for further inequality also exists that need to be addressed for AI-based technological progress to be fully benefited from. The paper also calls for new forms of regulating the digital economy to prevent rises in market concentration, as well as the importance of data protection and privacy to help share the benefits of productivity growth through a combination of profit sharing, (digital) capital taxation and a reduction in working time. The paper calls for a moderately optimistic outlook on the opportunities and risks from artificial intelligence, provided policy-makers and social partners take the particular characteristics of these new technologies into account.
9.	The Work of the Future: Shaping Technology and Institutions Fall 2019 Report		This report examines several aspects of the interaction between work and technology, highlighting the positive and negative discourses of the last four decades to help shed light on the disconnect in the paradox of both rising productivity and stagnant incomes of the majority of workers. The report outlines many challenges introduced by technology creating a culture of fear amongst workers, however highlights how this could offer an opportunity for individuals and society to re-examine their relationship with work. The report discusses specific changes in the workplace due to automation, robotics and artificial intelligence, and discusses how this has resulted in a change of skills demand and job opportunities today, as well as in future workers. The authors provide potential policy responses, highlighting four broad areas, including education and training, where

			they believe future investments and incentives should be made by institutions in order to establish greater economic security for workers, as well as higher productivity for firms and broader opportunity for societies at large. This report offers important insights onto the potential of shaping the work of the future from a policy perspective, including rebalancing fiscal policies and recognizing workers as stakeholders, as well as discussion on technological leadership and economic growth.
10.	OECD Employment Outlook 2019 The Future of Work Highlights (2019)		OECD Employment Outlook estimates that 14% of existing jobs could disappear due to automation in the next 15 to 20 year, and an estimated 32% are likely to change radically as individual tasks become automated. The report examines the role globalization and the digital divide has on many people and communities, claiming that many have been left behind in the race to access new technologies. As a result, there have been inequalities along age, gender, and socio-economic lines. While the digital revolution has offered a lot of potential for economic growth, many have been stuck with risky working arrangements, with little pay and limited or no access to social protection. The paper also discusses the concern of “hollowing out” of the middle class as technological advancements have spurred many lower-quality and precarious jobs. In some countries, for example, non-standard workers are 40-50% less likely than standard employees to receive any form of income support when they are out-of-work. While the technological revolution offers ample opportunity to improve economic and social conditions, it is not guaranteed and the most important focus will be on having the right policies and institutions in place.
11.	The Future of Work: OECD Employment Outlook 2019		OECD’s Future of Work Initiative report is an assessment of how globalisation, technological progress and demographic change are transforming OECD labour markets, and its impact on worker skills and social policies. The OECD Employment Outlook provides policy makers with a thorough analysis of the challenges, as well as a detailed set of policy directions for maximizing opportunities to create better jobs for all. The key message of this OECD Employment Outlook is that the future of work is in our hands and will largely depend on the policy decisions countries make. It will be the nature of such policies that will allow workers, organizations and societies to harness the potential of the unprecedented digital and technological change while coping with the challenges it poses.
12.	Workforce of the future The competing forces shaping 2030		The report includes a number of important info graphs highlighting the various areas of concerns to both market leaders and policymakers, including the impact of technological innovation on the type of work, as well as work from full-time jobs dropping to potentially an all-time low by 2030 at 9%. The paper also discusses the transformation of talent, stating that many of the jobs of the future and required skills are virtually unknown, and pose a challenge in understanding the consequences this will have on HR, and how to attract, keep and motivate people. The report draws on research begun in 2007 by a team from PwC and the James Martin Institute for Science and Civilisation at the Said Business School in Oxford and a specially commissioned survey of 10,000 people in China, India, Germany, the UK and the US, and offers insight on how people think the workplace will evolve and how this will affect their employment prospects and future working lives. This paper discusses the forces shaping the future, highlighting how the future is taking place now, and separating four worlds of work by 2030, namely “Red World,” “Blue World,” “Green World, and “Yellow World.” - The Red World: Innovation Rules - The Blue World: Corporate is king - The Green World: Companies care - The Yellow World: Humans Come First
13.	We need a reskilling revolution. Here's how to make it happen	World Economic Forum	This paper argues that the massive impact of the digital revolution on our economic, social and environmental ecosystems calls for the importance of investing in people by both equipping individuals with the knowledge and skills to respond to the technological shifts, but also to

	(April 2019)		empower human capital more equally and inclusively. The authors cite the importance of investing in education as one of the most critical factors in promoting inclusive economic growth, requiring reform and investment in lifelong learning and re-skilling initiatives for people to remain competitive in a rapidly transforming world of work. According to the 2018 Future of Jobs Report, 75 million jobs are estimated to be displaced by 2022 in 20 major economies. However, the same technological advances and new ways of working have the potential of creating 133 million new jobs. These changes are due to a large-scale growth in new products and services that would allow people to work with machines and algorithms to meet the demands of demographic shifts as well as economic changes. In order to harness the potential gains of such changes, the authors state that at least 54% of all employees will need reskilling and up-skilling by 2022, but found that only 30% of employees at risk of job displacement from technological changes managed to receive training in the past year. Human capital most at risk of losing their job were those who were least likely to receive any training at all, and those most at risk are often the ones who are least likely to receive any retraining at all. The authors place the most emphasis on preparing workers through investment, and offer the statistic that transitioning 95% of at-risk workers in the United States into new jobs through reskilling may cost more than \$34 billion. As the private sector today could only reskill 25% of those workers, the authors argue that ushering in the new era would require business collaboration, government investment and public-private collaboration to lower costs and reach scale. The report also argues that the rapid changes offer a unique opportunity to hardwire the gender parity into the future of work and ensure women are equally represented in the highest-growth occupations and most in-demand skill sets. The authors cite how transitioning 95% of at-risk workers into new jobs in the U.S. cost more than \$34 billion. They propose that a mix of public-private partnerships would be the most effective and profitable way to reskill workers, state that if businesses could work together to create economies of scale they could collectively reskill 45% of at-risk workers, but if governments join this effort, they could re-skill as many as 77% of all at-risk workers. This would create a win-win situation, allowing governments to also “benefit from returns on investment in the form of increased tax returns and lower social costs and unemployment compensation (p. 2)”.
14.	Globalization 4.0 Shaping a New Global Architecture in the Age of the Fourth Industrial Revolution		The authors argue that the most important factors of Globalization 4.0 will depend on efforts in governance, on the government, corporate and international level. The report overviews potential opportunities for corporate arrangements, and also offers a review of existing efforts, with examples extracted from both global and domestic efforts. The authors highlight several key areas that need to be focused on for governance reform, particularly in: - Trade, finance, and global public goods, and climate change and the environment. - As well as the new areas of technology and cyber-security governance.
15.	AI, automation, and the future of work: Ten things to solve for Executive Briefing (June 2018)	McKinsey & Company	Research collected by McKinsey & Company suggests that by 2030 around 3 percent of the global workforce will need to change occupational categories. For example, jobs made up of physical activities in “highly predictable environments” or data processing or collection will likely see decline. Jobs on the rise will be those such as managers with difficult to automate activities, or physical jobs in “highly unpredictable environments” such as plumbing. Other occupations that will see increasing demand for work include teachers, nursing aides, and tech and other professionals. While managing this transition may pose a challenge for many governments and economies, governments should seek to take advantage of such opportunity and harness it rather than live in fear and scale back. Companies and governments should harness automation and AI to benefit from enhanced performance, productivity and social benefits as such technologies can allow economic surpluses and help societies manage workforce transition.

			The ten things to solve for in anticipation for such workforce structural change are: 1. Ensuring robust economic and productivity growth. 2. Fostering business dynamism a. Entrepreneurship and rapid business formation will boost productivity and also job creation, with a growing number of small businesses and large competitive environment for large businesses b. To secure this dynamic it will be important will require simpler, and evolved regulation and tax, as well as other incentives 3. Evolving education systems and learning for a changed workplace a. Policy makers will have to work with both traditional and nontraditional education providers in order to improve basic STEM skills through school systems and improved on-the-job training with an emphasis on creativity critical and systems thinking and adaptive and life-long learning b. Importance for solutions at scale 4. Investing in human capital a. Tax benefits and other incentives are required to encourage companies to invest in human capital, particularly as reversing the trend of low and declining public investment in worker training b. Policy makers need to encourage companies to invest in human capital, job creation, learning and capability building, and wage growth, similar to incentives for private sector to invest in other types of capital, such as R&D 5. Improving labour-market dynamism a. Information signals and digital platforms to match up people to work will help bolster vibrancy in the labour market b. According to the article, there is evidence that wages rise when more people change jobs, even if within a company c. Moreover, as more varieties of work and income-earning opportunities arise, such as the “gig economy,” policies must account for portability of benefits, worker classification, and wage variability 6. Redesigning work a. Workflow designs and workspace designs will need to adapt to era where man works closely with machine; this is both an opportunity and a challenge b. Organization is changing as more work becomes collaborative and companies become more flexible and non-hierarchical 7. Rethinking incomes a. As full of partial automation takes place, conditional transfers, support for mobility, universal basic income, and adapted social safety nets may need to be properly considered and tested in lieu of a reduction of employment or pressure on wages b. The key will be to find economically viable solutions, but also to account for the “multiple roles that work plays for workers, including providing not only income, but also meaning, purpose, and dignity.” 8. Rethinking transition support and safety nets for workers affected a. The disruptive role of technology will require that many workers have assistance in adjusting b. Best practice approaches to safety nets exists, but new approaches will have to be trialed and tested 9. Investing in drivers of demand for work 10. Embracing AI and automation safely
--	--	--	---



8. Annex A

List of Experts Interviewed

Name	Full Title/Position	Date of Interview
Dr. Sally Golestan Radwan	Special Advisor of AI to the Minister of Communications and Information Technology	27 April 2020
Dr. Mona Said	Labour Economist and former Chair of Economics Department at AUC	27 April 2020
Islam Zekry	Chief Data Officer at Commercial International Bank Egypt (CIB)	27 April 2020
Hany Soliman	General Manager at PayTabs Egypt	27 April 2020
Dr. Amr Kais	Vice President of Strategy and Business Development at AvidBeam	29 April 2020
Loay El Shawarby	Legal Expert and Angel Investor	29 April 2020
Dr. Abla Abdel Latif	Executive Director at the Egyptian Centre of Economic Studies	4 May 2020
Dr. Gamal Elsayed	Special Advisor of AI to the Minister of Communications and Information Technology	27 April 2020

Ameer Sherif	Cofounder and CEO at BasharSoft (Wuzzuf and Forasna)	4 June 2020
Mohamed Abdelmottaleb	Managing Partner and Founder at XPay	4 June 2020
Ahmed Amin	Founding Partner at MaxAB	4 June 2020
Ahmed Ellaithy	Senior Director of Technology Transfer Office at AUC	8 June 2020
Mohamed Kharma	Cofounder at Emkay Foods and former Executive Board Member at Tawfeer for Food Products (Kazyon)	13 June 2020

This project is funded by:
the Swedish International
Development Cooperation
Agency (SIDA)



Contact Details

Email: adwa@ilo.org

Address: 13 Brazil St., Zamalek, 11211, Cairo, Egypt
ilo.org/Cairo | [Twitter](#) | [Facebook](#) | [YouTube](#)