Introduction

Previous industrial revolutions started with incredible inventions that created a large-scale and cross-border impact, causing productivity to grow exponentially while restructuring existing skills and jobs. The first revolution started when water and steam were used as an energy source for machine production. The second brought electricity to humanity, and launched the mass production of goods and services, thus creating wealthy entrepreneurs and a well-off middle-class, while most workers were villagers and migrants. The third revolution was a turning point for current generations: information and communication technologies (ICT) enhanced productivity and growth, especially where ICT complemented other factors of production.

The world is currently experiencing the Fourth Industrial Revolution, where gaps and differences between the physical, biological and digital worlds are shrinking. It builds on the Third Industrial Revolution, with ICT as its cornerstone. However, the velocity of change and the increasing number of innovations during the Fourth Industrial Revolution are unprecedented. This revolution is making many jobs obsolete, while creating new sets of jobs. This has pushed companies worldwide and across all sectors to rush to capture in their business models the growth potential associated with adopting new technologies. For instance, it is expected that by 2022, 85 per cent of companies based in the United States of America will adopt user and entity big data analytics, while 70 per cent plan to integrate the Internet of Things (IoT), explore web and app-enabled markets, and take advantage of machine learning and cloud computing.[4]

Purpose and scope of the present report

The commitment of the Economic and Social Commission for Western Asia (ESCWA) to leaving no one behind places it at the forefront of efforts to pioneer creative initiatives and unique technical assistance, so as to assist Arab countries in creating sufficient new and innovative jobs, updating their citizens' skill set, and reducing labour market mismatches. To do so, ESCWA started an initiative to investigate the future of work in the Arab region. Part of this initiative was to develop the ESCWA Skills Monitor: a new and up-to-date assessment tool that is granulated enough to focus mainly on the quantity and quality of skills. This state-of-the-art tool will help countries with low dynamic data capacity to formulate advanced policies and strategies that tackle changes in skills, sudden shocks to labour markets, including those related to the Fourth Industrial Revolution, Pandemics and conflicts among others. Using the Skills Monitor, the present report focuses on the unique skills, jobs and job families demanded in the Arab region's job markets and matches them with global trends.[5] This includes skills and

jobs related to the Fourth Industrial Revolution, traditional skills, and jobs modalities dictated by the COVID-19 pandemic over the period June 2020 – March 2022.

The ESCWA Skills Monitor will enable member States to swiftly monitor demand for newly needed skills, thus adapting existing skills. The Skills Monitor uses big-data mining to ensure a more dynamic and agile monitoring platform for countries to assess their demanded skills and allow them to develop suitable upskilling and reskilling programmes. The Skills Monitor is extended to capture all demanded skills, including those in the informal sector. In addition to the demand for skills, the ESCWA Skills Monitor also assesses the level of inclusiveness (gender, young people and people with disabilities) in private sector employment, sector development, job growth predictions, and SDG mapping, among others.

Data analysed in the present report was collected during the COVID-19 pandemic, in the midst of the world's efforts to digitize tasks and job activities, thus pushing the global demand of related skills to record highs. The report aims to assist member States in identifying ways to promote sustainable technological diffusion, productive and inclusive employment and decent work, as stipulated in SDG 8. The report examines the current status of skills and shows the kind of skills demanded in 1.7 million online job openings in the Arab region.

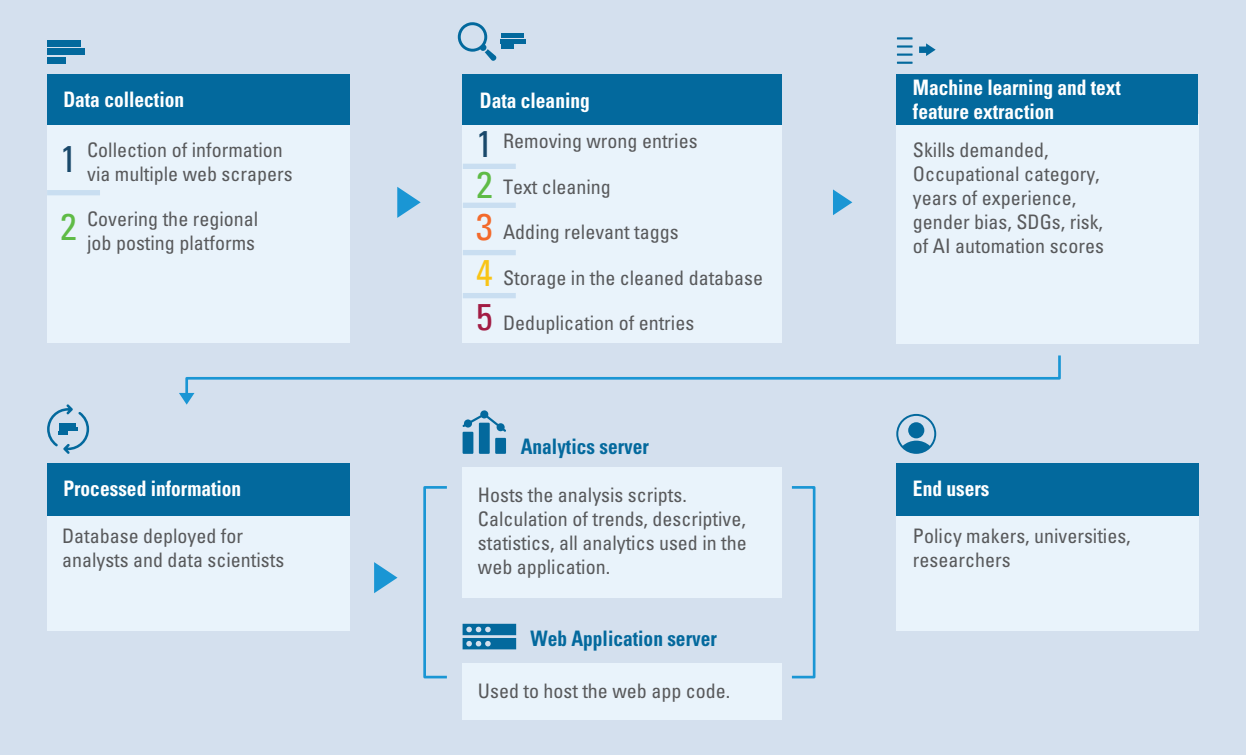
Overview of the ESCWA Skills Monitor

The present report relies on a wealth of data collected by the ESCWA Skills Monitor, a data- and AI-driven tool built inhouse for the collection, processing and analysis of online job openings in the Arab region.[6] To ensure the most complete coverage of the online job market, information from over 100 platforms was collected, covering 19 ESCWA member States. Gulf Cooperation Council (GCC) countries, Egypt, Jordan and Lebanon have the highest number of collected online jobs. The collection process, also referred to as data pipeline, is illustrated in figure 1.

The data collection, done on a once a week basis, captures the latest job postings in the Arab region from the list of platforms. The newly collected postings are cleaned of unusable characters, tagged by language, and then compared with previous data in our existing database of jobs to ensure their uniqueness across the various platforms, so as to make them "unique job openings". Machine learning and natural language processing techniques are then leveraged to extract the relevant features from the job opening, starting with the different skills mentioned and their types (hard or technical/soft or human skills). The years of required experience are extracted using a set of regular expressions. Gender bias in the language of the posting, or explicit gender specification from the employer, are tagged. The job title text is used to classify the occupational category according to the International Standard Classification of Occupations (ISCO) framework.[7] A comprehensive SDG dictionary[8] is used to match and tag the job description to relevant SDGs. The Skills Monitor is in continuous development: information collected to make better classifications, expand skills coverage, and provide more timely information.

The present report covers the period from June 2020 to March 2022. Over this period, the skills library of the Arab online job market reached around 12,500 unique hard skills,[9] which requires the development of an Arab skills taxonomy in the near future to better assess the quality of skills in the region.

Figure 1. Online job postings data collection process



Technological advancements in Arab countries

In the Arab region, most employment opportunities are in traditional jobs. Recently, unemployment across the Arab region has been increasing. Moreover, labour force participation is the lowest worldwide for women and young people, and the skills mismatch between demanded skills and attained education is considerably high. Furthermore, machine share in production in many Arab countries is dominating labour share, leading to lower average wages and increasing inequality.[10] The outbreak of the COVID-19 pandemic came at the disadvantage of regional employment-creation efforts, putting 39 million of the region's employees at risk of losing their jobs.[11] In addition, many Arab jobs may soon be at risk of automation, since most jobs are in the mid-skill and low-skill categories. Consequently, some Arab countries have begun reacting to changes in the workplace, and have started developing new policies to cope with the technological changes dictated by the COVID-19 pandemic and the Fourth Industrial Revolution. For instance, a set of coherent policies and strategies that cover the following dimensions should be formulated and updated in several Arab countries to cope with the new dynamics in the job market.

Education policies are required to upgrade education curriculums, train instructors, and provide graduates with the needed skills for the labour market. For example, in Saudi Arabia, the pioneering Misk Schools in Riyadh will become the first in the country to introduce AI into the classroom.[12] The school uses CENTURY, an AI-based platform to adapt learning to each student's individual strengths, weaknesses, behaviours and habits. Moreover, in Egypt, a draft law for establishing technological universities was approved by the cabinet in 2018.[13] The legislation aims to improve technical and vocational education and training (TVET), and boost the youth employability. As per the draft law, graduates of technical education will have the chance to apply to

technological universities, complete the postgraduate studies and secure better jobs.

Training plans and initiatives are needed to ensure that all individuals who are willing to acquire new (hard or soft) skills have the right opportunities to do so and to cope with labour market dynamics For example, in 2018, the United Arab Emirates launched an advanced skills strategy, based on a forward-thinking approach that sets out a national framework aimed at consolidating the concept of life-long learning for citizens and residents to achieve Centennial 2071 goals.[14] The strategy identifies the following four main categories for future skills: basic skills, competencies, personality traits, and specialized skills to provide life-long learners and students with flexible skills applicable along various professions and sectors. A programme to help individuals acquire advanced soft and technical skills was also launched.[15] Soft skills cover the following aspects: foundational literacies in science, technology and finance; critical thinking, creativity, communication and collaboration; and adaptability, leadership, social and cultural awareness, empathy and growth mindsets. This programme targets the following three main segments: students of the K-12 education system, graduates, and employees with more than 15 years of experience. The National Programme for Advanced Skills has an interactive self-assessment game called Future Fit, which enables individuals to assess themselves and discover which skills they are most proficient and to improve their other skills Moreover, in 2017, the "One million Arab coders" initiative provided free online training to 1 million young Arabs, to equip them with coding and programming skills, and prepare them for job opportunities in a knowledge and ICT-based economy.[16] Furthermore, to prepare young people for future jobs, the Abu Dhabi Centre for Technical and Vocational Education and Training initiated Emirates Skills, whose activities are focused on raising the awareness of career-based technical and vocational education among young Emiratis by organizing competitions, events, training programmes and technical career activities.[17] In Oman, royal decree No. 48/2016 established the National Training Fund to bridge the gap between available skills and the talent needs of the private sector and national projects, and to fund training programmes aligned with the national vision and priority sectors.[18] In 2018, the Omani Government adopted a strategy to equip young Omanis with the capabilities and skills to keep pace with the Fourth Industrial Revolution. In this context, the National Youth Program for Skills Development was launched to provide young Omanis with the skills of the future.[19]

Remote working regulations and frameworks are also needed to adapt the labour market in the Arab region to global trends imposed by the COVID-19 pandemic. Such regulations and frameworks are empowered by the use of digital platforms in all sectors, such as education, health and public administration. For example, in Jordan, a defence order was issued in 2020 to regulate remote work.[20] Workers who perform their work remotely in full for institutions and establishments are entitled to their full wages. In Morocco, a draft law to formalize remote working was prepared by the Ministry of Economy, allowing administrations to permit officials to work remotely for a maximum period of one year.[21] It indicates that the concerned administration should bear the costs of work-related facilities, including Internet, electronic devices, software, programmes, and other related tools. Remote workers also benefit from the same rights as other employees who maintain their duties from the office, including medical insurance in case of a work accident, or medical leave when indicated by a doctor's certificate.

AI strategies and policies should be developed to encourage the use of AI applications in critical sectors, while preparing the needed skills and legal frameworks, and ensuring respect for international AI principles and ethics. In 2018, Tunisia issued a national AI strategy to highlight its capabilities, ambitions, and vision of AI as a knowledge-intensive sector and a lever of sustainable and equitable development, while underscoring the ethical and economic challenges posed by this emerging technology.[22] In 2020, the Lebanese Ministry of Industry issued the National Artificial Intelligence Strategy in Lebanese Industry (2020-2050) for the industrial sector and other entities in various economic fields pertaining to the industrial sectors. Furthermore, in 2020,

Algeria announced its first national strategy for research and innovation in AI, aimed at building an innovative society and a generation of digitally skilled citizens.[23] The strategy aims to improve Algerian skills in AI through education, training and research, and to strengthen these capacities as a tool for development. In the United Arab Emirates, a national AI programme was launched that includes several training activities for government employees; summer and spring camp programmes for high school students, university students and government executives; and internship programmes aimed at bridging the gap in skills required in the technology sector, and supporting young people to enable them to meet future challenges in the rapidly changing technology sector.[24]

In the COVID-19 era, the delivery of public services through electronic channels gained an exceptional importance globally and in the Arab region. The availability of digital government policies and strategies is critical to develop such services. For example, in Kuwait, an e-government payment system, the Tasdid platform, has been established to facilitate the payment of electricity and water bills and of traffic and immigration fines.[25] In the United Arab Emirates, a unified e-portal for the self-employment of skilled personnel was launched to connect national talent with various programmes and services in the private and public sectors.[26] Companies can also use the portal to hire national talent. Moreover, the United Arab Emirates has developed multiple mobile apps to facilitate service provision, including Wajehni which provides professional guidance for fresh graduates to identify work and internship opportunities,[27] and the Salamah app targeted at employers, workers and doctors to instantly report any work-related injuries.

An innovation and entrepreneurship ecosystem is required to enable young people and fresh graduates to establish their own businesses, create more job opportunities, and harness new technologies in producing innovative solutions and applications. For example, in 2016, Jordan launched a financial education programme to deliver financial and entrepreneurial skills training to students in grades 7 to 12 across all public, private and refugee schools.[28] In addition to building competence in economics and accounting, the programme promotes twenty-first century skills such as critical thinking, negotiation and teamwork. Egypt has established many incubators, providing a stepping stone for local entrepreneurs. In 2010, the Egyptian Technology Innovation and Entrepreneurship Center was established to support young entrepreneurs in starting their own businesses.[29]

Including gender and other inclusion aspects in policies and plans is necessary to offer equal opportunities to all individuals. Such plans include digital accessibility plans for persons with disability to allow them to benefit equally from digital technologies. For example, in Tunisia, the European Bank for Reconstruction and Development established the Tunisia Women in Business Programme in 2018 to promote women entrepreneurship in the country and, more broadly, women's participation in business, by helping women-led small and medium enterprises (SMEs) access finance, know-how and non-financial business development services.[30] In 2021, Mauritania launched a project entitled "Vulnerable youth employability and socioeconomic integration support" to support Government efforts to ensure that women, young people (aged 15 to 24) and low-skilled primary and secondary school leavers were primarily targeted by the country's employment policy.[31] The project's main objective is to improve the quality of life for people aged 15 to 24 and belonging to the "not in education, employment, or training" group, especially young women, in the Brakna Region, one of the country's most disadvantaged regions, through skills development and entrepreneurship. In Lebanon, the Ministry of Education and Higher Education, with the support of the United Nations Children's Fund (UNICEF), launched a programme[32] to promote the development of inclusive education and ensure quality education for all children, including children with disabilities and learning difficulties. This programme targets 30 public schools in all governorates of Lebanon. Furthermore, both Oman and Qatar have invested in national e-accessibility strategies and programmes, enabling them to score high on the Digital Accessibility Rights Evaluation Index.