
Digital Transformation and Its Impact on Labor Markets in the Arab Region

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Abstract:

This study aims to analyze the impact of digital transformation on Arab labor markets amid rapid global shifts driven by information technology and artificial intelligence; to achieve this, the study adopts a descriptive-analytical methodology, reviewing theoretical literature and international reports while comparing the Arab digital reality with the global context. The findings reveal that digital transformation reshapes labor market structures by creating new digital-economy jobs while eroding routine, automatable positions, thereby shifting skill demand toward digital, analytical, and creative competencies.

Furthermore, a clear gap persists between education outputs and digital labor market requirements, alongside significant disparities in digital readiness among Arab countries; ultimately, digital transformation offers a genuine opportunity for employment and entrepreneurship, yet it poses challenges of structural unemployment, skill mismatches, and unequal access, necessitating effective educational, training, and legislative policies for a just transition toward the digital economy.

Keywords: Digital Transformation; Labor Market; Artificial Intelligence; Arab Countries; Digital Skills; Automation.

Jel Classification Codes : O33, J21, O53

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1. Introduction :

The contemporary world is witnessing accelerated and profound transformations driven by the digital revolution, encompassing artificial intelligence, automation, cloud computing, the Internet of Things, and digital platforms; these transformations are no longer confined solely to technical or productive aspects, but their impact has extended to reshape economic structures, patterns of institutional organization, the configuration of skills, and the very nature of jobs across various sectors, and in this context, digital transformation has become a central determinant in the reshaping of global labor markets, imposing a gradual shift from routine, automatable jobs to new roles founded on knowledge, innovation, and digital and complementary skills, accompanied by mounting pressures on education and training systems as well as employment policies. In the Arab region, this transformation assumes double significance given its coincidence with complex developmental and structural challenges such as high unemployment, a widening skills gap, weak productivity in certain economies, in addition to the pronounced disparity among Arab countries regarding digital infrastructure, technological readiness, and the capacity to absorb ongoing changes; while some Arab nations, particularly the Gulf states, have made considerable progress in digitization pathways, e-government services, and the digital economy, other countries continue to face difficulties related to underinvestment, fragile legislative environments, and a shortage of qualified competencies, a situation which renders the impact of digital transformation on the Arab labor market highly heterogeneous in terms of intensity, direction, and outcomes. Stemming from this perspective, this article seeks to analyze the impact of digital transformation on the labor market in Arab countries by combining a theoretical grounding of the phenomenon within its global context with a diagnosis of the reality of digital changes in the Arab world, then examining their repercussions on jobs, skills, economic sectors, and the most affected social groups, ultimately projecting the contours of the Arab labor market by the horizon of 2030; the article proceeds from the hypothesis that digital transformation, despite offering vast opportunities for creating new jobs, enhancing productivity, and expanding entrepreneurship, nonetheless deepens the risks of professional exclusion, structural unemployment, and the digital and skills divide unless accompanied by effective Arab policies in education, training, social protection, and digital governance.

2 .Digital Transformation, Artificial Intelligence, and the Labor Market: A Global Context

The Organisation for Economic Co-operation and Development defines the digital economy as “all economic activities that rely on the use of digital inputs, including digital technologies, digital infrastructure, digital services, and data, or those which the use of digital inputs significantly supports and enhances, encompassing all producers and consumers, including government” (OECD, 2020, p. 5). The past decade has witnessed a remarkable qualitative leap in digital transformation and the digital economy worldwide, the reflections and effects of which

have become clearly evident across most development indicators in all their dimensions; the digital economy continues to play a growing role in raising global gross domestic product, with its contribution reaching approximately 15.5% in 2025 (World Economic Forum, 2025), achieved through increased productivity, the stimulation of innovation, and the creation of new business ecosystems characterized by advanced digitization. Similarly, a study based on analyzing data from 279 Chinese cities between 2010 and 2022 concluded that each one-point increase in the digital economy index leads to a 0.267-point increase in the high-quality economic development index (statistical significance at 1%) (Wang, Liu, Chen, & Zhang, 2023, p. 5). Digital transformation and the digital economy have led to the creation of new job opportunities now traded in a new digital job market radically different from the traditional labor market; indicators suggest that 92% of job advertisements require mandatory or preferred digital skills, and all industries demand digital competencies at high rates (99% in information technology, 93% in manufacturing, 77% in transport and logistics) (National Skills Coalition, 2023, p. 12). Numerous studies have confirmed that the digitization of enterprises leads to a productivity increase ranging between 15% and 25% compared to enterprises not following the digital transformation path (Telefónica, 2023, para. 4), and according to a report published by KPMG Canada in 2024 covering more than 1,300 global companies, firms with advanced digital maturity and high digital capabilities achieved a 14% increase in net margin compared to their less digital counterparts (KPMG Canada, 2024, para. 6). Based on multiple indicators, it can be argued that the digital economy represents not merely a means for economic growth but rather a crucial strategic tool and an effective lever for reducing income distribution inequality (lowering the Gini index) and enhancing social inclusion, provided that this is accompanied by expanded access to technology and equal digital opportunities among members of society, especially marginalized groups (Ho, Ngoc, & Ho, 2025, p. 5). Digital transformation and the digital economy have contributed, in the context of urban settings through the adoption of Internet of Things technology and smart energy management systems, to improving energy consumption efficiency by a rate ranging between 10% and 30%, as urban digitization has proven markedly effective in reducing energy waste and enhancing environmental sustainability within smart city contexts (Wu, Lin, & Sun, 2023, p. 8); concerning foreign trade, digital transformation serves as a primary driver and accelerator of external trade (Wang, 2024), and modern theories in international economics consider it a factor explaining the occurrence and variation of foreign trade between countries and regions, for when digital transformation exceeds a certain threshold in a national economy, it subsequently acts to develop foreign trade. Artificial intelligence has become the main driving force of the Fourth Industrial Revolution, and numerous reports point to the positive contribution of this intelligence across many fields, having become a powerful driver for enhancing economic productivity and creating new job opportunities concentrated in the technology sector, software development, cybersecurity, and data analysis, thereby supporting economic growth and raising the efficiency of human capital. With the spread of

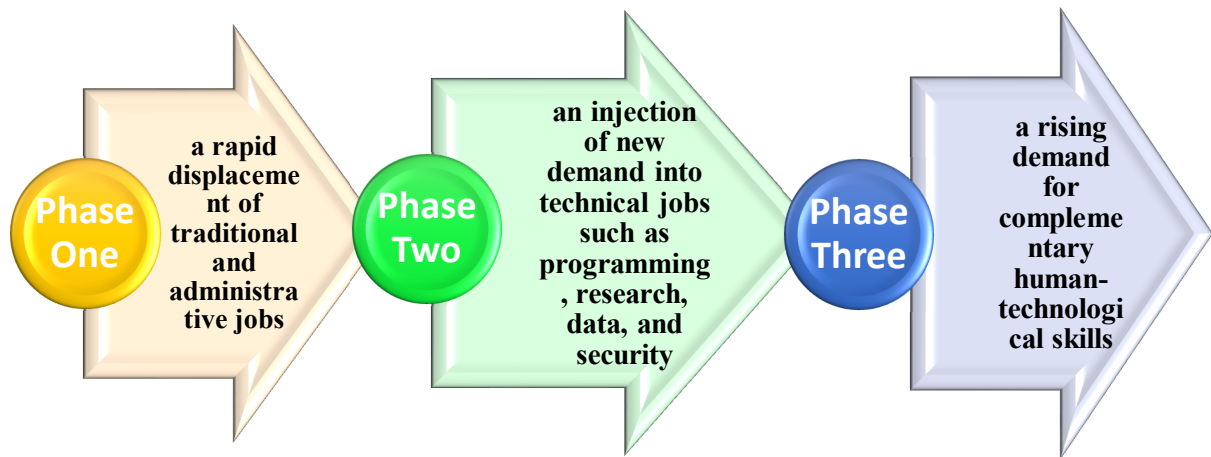
artificial intelligence, the market for education supported by this type of intelligence has expanded and witnessed rapid growth, making the slogan “lifelong learning” a tangible reality rather than a theoretical slogan; the size of this market was estimated at approximately 4 billion dollars in 2023, with a compound annual growth rate of 74% (Al-Azab & Al-Nashar, 2022, p. 16), which will undoubtedly enhance the development of the future workforce's skills. Regarding economic growth, artificial intelligence has been linked to increased GDP by improving production processes and reducing waste; projections indicate GDP improvement due to AI technologies in China by 26.1% and North America by 14.5% by around 2030, equivalent to 10.7 trillion dollars representing about 70% of the global impact, and the industry's contribution to GDP is expected to rise by at least 10% by 2030 thanks to the integration of AI technology (Price WaterhouseCoopers, 2018, p. 3). Moreover, artificial intelligence contributes in the health field to raising diagnostic accuracy by up to 30%, which has resulted in significant improvement in treatment outcomes, remarkable progress in epidemic management efficiency such as the Coronavirus pandemic, and notable advancement in developing specialized therapies. Artificial intelligence has become an effective tool for reducing cybersecurity risks and raising user confidence in digital technology, thereby giving a recognized impetus to the trend towards adopting the digital economy with complete reassurance and security; recent studies indicated that 2025 witnessed more than 60% of companies and organizations relying on artificial intelligence to support their cybersecurity systems (Xing, Chen, & Alshamrani, 2025, pp. 12-13), which has helped them reduce electronic attacks, raise the level of vital data protection, on the basis that AI has the ability to process large amounts of data, reduce duplicate operations, accelerate detection and response times to various security threats proactively, combat harmful and data-stealing bots, and serve as a means of securing authentication during access attempts to sensitive sites requiring additional protection, being more accurate and efficient compared to traditional cybersecurity tools. On another front, recent empirical evidence indicates that AI applications in smart cities achieve a reduction and rationalization in energy consumption exceeding 20%, with a tangible improvement in public service efficiency and citizens' quality of life (Wang, Liu, Chen, & Zhang, 2025, p. 12).

2.1 The Impact of Digital Transformation and Artificial Intelligence on Labor Demand

Statistics indicate that digital transformation has become the primary driver of labor market changes, changes that have begun to surface prominently, with 60% of employers considering the expansion of digital access (digital transformation) the most influential factor reshaping their businesses by 2030, accompanied by a new demand both quantitatively and qualitatively for jobs and skills. The eightfold increase in investment in digital technologies and AI technologies is the clearest evidence of the changing view of employers and projects towards the human resources they seek; in the language of recently recorded figures, 58% of employers globally expect automation

and robotics to transform their businesses, while the robot penetration rate has increased by 5% to 7% annually since 2020, and the average robot density rose to 162 units per 10,000 employees globally in 2023, double the figure from seven years prior (World Economic Forum, 2025, p. 23). Digital transformation and artificial intelligence remain the primary drivers changing organizations' demand for labor, involving the loss of traditional jobs on one hand and the emergence of digital roles based on advanced skills on the other, requiring speed in learning, training, and adaptation, for automation will gradually eliminate routine jobs and direct demand towards creative, analytical, and technical skills, with the necessity of continuous collective and individual professional training and development programs keeping pace with ongoing changes. The most significant manifestations of digital transformation's impact on labor demand can be recorded through the following angles: first, growing demand for new jobs related to digital technologies, as digital transformation, especially AI and process automation, has increased demand for specializations such as software development, data analysis, cybersecurity, and AI-related technologies, where it is expected that 170 million new jobs will be created in these sectors by 2030, representing a net increase of approximately 14% of total current jobs (World Economic Forum, 2025, p. 35); second, declining demand for routine jobs with repetitive tasks such as data entry and secretarial work due to their automation, which has allowed for increased productivity, reduced routine labor, and freed up time for higher-return activities; in this regard, statistics indicate that approximately 92 million jobs are expected to disappear or vanish by the end of the decade, equivalent to 8% of total current jobs, due to being replaced by automated digital processes, making the expected net global job growth 78 million (7%) as a net increase in the labor market until 2030; consequently, the proportion of jobs that will change or disappear due to digital transformation and automation is equivalent to 22% by 2030, encompassing both job losses and creations, an extremely significant impact that cannot be underestimated. Third, the impact of digital transformation on labor demand manifests itself as a “dual-demand structural shift” more than a decline in jobs, where there will be a strong trend towards highly specialized engineering and technical jobs driven by AI on one hand, and on the other hand, there will be rising demand for information security and research & development jobs—hybrid roles requiring complementary human skills based on digital thinking, flexibility, and collaboration, a dynamic illustrated in Figure 01 below .

Figure 01: The Process of Structural Shift in Labor Demand Resulting from Digital Transformation and Artificial Intelligence

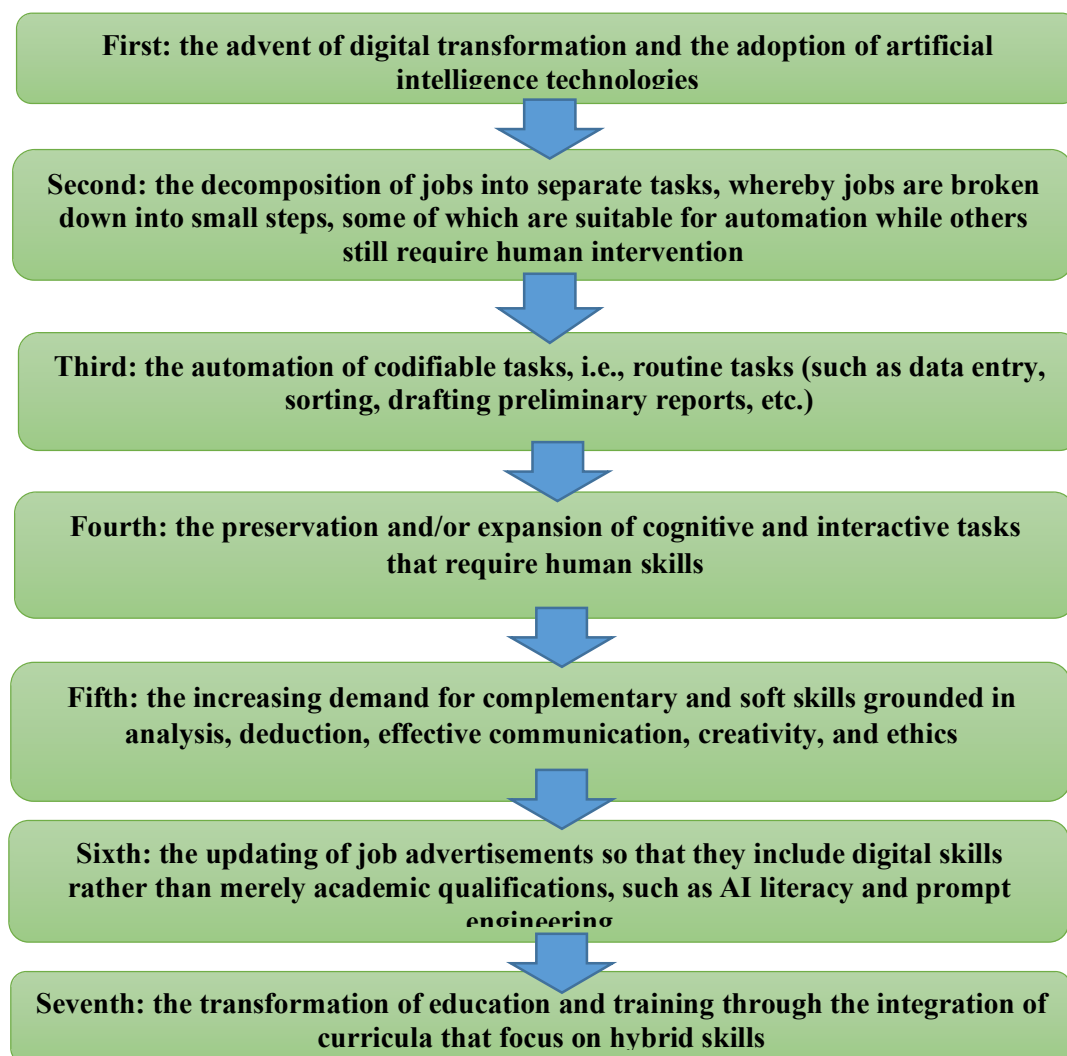


Source: Prepared by the authors

Fourth, increasing demand for digital and complementary (soft) skills, as business owners have become aware of the importance of technical skills (including AI and data analysis) alongside their attention to soft skills such as critical thinking, flexibility, and collaboration; 63% of them face a shortage of digital skills, and 85% plan to enhance worker training to meet this demand, so that by 2030, technical or digital skills will be a condition for entry and competition in the labor market, with no place for those who do not master them to remain in the job competition race; however, human soft and complementary skills will remain the differentiating element that ensures job sustainability and professional excellence, as the relationship is complementary rather than substitutive (World Economic Forum, 2025, p. 41). Data analysis of recent job advertisements in the most advanced countries in digital transformation shows that AI does not eliminate human value nor exclude human skills, but on the contrary, it values them and increases demand for them alongside its growing demand for technical and digital skills, for what is being replaced is routine, automatable tasks, while the importance of complementary human skills such as critical analysis, communication, creativity, ethics, and professional flexibility increases, supported by an increase of up to 50% in employer demand for these capabilities compared to traditional replaceable skills. Furthermore, an analytical study based on 12 million job advertisements (2018–2023) in the United States showed that wages for those with technical skills such as data analysts rose between 5% and 10% when accompanied by complementary skills (Mäkelä & Stephany, 2024, p. 15), which illustrates or rather confirms the importance of human skills as a complement to technical digital skills; for this reason, emerging job opportunities now require a sophisticated mix of technical and human capabilities, making those with hybrid skills more in demand in the new labor market at present. Fifth, generative AI tools enhance less experienced labor and reduce the skills gap between less experienced workers and more experienced ones, as AI spreads best

practices and organizational knowledge more broadly and efficiently, making the performance of new employees supported by AI better than that of more experienced employees without AI (Brynjolfsson, Li, & Raymond, 2023, p. 18); this complementary relationship between AI and human skills is conceptualized in Figure 02 .

Figure 02: Sequence of AI's Impact on Digital and Human Skills: Complementarity, Not Substitution



Source: Prepared by the authors

2.2 The Impact of Digital Transformation and Artificial Intelligence on Labor Supply

Labor supply, due to digital transformation and the adoption of AI models, has witnessed a profound transformation unprecedented in decades, as the matter is no longer limited to transforming the structure of individuals' offered skills but rather new models of labor supply have emerged that have imposed their presence increasingly, such as freelancing, remote work, and hybrid work, which have redirected the structuring of the labor market entirely, owing to the rapid spread of digitization and AI; these transformations have pushed labor supply towards raising qualitative supply based on purposeful competence rather than merely quantitative supply, which

has given a new definition to labor availability that now depends on technical readiness, adaptability, and the capacity for continuous learning. More specifically, job creation and sectoral transformation have occurred, as AI and digital transformation have brought about a real shift in the nature of labor supply, so that technical professions are no longer limited to technological sectors but have permeated the core of traditional sectors such as administration, transportation, and healthcare, making labor supply obligated to respond to the increasing demand for skills capable of dealing with AI in a way that combines human and technical skills jointly rather than separately; it is worth noting in this regard the qualitative orientation of labor supply rather than the quantitative orientation, searching for jobs with high-level, empowered added value instead of creating massive numbers of low-skilled jobs, as these transformations have provided an opportunity for workforce requalification to adapt them into analysts and managers of intelligent processes, and there is an expanding search in labor supply for jobs in technical fields such as programming, data science, cybersecurity, smart systems management, big data analytics, and digital maintenance (International Labour Organization, 2025, p. 7), alongside the transformation of traditional administrative tasks into jobs based on software and digital platforms. Furthermore, job reduction and restructuring are evident, as there is a notable decline and clear contraction in demand for repetitive routine tasks such as manual archiving and traditional financial transactions resulting from the reduced market need for low-skilled, easily replicable roles (Eurofound, 2023, para. 6). The emergence of new work models has accompanied these transformations in the labor market resulting from digital transformation and AI, foremost among them remote work, which has shifted from an exceptional measure imposed by the COVID-19 pandemic to a sustainable and adopted lifestyle, indeed becoming a strategic option for both organizations and workers alike; more than 20–30% of jobs have transitioned permanently to a remote model following the Coronavirus pandemic, while 55–60% of employees prefer the hybrid model combining traditional attendance and remote work (Gallup, 2024, p. 4). This represents a radical change in the nature of work offered, and the phenomenon of remote work has transcended being merely a luxury for employees to become a factor in productivity and innovation; a study conducted by Stanford University recorded a 13% increase in the productivity of remote work compared to traditional work, and companies are preparing for this permanent shift, with 74% of them planning to convert part of their workforce to permanent remote work. Moreover, artificial intelligence emerges as one of the main drivers reshaping the freelance labor market and its methods, having become a lifestyle model and an important opportunity to invest digital skills with unprecedented flexibility and independence by relying on available digital platforms in this field; with the rise of AI tools, the freelancing model has expanded as a method to achieve higher productivity, allowing access to new global markets and performing tasks with increasing efficiency and accuracy. Figures indicate that approximately 73% of self-employed freelancers worldwide rely primarily on the internet and digital platforms to manage their daily work, where the global freelance market value

is expected to exceed approximately 455 billion dollars by the end of this year, and all empirical evidence suggests that the future of skilled knowledge work is freelancing. According to research from the Future Workforce Index, while many traditional workers complain of burnout with rising uncertainty, skilled freelancers are highly satisfied and vibrant in their work: 78% of them are satisfied with their income compared to 64% of full-time employees, 83% say their work contributes positively to their physical, mental, and emotional well-being compared to 74% of full-time employees, 82% believe they have more and better job opportunities available than before compared to 63% of full-time employees, and 88% believe their skill sets are more in demand than ever before compared to 75% of full-time employees (Riyadat Al-Aamal, 2023, para. 8-10). Thus, freelancing offers its practitioners increased flexibility, greater earnings, and higher independence, yet at the same time, the freelance and independent work model faces several challenges, most importantly increasing global competition that poses challenges to income and work continuity, especially given the heavy reliance on digital platforms, alongside the fragility of social protection and the absence of legislation regulating this type of work that would ensure an acceptable level of social security and professional protection for freelancers. Additionally, digital transformation and AI have effectively and notably contributed to improving the quality and distribution of labor supply by enabling workers to use advanced technologies without the need to duplicate experiences or employ larger numbers, utilizing Augmented Reality (AR) technologies and remote maintenance to enable experienced professionals and specialists to directly assist and support field technicians, which has directly helped reduce training cycles compared to traditional methods, while also reducing travel costs and saving time; moreover, these technologies have reduced the skills gap existing between urban and rural areas, thereby contributing to achieving geographical developmental equity. Finally, as regards the widening skills gap within labor supply, studies from the McKinsey Global Institute indicate that 375 million workers worldwide—equivalent to 14% of the global workforce—will be forced to completely change their occupations or will need to acquire new skills over the next few years due to automation, digital transformation, and AI (Staffing Industry Analysts, 2023, para. 3). This transformation has already begun, as generative AI technologies now affect approximately one-third of knowledge-based jobs, which will lead to a redistribution of work rather than its disappearance, for jobs relying on human creativity, emotional intelligence, and complex social interaction will remain protected and fortified against future waves of automation and digital transformation; evidence of this is the rapid change in available skills, as approximately 39% of the skills currently possessed by workers will change or become obsolete within five years due to digital development, necessitating continuous training programs for workforce requalification.

3 .The General Landscape of Digital Changes in Arab Countries and Major Challenges (Abridged Version)

Most Arab countries have integrated digitization as a strategic objective within their national development visions (e.g., Saudi Vision 2030) and have adopted the common Arab Digital Agenda 2023–2033 (ESCWA, 2024, p. 7); nevertheless, the pace and depth of digital transformation vary enormously across the region, with Gulf states leading far ahead while others struggle with infrastructure and human capital deficits.

3.1 Digital Infrastructure

The 2024 Arab Digital Economy Index reveals a stark hierarchy: the UAE scores 75/100, followed by Saudi Arabia (72), Qatar (66), Bahrain and Kuwait (60 each), then Oman (59), while 11 Arab countries score below 50 (Arab Federation for the Digital Economy, 2024, p. 10), as shown in Table 1; although 4G coverage exceeds 90% in most Arab countries, 5G deployment remains limited to about 12% in Gulf states (International Telecommunication Union, 2023, p. 4), and data centers are heavily concentrated in the UAE (56) and Saudi Arabia (43), signaling a foundational advantage for cloud computing and digital sovereignty (Fierce, 2025, para. 5), while internet speeds continue their gradual improvement across the region.

Table 1: Arab Digital Economy Index 2024

Index /100	Country
75	UAE
72	Saudi Arabia
66	Qatar
60	Bahrain
60	Kuwait
59	Oman
53	Jordan
50–50	Tunisia/Egypt/Morocco
45	Algeria
44	Lebanon
<30	Remaining countries

Source: Report "The Arab Digital Economy Index 2024"

3.2 E-Government E Services and Electronic Maturity (GEMS Index)

The GEMS index for 2024 averaged 45% across the Arab region, up slightly from 43% in 2023, but with extreme variation: the UAE (96%), Saudi Arabia (95%), and Qatar lead the "advanced maturity" group (75–95%), while a second group (Morocco, Algeria, Tunisia, Palestine, Iraq) shows medium maturity, and a third group (Libya, Syria, Mauritania, Yemen, Somalia) remains below 25% (Institute of Technology and Computing Applications, 2024, p.

3); education and labor sectors perform best digitally, whereas health and tourism lag behind, and despite widespread smartphone use, electronic portals remain the primary channel for government services, with the digital divide reaching a staggering 98% gap between highest and lowest performers.

3.3 Technology Use Among Arab Individuals, Companies, and Societies

Internet users in the Arab world reached 348 million in 2025, or 70.2% of the population, up from 28.8% in 2012 (Orient Planet Research, 2025, para. 3), led by the UAE and Saudi Arabia with 99% penetration rates (Kemp, 2025, para. 4; DataReportal, 2025, para. 5); mobile phone penetration in Gulf countries exceeds 195%, while conflict-affected nations like Yemen, Sudan, and Somalia languish at 30–50% internet access, and social media usage stands at 46% of the population, concentrated in Egypt, Iraq, and Saudi Arabia, with youth under 35 constituting 62.8% of the region's population and driving digital adoption, though persistent gender and rural-urban gaps, alongside cybersecurity and data protection concerns, remain pressing challenges.

3.4 Digitization of the Education Sector in the Arab Region

The COVID-19 pandemic accelerated the official adoption of distance education across most Arab countries, as exemplified by Saudi Arabia's "Madrasati" platform covering all K-12 grades, and studies from the UAE show strong parental and stakeholder support for continued digital learning (Abdallah, 2018, p. 35); however, the digital divide still hampers progress, with many rural students lacking stable internet connections and teachers requiring further training, necessitating greater investment in digital infrastructure, public-private partnerships, and innovative content design.

3.5 Digital Economy and E-Commerce

The digital economy contributes on average 4–5% to Arab GDP, exceeding 10% in the UAE, Saudi Arabia, and Bahrain but falling below 2% in less developed countries (EZDubai, 2024, para. 4), with long-term potential to raise regional per capita income by over 40% (World Bank, 2024, p. 2); e-commerce in the MENA region reached \$34.5 billion in 2024 (up 13% year-on-year) and is projected to hit \$57.8 billion by 2029, led by the UAE, Saudi Arabia, and Egypt (EZDubai, 2024, para. 6), yet the informal economy, weak legislative frameworks for e-signatures and online contracts, and consumer mistrust of electronic payments continue to hinder full digitization of commerce.

3.6 Adoption of Artificial Intelligence Technologies and Technical Innovation

At least 15 Arab countries have launched national AI strategies or initiatives, with the UAE pioneering a dedicated AI minister and strategy in 2017, followed by Saudi Arabia, Egypt, Qatar, Tunisia, and Jordan; regional spending on

AI systems reached \$3 billion in 2023 (about 2% of global spending) with 30% annual growth, and AI's projected economic impact in MENA by 2030 is \$320 billion, including \$135 billion for Saudi Arabia (12.4% of its GDP) and 14% of GDP for the UAE; practical applications now span government (Dubai Police crime prediction), health (UAE's AI radiology analysis), finance (fraud detection), and smart cities (Dubai, NEOM), while dedicated research centers like the Mohamed bin Zayed University of AI in Abu Dhabi and Saudi Arabia's Thakaa Center signal a determined move toward technological leadership.

4. The Impact of Digital Changes on the Labor Market in the Arab Region

4.1 Digital Transformations and Their Impact on Jobs and Skills

The Arab region is currently witnessing two intertwined and powerful streams of transformation: accelerated digital transformations on one hand, and green transformations toward a more sustainable economy on the other; there is little doubt that these two parallel shifts will have a profound and lasting impact on the labor market, particularly in terms of the nature of jobs demanded and the skills required to perform them, and this impact carries two opposing yet complementary dimensions. On the one hand, digitization and automation will inevitably lead to the disappearance or replacement of a significant number of traditional jobs that rely heavily on repetitive and routine tasks, which unfortunately constitute a considerable proportion of existing job activities across most Arab economies; some estimates suggest that approximately 45% of job activities in the Gulf countries are automatable using currently available technology (Hertog, 2019, p. 12), and this situation becomes even more alarming when one considers that the majority of employment in the Arab region is concentrated in middle and low-skill categories that are highly susceptible to automation, a reality that exposed around 39 million Arab workers to the tangible risk of losing their livelihoods during the COVID-19 pandemic as digital transformation accelerated unexpectedly (ESCWA, 2022, p. 5). On the other hand, and somewhat paradoxically, both digital and green transformations are simultaneously creating entirely new job opportunities and even whole new sectors that did not exist a decade ago; digital transformation has given birth to fields such as e-commerce, digital financial services (fintech), software and application development, digital content creation, online freelancing, and the broader platform economy, all of which have already generated thousands of well-paying jobs that operate outside traditional employment frameworks. Similarly, the green transformation is actively stimulating the growth of emerging environmentally sustainable sectors including renewable energy production, energy efficiency consulting, the circular economy, sustainable transportation, and other eco-friendly activities, all of which have consistently proven to be significant sources of permanent and decent employment; for instance, the number of global jobs in the renewable energy sector alone rose dramatically to 13.7 million in 2022, up from only 7.3 million in 2012 (IRENA & ILO, 2023, p. 2). In addition to these sectoral shifts, the Arab labor market is undergoing a

fundamental restructuring of skills themselves, where the demand for technical digital competencies such as programming, data analysis, cybersecurity, and platform management is rising exponentially, while simultaneously the need for complementary human skills—often called soft skills—including analytical and creative thinking, adaptability, flexibility, and a commitment to continuous learning, is also growing at an unprecedented rate; indeed, the most valuable skills in the emerging labor market are those that effectively combine machine efficiency with uniquely human capabilities, and the same applies to green skills related to environmental sustainability, the circular economy, and renewable energy technologies, which have now become integral components of virtually every future-oriented job.

4.2 Sectoral Impact of Digital Transformations on the Labor Market in the Arab Region

The effects of digital and green transformations are not uniform across all economic sectors; rather, they vary considerably depending on the specific characteristics of each sector, and the following is a detailed examination of the most prominent effects and concrete examples across four main sectors: industry, agriculture, services, and education. Beginning with the industrial sector, this sector is currently witnessing fundamental and far-reaching changes driven by the adoption of digital technologies such as robotics, the Industrial Internet of Things, and artificial intelligence; although these technologies undoubtedly raise productivity and efficiency, they simultaneously threaten to eliminate many traditional factory and production line jobs, with the World Economic Forum indicating that 46% of work activities in Saudi Arabia and Bahrain, and 52% in Qatar, are susceptible to automation in the near future, thereby putting assembly line workers, packaging staff, warehouse employees, and various other routine manufacturing jobs at high risk of loss and eventual extinction (World Economic Forum, 2023, para. 4). On the other hand, digital transformation is also creating new industrial job opportunities related to the operation and maintenance of smart machinery, the programming of digital control systems, and the analysis of industrial data; indeed, job advertisements in Gulf countries for industrial establishments now routinely include the need to hire specialists in production line data analysis and operational efficiency improvement using AI, roles that simply did not exist a few years ago. Moving to the agricultural sector, this sector holds particular importance for the Arab region as a primary source of livelihood and food security, yet it faces a dual challenge: a harsh climatic challenge on one side and the sweeping challenge of digital and green transformation on the other; digital transformation in agriculture has already produced several smart technologies including remote sensing, AI-driven precision irrigation and fertilization, drones for crop monitoring, electronic marketing platforms for agricultural products, sensor-based smart irrigation systems, autonomous tractors, and fully automated farming systems. These technologies have a direct and immediate effect on improving agricultural productivity while simultaneously reducing the need for unskilled manual labor, but in a positive turn, they have also created a new

demand for engineers, technicians, and specialists capable of operating these smart systems and processing the vast amounts of data they generate, jobs that were not previously in demand. Regarding the services sector, this sector is arguably undergoing the deepest restructuring due to digitization, as e-commerce has flourished dramatically across commercial services, particularly following the COVID-19 pandemic, with the e-commerce market size in the Middle East reaching approximately 50 billion dollars in 2025 and recording double-digit annual growth rates (Deloitte, 2024, para. 5). This explosive growth has created a whole new set of jobs including digital marketing specialists, electronic sales platform managers, logistics coordinators, and express delivery personnel, while simultaneously reducing the number of traditional sales employees; in the financial and banking sector, digitization has led to a noticeable reduction in routine jobs such as bank tellers and branch staff in favor of digital banking services, leading many Gulf banks to close physical branches and redistribute their employees toward remote digital roles, alongside the emergence of entirely new fintech jobs such as customer data analysts, user experience specialists for banking applications, and financial information security experts. Finally, concerning the education sector, this sector occupies a unique position as both affected and influential: it is affected in terms of teachers' jobs and educational content, but it is also influential as the primary means through which the workforce can be qualified to adapt to these very transformations. The COVID-19 pandemic forced a rapid and widespread adoption of e-learning and distance education, making digital skills an essential part of every teacher's job description; teachers are now required to master virtual learning platforms and produce interactive digital content, and many educational institutions have formally adopted hybrid education models, leading to the emergence of new specialized roles such as e-learning coordinators, distance education supervisors, and remote learning support units. Many Arab countries, including Saudi Arabia, the UAE, Egypt, and Oman, have already begun revising their educational curricula to integrate AI and 21st-century skills (ESCWA, 2022, p. 8), while also offering reskilling programs for workers in routine sectors most exposed to automation, such as accountants and bank employees, to qualify them for new digital roles.

4.3 Social Groups Most Affected by Digital Transformations: Youth, Women, and Low-Skilled Migrant Workers

Digital transformations do not affect all social groups equally or fairly; some groups are far more vulnerable than others and therefore require special attention in any adaptation and protection policies. In the Arab context, three groups stand out as particularly susceptible: youth, women, and low-skilled migrant workers. Regarding youth, young people constitute a very large percentage of the Arab world's population, and they already suffer from labor market challenges manifested in unemployment rates that are the highest globally; according to the International Labour Organization, the youth unemployment rate in the region reached 24.4% in 2023, approximately double

the global average of 13%, with a particularly severe gender gap as fewer than one in ten young Arab women were actually working or actively seeking work (Saidi, 2024, para. 3). On the positive side, young people are generally the most capable of adapting to new technologies and acquiring digital skills, making them the fastest to fill newly created digital jobs; the online gig economy has become increasingly attractive to Arab youth, with thousands now working as freelance software developers, graphic designers, or digital marketers on platforms like Upwork and Udemy, often earning incomes far exceeding those of their peers in traditional employment. However, a wide segment of youth still suffer from a significant skills gap between their educational attainments and labor market requirements, and in the absence of digital and green skills, they risk being permanently excluded from the future labor market; additionally, about 32% of the Arab population (some 142 million people) remained outside digital coverage until 2021, most of them in low-income countries and rural areas (Fardoust & Nabli, 2022, p. 15). Concerning women, their labor force participation rate in the Arab world remains the lowest globally at only about 19%, compared to a global average of nearly 48% (World Bank, 2024, para. 2); digital transformation offers a potential pathway to overcome some traditional barriers, particularly through remote work and online freelancing which provide flexibility to balance work with domestic and caregiving responsibilities. A World Bank study indicated that generalizing digital technology in the region could double women's labor force participation rate, raising it by about 20 percentage points in the long term, meaning tens of millions of additional women in the workforce (World Bank, 2022, para. 3). Nevertheless, women remain heavily concentrated in routine, automatable jobs, making them extremely vulnerable to displacement unless they are reskilled, and the persistent gender digital divide threatens to exclude them entirely from future opportunities; encouraging signs include the solar energy sector, where about 40% of jobs are held by women, offering a model for more balanced green employment (IRENA & ILO, 2023, p. 5). Regarding low-skilled migrant workers, they constitute between 76% and 95% of the total workforce in Gulf countries depending on the specific nation (ILO, 2024, para. 2), and they are heavily concentrated in construction, land transport, domestic work, retail trade, and simple craft activities—all of which are highly automatable. In the UAE, for example, 93% of automatable tasks are performed by expatriate workers, indicating that the coming wave of automation will disproportionately and perhaps devastatingly affect this group unless proactive measures are taken; these workers generally lack the skills needed to participate in the digital or green economy, and they risk losing their income and being forced to return to their home countries. Training programs that convert construction workers into solar panel installation technicians, for instance, could mitigate this risk, while national low-skilled workers in the informal economy similarly require transformative training and strengthened social safety nets (Fardoust & Nabli, 2022, p. 22).

5 .Expectations for the Arab Labor Market by 2030: Job Disappearance, Emergence of Others, and Entrepreneurship Opportunities

With the acceleration of technical and green changes, experts are attempting to envision the picture of the Arab labor market in the coming years up to the challenging year 2030; despite the difficulty of future forecasting, general contours can be drawn of jobs that may disappear or vanish compared to those that will emerge, grow, and flourish within the framework of the “creative destruction” process, in addition to the emergence of new work patterns such as entrepreneurship and freelancing; these expectations are based on the digital and environmental changes during the current decade. First, regarding jobs expected to disappear or decline (Skillz Middle East, 2024, para. 4), this category primarily includes jobs that can be easily automated or those linked to traditional activities that will recede with economic transformation, most notably: routine administrative and clerical jobs, such as data entry clerks, traditional secretaries, and archiving and filing staff; traditional sales and customer service jobs, where the Arab region is expected to witness the continued closure of some traditional retail outlets (especially in sectors such as books and electronics), reducing job opportunities for salespeople, as well as the replacement of part of call center and customer service staff by automated response systems and intelligent robots; unskilled manual jobs in industry and agriculture, such as assembly workers on industrial production lines, seasonal agricultural workers for harvesting and others, where we may witness the gradual extinction of some traditional agricultural professions (such as manual harvesting) and some factory worker tasks, unless the skills of their holders are upgraded and they are transferred to other roles; some jobs in the oil sector and polluting industries, within the framework of green transformation and plans to reduce reliance on fossil fuels, a slow decline in the employment of new engineers and technicians in oil industries is expected in the medium/long term. In addition to the above, various other jobs are candidates for decline, such as vehicle drivers, typists, office machine operators, post office workers, traditional press correspondents, and others; it is important to emphasize that disappearance here is relative rather than absolute, and the pace will vary by country, as technologically advanced Gulf countries may precede others in abandoning certain jobs. Second, concerning jobs expected to grow and flourish, these include information technology and AI jobs: software developers, systems engineers, big data analysts, machine learning and AI specialists, AI and machine learning expert jobs, cloud computing solution developers, robotics engineers; renewable energy and environmental sustainability sector jobs: solar panel installation and maintenance technicians, wind energy engineers, building energy efficiency specialists, electric vehicle and charging infrastructure engineers, waste management and recycling experts, corporate sustainability officers; regionally, engineers and technicians in the implementation and operation of these facilities, green building auditors and sustainable design engineers, organic production guides and urban farming specialists; healthcare and education jobs (care economy): global forecasts indicate strong growth in care economy jobs in health, education, and social services by 2030, as they are less automatable and due to rising societal demand for them; platform economy and creative jobs: digital content creators (YouTubers, podcasters), social media marketers, electronic game

developers, virtual and augmented reality designers, artisans selling their products in global online stores, and freelance translators offering their services through freelance work sites. Third, regarding entrepreneurship and freelancing opportunities in the age of transformation, thanks to the low entry barrier for digital businesses and the expansion of the online freelance labor market, independent online work will become a prevalent option for a large segment of Arab professionals; in addition to green entrepreneurship, we will see entrepreneurs establishing startups offering innovative solutions in home solar energy, electric car-sharing applications, or e-waste recycling projects; the region may have a comparative advantage in certain technologies, for example in energy-efficient desalination solutions or farming in arid environments; early signs include the emergence of Arab companies in the recycling and waste management economy, as well as entrepreneurial initiatives in hydroponics and organic food production. Micro-enterprises and home-based businesses, such as home kitchens selling via Instagram, or craftswomen selling their handmade products on Facebook, will also flourish.

6 .Conclusion

This study has concluded that digital transformation is no longer merely a technical option or administrative modernization but has become a structural pathway reshaping the labor market in the Arab region at the levels of jobs, skills, employment patterns, and professional relationships; the analysis has shown that this transformation carries two interdependent faces: a positive face represented by creating new opportunities in the digital economy, e-commerce, digital financial services, freelancing, artificial intelligence, and sustainability-related sectors; and another pressure-filled face represented by the decline of routine jobs, the escalating demand for hybrid skills that education and training systems in several Arab countries remain unable to provide with the required efficiency and speed. Furthermore, the article has demonstrated that the impact of digital transformation in Arab countries does not proceed at a uniform pace but is influenced by the degree of digital infrastructure readiness, the maturity of electronic government services, the extent of technology use by individuals and institutions, and the volume of investment in innovation and AI; consequently, disparities deepen between digitally leading Arab countries and those still in the early stages of transformation, while internally, gaps widen between social, spatial, and gender groups, making youth, women, low-skilled workers, and migrant workers among the groups most exposed to risks of exclusion unless supported by effective requalification and professional conversion programs. Accordingly, the future of work in the Arab region will not be determined solely by the extent of technology diffusion but rather primarily by the ability of Arab countries to transform digitization into a comprehensive and equitable developmental project grounded in education reform, vocational training modernization, expansion of digital access, stimulation of innovation, and the building of legislative and institutional frameworks capable of protecting vulnerable groups and keeping pace with new work patterns; the real challenge does not lie in the onset of digital

transformation itself, but in how to direct it to become a tool for producing decent job opportunities, reducing disparities, and enhancing the competitiveness of Arab economies, rather than turning into a new factor of inequality and marginalization. Therefore, the challenge facing Arab countries today is the transition from the digitization of tools to the digitization of development, and from consuming technology to localizing and investing it in building a more flexible, equitable, and sustainable Arab labor market

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