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Shifting towards a Smart University to bridge the Digital Skills Gap, In Response to the Requirements of the Digital Economy

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Abstract
The university, in its traditional form, is a reservoir of talents and skills in all fields and domains. This study aims to highlight the critical role played by the university in shaping the future of labor and innovation in light of the digital transformationunderway around the world. The digital economy emerges to asessentialalternative to the traditional economic sector,adaptingto the secretions of technology and dealingwith its consequences. The study showed that the transformation of the educational institution towards the so-called Smart University as a modern and advanced educational style is a necessary measure to meet the needs of the digital labor marketthrough a qualified workforce capable of using and developing digital technology to achieve sustainable economic development.
Keywords: Digital Transformation,Smart University, Digital Economy, Digital Skills,Industrial Revolution 4.0.

1. Introduction:

Today, there is a notable technological revolution underway, marked by significant advancements. The Fourth Industrial Revolution has emphasized the necessity of digital transformation, especially following the Covid-19 pandemic, which highlighted the inadequacies of conventional systems in managing crises. The education sector, at all levels, plays a pivotal role in laying the foundation for a digital society.There is an urgent need to develop higher education systems to keep pace with these changes. The qualified human element is the bridge that will safely transition societies from a traditional classical economy to a digital economy. Universities must focus their efforts on developing comprehensive student skills, including critical thinking, problem-solving, and effective communication, to prepare them to overcome challenges. Their role remains pivotal, particularly in bridging the gap between available skills and those required in the job market and the digital economy. The concept of the smart university emerges as a strategic solution to embed key principles of digital transformation within the campus, enhancing the capacity of educational institutions to respond to various challenges of the digital age across sectors and fields.The smart university is an advanced digital educational environment that utilizes modern teaching methods and

advanced technology to enhance the quality of education and make it more suitable for students' needs and the requirements of the job market. This is achieved through the deployment of modern technologies such as artificial intelligence, Internet of Things, blockchain, data analytics, and the use of automation technologies and applications to improve students' experience and enable them to acquire the necessary skills in a rapidly digitizing world. The qualified human element possessing 21st-century skills is of interest to employers. While technology in all its branches, specialties, and application fields is a means, the highly competent human element remains the ultimate goal. This research will explore the conceptual framework of digital transformation, addressing the justifications for the transition to the smart university as one of the requirements of the digital economy. Additionally, we aim to analyze the reasons for the widening skills gap in the digital job market through this study.

- **Problem and questions of the study:**

To grasp the various aspects of this study, we present the following problematic issues:**How can digital transformation in the higher education sector enhance the development of the smart university, to meet the challenges of the digital economy, and to fill the skills gap in the labor market?**

- **Theimportanceandobjectives of the research:** The importance of the research is to highlight the following points:

- Addressing the analysis of the phenomenon of digital transformation that occurred as an inevitable response to the requirements of the Fourth Industrial Revolution on the one hand, and pre-empting future crises on the other. Especially after the Covid-19 pandemic showed the weakness of the traditional economy in addressing the repercussions of the pandemics, in light of the weakness of the digital infrastructure of various sectors.
- Analyze the justification for the shift towards a smart university to fill the shortage of skilled labor in the labor market.

- **The most important objectives of this study are summarized as follows:**

- Providing the necessary data and information to decision-makers in the higher education sector in developing countries in particular, in order to initiate digital transformation strategies in the form of a smart university to support sustainable development.
- Establishing the principle of promoting integration between universities and other sectors to provide a more applied and appropriate education to the needs of the digital market, which in turn contributes to the well-being of all layers of society.
- Explain the concept of 21st century skills and urge university graduates to acquire them to ensure their integration into open vacancies in the digital world of work.
- Emphasizing the importance of digital transformation to develop all sectors and make them adapt smoothly to the outcomes of globalization and the Fourth Industrial Revolution.

- **Approach:**

In order to answer the problem at hand, the descriptive-analytical approach was used.

- **Study axes**

The study was divided into two axes as follows:

- Conceptual Framework for Digital Transformation, Smart University, Digital Economy, 21st Century Skills and Industrial Revolution 4.0.
- The relationship of the smart university to the problem of bridging the digital skills gap in the labor market (the American labor market as a model)

2. Conceptual Framework for Digital Transformation, Smart University, Digital Economy, 21st Century Skills and Industrial Revolution 4.0.

2.1. Digital Transformation

All sectors have been affected by the digital transformation and rapid progress in technology, which enhances the phenomenon of globalization, and strongly affects all fields, including the field of education. As a result, various programs have been developed to manage, direct and train human resources and make them of high quality to fill the gap in the skills of the digital economy. Various countries have accelerated the reform of national education systems to improve the quality and efficiency of higher education, in order to adapt them to the requirements of digital transformation. The COVID-19 pandemic, which has turned into a pandemic crisis and an economic shock that shakes the global economy, has emphasized the need for digital transformation to achieve financial inclusion and reach all dealers without an intermediary, using high technology (Nguyen, 2023).Many companies have begun implementing remote work procedures in response to the repercussions of the pandemic and the resulting lockdown. Many educational institutions scrambled to find the best ways to activate off-campus teaching methods using various technological media. Global companies such as WebEx, Microsoft Team, and Zoom have also modified their operational policies to allow as many subscribers as possible to benefit from their services in this field, reflecting the great role played by digital technologies in helping countries cope with the pandemic.(Qaaloul&Talha0202).

Due to the inadequacy of traditional trade infrastructure, the world is witnessing a real revolution towards digital transformation. Hence, the urgent need to change this structure and transform it into a digital infrastructure supported by a new generation of information technology, with a focus on data perception, transmission, storage, computation, processing and security, where data is the main factor of production. After the Fourth Industrial Revolution and the overall trend towards digital transformation in all fields, data has become the most valuable element in the world instead of oil. Thus, the data market has become the building block of the digital economy. Different definitions of data come from different perspectives, with ISO defining data as “an official representation of information for appropriate purposes of communication, interpretation or processing”. Information is an economic good that is stored as small chains (Rong, 2022). The need for competencies has emerged in the digital society to achieve the results and objectives underlined. Digital competence is part of the revised European core competency reference system for lifelong learning, which should be enjoyed by all citizens. To reach this goal, learning must be completely restructured to suit the process of innovative economic transformation.

Digital competence means the confident and critical use of digital technologies encompassing the knowledge, skills, and attitudes that all citizens need in light of the rapid growth of a

digital society. The European Digital Competency Framework for Citizens describes digital competencies in five areas:

- Information and information literacy - Communication and cooperation - Digital content and its creation - Safety and well-being - Problem-solving. (Abduvakhidov, Mannapova, & Akhmetshin, 2020) Digital transformation touches different levels of business. So that the procedures for employing any digital technology that enables companies to improve their processes, practices and performance to positively affect their environment can be classified as one of the company's steps towards digital transformation. Digital transformation can be a transition from paper to digital archiving, filling out paper forms and applications to digital documents, such as the automation of specific processes, the integration of artificial intelligence, and machine learning**.**(https://www.intotheminds.com/blog/en/digital-transformation /, 2024)

2.2. Smart University:

The concept of the smart university occupied the minds of a large number of researchers after the technology revolution reached its peak, and the attention-grabbing race between various sectors, towards digitization and the adoption of applications that use high technology. As the education sector, it has a great impact on all other sectors, through what it does in providing them with the necessary competencies and innovations that support the launch into a smarter world. There have been calls for the need to move towards a smart university to adapt to the digital transformation taking place in the world. A smart campus is an umbrella for many smart solutions, such as smart classrooms. Smart classrooms have sensors and cameras to monitor and track students' participation and analyze their behavior and feelings. Smart cards and IoT building safety and control systems are common and necessary in any smart university institution. Therefore, the Internet of Things, artificial intelligence is one of the most important tools to be available in order to achieve the transformation into a university. The most important elements of IoT are wireless sensors networks (WSNs) and radio frequency identification (RFID). (Sen, Aljohani, & Hakami, 2017)With the increasing use of technology in education as well as in everyday life, there is a need to further develop skills in this area. Lifelong learning can be facilitated and made more accessible with technology**.**(Leahy & Wilson, 2016)

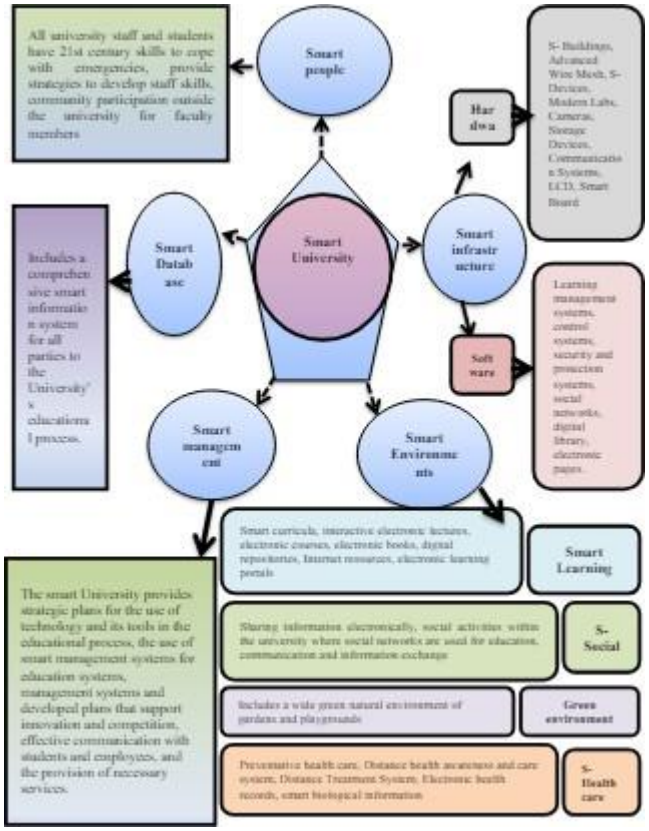
In order to demonstrate citizenship in the digital age, learners need to acquire 21st century skills. 21st century skills are classified into three main categories and subcategories are associated with them:

- Learning and innovation skills include critical thinking and problem solving, communication and collaboration skills, creativity and innovation
- Information, media and technology skills include information literacy, media literacy, information literacy and communication.
- Life and vocational skills include resilience and adaptability, initiative and self-direction, social and cultural skills, productivity and accountability, leadership and responsibility skills.(Saykili, 2019)

The Smart Campus, is a global digital link through the use of cloud computing, the Internet of Things, and the Web, which results in comprehensive and effective educational activities.

Smart campus components include sensors, big data, cloud computing, network platforms, and security services.(Kariapper, 2020)

Fig. 01 Smart University



Source :(Rania ،2020)

Exemples of smart campus technology in universities and colleges: (Katherine, 2020)

- ✓ Arizona State University's $300 million football field has been renovated to improve operational efficiency with smart sensors and cameras. For example, sensors will send data on water use, franchise sales, and noise levels.
- ✓ At Northern Arizona University (NAU), the transition to a smart campus has begun.The university has set up a lab to study towns, cities, campuses, how to use artificial intelligence, robotics, the Internet of Things, and more.
- ✓ In 2019, Portland State University established the Digital City Test Center (DCTC), which is also part of a network of test sites including the University of British Columbia. The university is collaborating with the City of Portland to conduct smart technology tests and is working with the Portland Planning Office and the Portland Transportation Office. The project focuses on air quality sensors and traffic sensors.
- ✓ At the University of Wisconsin-Madison, they are preparing to create a test area for self-driving vehicles that will include sensors on traffic lights in a 32-acre area.
- ✓ At the University of Texas at Austin, the campus is managed by America's largest mini-grid and provides on-campus electricity, heat, and cooling.

- ✓ In Cleveland, Case Western Reserve University and Cleveland State University have teamed up to work on collaborative IoT to improve the city's urban and industrial infrastructure.
- ✓ At Boston University, I worked on the cloud-based open platform for Smart City and Ecosystem Scope for five years.
- ✓ University of Michigan, mechanical engineering professor Huey Bing works at this university, as the director of Mcity, which aims to develop smart and automated technologies to power transportation such as self-driving vehicles. Mcity is a public-private partnership involving the University and the City of Ann Arbor, providing a controlled simulation environment for participants to test theories and collect data.

One of the most important goals of the emergence of smart campus technology is to promote a more connected, interactive and intelligent learning environment, while also ensuring that higher education institutions are able to adapt to students' changing needs and expectations. This is done by harnessing a consistent, high-resolution suite of emerging technologies such as artificial intelligence (AI), the Internet of Things (IoT), ChatGPT, and big data. (https://hartmanadvisors.com/the-future-of-learning-how-smart-campus-technology-is-changing-higher-education-2)

Successful digital education requires intervening and influencing the various players in the education system (such as students, teachers, school leaders and sub-central authorities) through the development of scientific research tools and methods on which they work. The success of digital education policies must ultimately be evaluated on the basis of their contribution to a wide range of education outcomes, which requires an understanding of the diverse ways in which digital education policies interact with other policies to improve students' skills, well-being, social outcomes, and the labor market more broadly.(Tremblay, Minea-Pic, Boeskens, & Meyer)

2.3. Digital Economy:

The digital economy refers to the economic activities that arise from connecting individuals, companies, devices, data and processes with digital technology. It includes online communications and transactions that take place across multiple sectors and technologies, such as the Internet, mobile technology, big data, and ICT.
(https://www.techtarget.com/searchcio/definition/digital-economy)"The extensive use of data is transforming business models, facilitating new products and services, creating new processes, generating greater utility, and ushering in a new culture of management," says Professor Walter Brenner of the University of St. Gallen in Switzerland. On this basis, the digital economy represents every economic activity that would result from billions of daily online communications between people, companies, devices, data and operations. The cornerstone of the digital economy is the hyper connectivity that means increasing connectivity between people, organizations and machines, resulting from the Internet, mobile technology and the Internet of Things (IoT)

(https://www2.deloitte.com/mt/en/pages/technology/articles/mt-what-is-digital-economy.html)

Most definitions of the digital economy suggest the idea of "zero marginal cost" as the main factor in the current of economic change. These tariffs classify digital goods and services as both intangible and non-competitive, noting that they can be acquired without necessarily being owned, used on a non-exclusive basis and have zero or virtually zero marginal costs of reproduction.(Valenduc & Patricia, 2016)

- For example, we review the aspects of digital transformation in the financial and banking sector in the Kingdom of Saudi Arabia

State	**Digital transformation in the financial and banking sector**
SaudiArabia	• Basic**Policies** Saudi Vision 2030 - Digital Inclusion - E-Participation - Privacy and Data Protection • National Strategy for Data and Artificial Intelligence - Cybersecurity Strategy • **Aspects of digital transformation in the economy** • Financial Innovation Center (Fintech Saudi): Fintech Saudi is an initiative launched by the Central Bank of Saudi Arabia in cooperation with the Market Authority • Digital Lab: (SDAIA) an initiative launched by the Saudi Authority for Data and Artificial Intelligence • The Financial Data Exchange (FDI) platform, which is being developed by the General Authority for Statistics (GASTAT). • Miza Project: It is a project of Al Rajhi Bank, and aims to provide Islamic finance services online and in cooperation with startups in the field of financial technology. • STC Pay: STC Pay is a STC project that provides electronic payment and mobile money transfer services. • Smart Financial Reporting: Some companies and organizations in the Kingdom use artificial intelligence and big data technologies to generate smart financial reports • E-insurance: Many insurance companies in the Kingdom offer e-insurance services, which allow users to buy and manage insurance easily and safely, through banking applications or the Internet. • Mada App: It is an application affiliated with the Saudi Arabian Monetary Agency, and it is considered an

	integrated electronic payment platform, as it can be used to pay in commercial branches and electronic stores. • The "Saudi Digital" initiative aims to transform the country into a sophisticated digital society, and promote ICT in all aspects of life, including the financial services sector. • Launching the Kingdom's Vision 2030, the Kingdom of Saudi Arabia seeks to achieve comprehensive and sustainable economic development, modernize and diversify the sectors of the national economy, and enhance the role of the private sector, innovation and technology in economic and social development. **Digital Government** • Digital ID - Electronic Signatures and Public Key Infrastructure - Electronic Communications Legislation - Electronic Commerce Legislation - **Policies and strategies** • Cloud First Policy - Digital Economy Policy - IoT Regulatory Framework - Universal Service Policy

Source: Compiled by researchers basedon - (https://tanmia-idaria.ipa.edu.sa/Pages/200-11.aspx And https://www.my.gov.sa/portal/snp/aboutksa/digitaltransformation/dtcontendetails).

2.4.21st CenturySkills :

The traditional economy relies on natural resources such as agriculture and oil, while the knowledge economy relies on the production of goods and services using human intellectual capital. The economy is based on intellectual potential and scientific research, an age that requires skills and knowledge to work in a knowledge-based society. There is an urgent need to develop the skills of 21st century graduates to meet the needs of the evolving labor market. Individuals must communicate and collaborate with the world's problems transnationally. All of these reasons underscore the importance of acquiring 21st century skills to participate in the interconnected global economy.(Shaikhah & Ahmed, 2024)21st century skills are the broad skills and abilities necessary to succeed in modern society. Over the years, groups of educators, academics, and government agencies have worked to identify and strengthen these essential skills to prepare the workforce of the future. Although there are slight differences in the description and definition of 21st century skills from one group to another, they are mainly divided into three categories:

- ✓ Learning skills: These include skills used to process and transmit information, such as creativity, critical thinking, collaboration, and communication.
- ✓ Reading and writing skills: These are used to develop intelligent and informed researchers and thinkers, such as information, media and technological literacy, which focus on your ability to evaluate and process new information.

- ✓ Life skills: These include the skills needed to create a successful individual who can thrive in their personal and professional lives, such as adaptability, leadership, initiative, competence, and social skills (Slyter, 2019).
- ✓ Analytical skills, critical thinking and the ability to learn and adapt to new technology.

Additionally, Personnel are required to:

- ✓ Communication and collaboration skills and ability to work in multidisciplinary teams.
- ✓ Ability to interact with robotics, automation and other smart technology.
- ✓ Ability to handle, analyze, and use data to make smart decisions.
- ✓ Ability to think creatively, innovate and develop new solutions to complex problems.

In total, employees must have a variety of technical, academic, and social skills to succeed in Industry 4.0.(Nur Muzdalifah Binti & Kok Wai, 2022)

2.5.IndustrialRevolution 4.0 :

Industry 4.0 represents an increase in the digital transformation of the entire value chain, with a focus on intelligent and autonomous systems powered by data and artificial intelligence. The industry aims to achieve better productivity, distribute the supply chain, exchange data between subsystems, and make decisions faster. Industry 4.0 is an improvement of Industry 3.0 through the use of computing technologies and Internet connections of things. The industry focuses on industrial sustainability and worker welfare as well as industrial productivity and versatility. Due to global climate changes, they require sustainable solutions for the industry. Big data, IoT and AI technologies contribute to problem-solving and innovation, but they come with downsides such as replacing labor with cutting-edge software and robotic automation.(Uzoamaka & Peter, 2024)

Technology has advanced rapidly in recent decades, giving rise to a fourth industrial revolution known as Industry 4.0. This industry includes technologies such as smart factories, artificial intelligence, cyber systems, and the Internet of Things. These technologies have the potential to decentralize decision-making and transform labor markets globally. This transformation requires replacing traditional jobs with new ones, necessitating a redefinition of the role of human labor. For example, the demand for routine jobs is decreasing and the demand for knowledge-based jobs is increasing. Therefore, qualifying workers to face new challenges in the labor market has become one of the main priorities around the world. Teachers, researchers, and policymakers have been tasked with identifying and developing the skills necessary to adapt to these changes, and these skills have been referenced using different terms such as 21st century skills, future skills, digital abilities, soft skills, and survival skills.(Sumayya, Elizabeth, Linda, & Michal, 2024)

3. The relationship of the Smart University to the problem of bridging the digital skills gap in the labor market (the American labor market as a model) :

The Covid-19 pandemic has caused a global dilemma, with its negative results reflected in inequality among students around the world due to the total closure of all public and educational facilities at all stages, with a large number of countries unable to implement distance education policy. Children from disadvantaged families were less likely to benefit from distance learning than their peers, often due to lack of electricity, internet connectivity,

lack of devices, and lack of support from caregivers. The vulnerable group of girls, students with disabilities, younger children and children of low-income families also faced significant obstacles to participating in distance learning and benefiting from this feature. Altogether, at least one-third of the world's schoolchildren were unable to access distance education during school closures. This requires reconsidering the educational system, supporting it with artificial intelligence applications, and linkingit to various networks to address such crises. (https://www.albankaldawli.org/ar/topic/education/overview?s_kwcid)

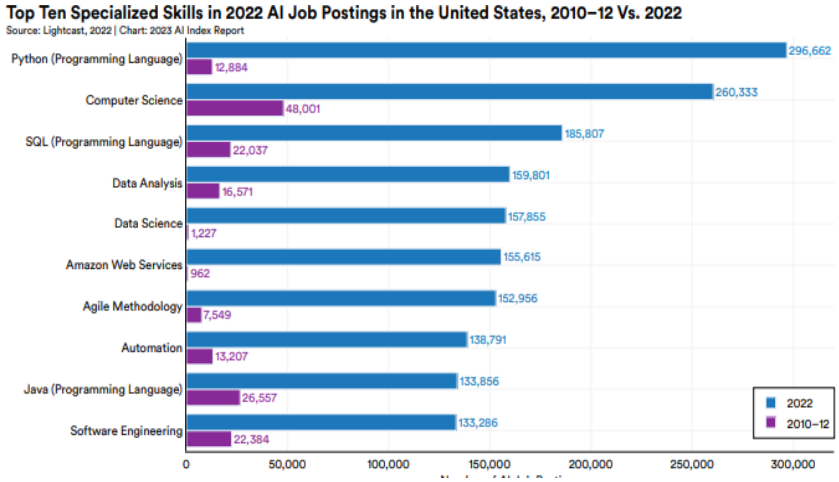
The fourth industry also has profound implications for how to better prepare people in the changing world of work, especially in the field of technical skills, vocational education and training in response to the demands of the digital market. (Jagannathan, Ra, & Maclean, 2019) The higher education sector is undergoing a profound transformation in response to the Fourth Industrial Revolution, which is increasing the demand for interdisciplinary programs, combining technical skills with critical thinking, creativity and adaptability. The shift towards digitization of this sector is exemplified by its use of emerging applications and technologies, such as Artificial Intelligence (AI). These technologies offer new projects for personalized learning experiences, adaptive assessments, and data-driven decision-making processes. The development of industries and their great reliance on artificial intelligence applications and the Internet of Things, made the university institution forced to review its curricula to make graduates have the necessary skills, which are commensurate with the most in-demand jobs in the digital labor market. Furthermore, the Fourth Industrial Revolution fosters collaboration between academia and industry, through technology integration, fosters innovative thinking, and equips students with the skills needed for future jobs. (Smith, 2023).

It should be noted that in developing countries, a serious problem has emerged, which is the problem of unemployment associated with technology. Thus, higher education institutions must play a key role in finding a solution to this problem, which negatively affects the economy. The scarcity of qualified workers is one of the most serious obstacles to economic growth, which is closely linked to the inadequacy of higher and technical education. We live in an age where there is no alternative to technology and innovation, to increase economic growth. Therefore, those in charge of the higher education sector in developing countries must work hard to implement a tight strategy through which workers are trained to meet the requirements of institutions and companies to keep pace with digital transformation. Despite the booming digital market, however, the skills gap in most developing countries is widening, due to the university remaining in its classical style, at the level of these countries. (Mohammad & Alenezi, 2022)

In today's society, the skills needed for the digital job market are often referred to as 21st century skills. Although this concept carries with it a wide range of skills, that is, it serves as a basket for all skills of various types and fields, but the common component between them is the digital feature. The digital component is the core component of every twentieth-century skill. With the increasing digitization and rapid growth of the labor market, one of the most important conditions of employment is the need for individuals to acquire a new set of skills related to the use of information technology, communications or digital technologies, big data analysis and the management of automated media devices, and the ability to use artificial

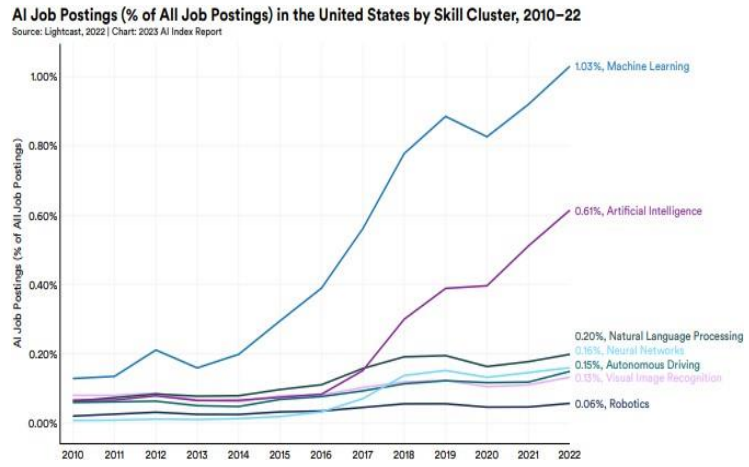
intelligence applications in the workplace. (Laar, et al., 2020) Due to technological advances and automation, the demand for digital skills is increasing at an unprecedented rate. The coronavirus (COVID-19), as mentioned earlier, has been a wake-up call for the global community to make efforts to work to ensure that people who are still offline are connected to the internet as a matter of utmost urgency, equipped with skills and knowledge resources, to enable them to take full advantage of digital gadget services. Digital skills are increasingly in demand in workplaces around the world. There will also be a growing demand for people with digital skills in the coming years due to the Fourth Industrial Revolution, the expansion of the digital financial market, and the increasing expansion of foreign trade and financial liberalization due to the deluge of financial globalization.

Figure 02 Top Ten Specialized Skills in 2022 Job Postings USA Ahead of 2010



Source: (Artificial Intelligence, 2023)

Figure 03: Job advertisements (out of total job advertisements) in USA accordingto skill set 2010-2022



Source: (Artificial Intelligence, 2023)

Figure 02 shows that the ten most in-demand jobs in America are : Python Programming Language – Computer Science – SQL Programming Language – Data Analysis – Data Science – Web Services, Amazon – Automation – Java Programming Language – Software

Engineering. Figure 03 also shows that machine learning has reached 103% of the ten skills that topped the labor market in the United States of America. This indicates that the trend towards the Smart University in USA was an inevitable necessity to keep pace with the requirements of the Fourth Industrial Revolution, and the American University succeeded in this, by meeting the demands of the digital market with skilled and qualified labor on the one hand, and adapting properly to the outcomes of globalization on the other. At a time when enterprises, companies and even individuals are racing to acquire and adopt smart applications, based on blockchain technology, to ensure that they remain in the lobby of competition in a world that does not accept the weak. Among the most important sectors that are always looking for 21st century skills in their journey towards achieving the underlined results are, for example:

- ✓ The ICT sector is this vital sector that always seeks, in a renewed manner, companies with various companies active in the field of technology and technology, to develop software, for data management and cybersecurity. In addition to the comprehensive employment of cloud computing and artificial intelligence.
- ✓ The digital economy sector based on e-commerce, digital marketing and financial markets management, including transactions of encrypted and virtual electronic money and smart contracts, which seeks competent employees to manage programming techniques and analyze big data stored on electronic media, to understand consumer behavior, and ensure the effectiveness of digital marketing campaigns.
- ✓ The banking sector, which includes various public and private financial and banking institutions that are always looking for advanced software, in order to analyze data, develop banking risk management systems, activate the quality of financial analysis, manage electronic banks, and improve the process of automated trading and digital payment.
- ✓ The medical and health care sector also seeks to recruit competent employees with 21st century skills to be employed in research laboratories and pharmaceutical manufacturing companies to raise the level of personal care provided to members of society and to face renewed health pandemics.
- ✓ Manufacturing and engineering sector, this sector widely uses various technologies and high technology, to manage, analyze and process data, and develop automatic control systems in order to ensure the achievement of competitive advantage, improve production processes and meet the desires of consumers.

Digital transformation has seen significant progress in many sectors since the early 2000s. The pandemic has accelerated the digital transformation process in most economic sectors. An analysis of job offers published in Switzerland over the past seven years shows that companies require at least one digital skill in almost one of every two job offers (49%). Thus, we see that the skills of digital technologies are very popular in the labor market.(GROUPE, 2022)

Many countries are actively developing or revising their digital skills frameworks in order to appropriately prepare them to meet the demands of the digital economy. For example, the UK Department of Education created the Essential Digital Skills at Work Framework and later

updated it to the Essential Digital Skills for Life and Work Framework. This framework aims to support adults in enhancing their digital skills for the digital world. They are divided into five categories, namely communication, handling of information, content, transactions, problem-solving, and online security. Similarly, the European Commission recently updated its Digital Skills Index (DSI) using the Competency Framework 2.0. The DSI serves as a benchmark to measure citizens' digital skills in areas such as knowledge, information, data, communication, collaboration, digital content creation, safety and problem-solving. By using the DSI to assess the activities of individuals, it can be considered an indicator of their digital skills in preparation for economic competitiveness due to the knowledge economy; technologies are applied across a range of workplaces. So digital skills become a core competency of the knowledge economy. Changing technology is increasing the demand for highly skilled people to handle the daily work tasks required by new technologies. **"Digital skills gaps"** can affect work performance and in general, digital skills gaps are understood as the level of digital skills of employees that are below or not in line with the requirements of the job. This can be determined by the ability of some employers to carry out tasks using ICT. (Alghamdi, et al., 2023) The OECD, with support from the Randstad Foundation, has analyzed 417 million online job offers posted over the past 10 years, in 10 countries Germany, Belgium, Canada, Spain, the United States, France, Italy, the Netherlands, the United Kingdom and Singapore. Job offers in the digital sector continue to grow. Software developers and programmers, and software engineers, are a particularly in-demand category. Over the ten years, the demand for digital skills has outpaced the demand for other skills. (Saint-Denis, 2022)

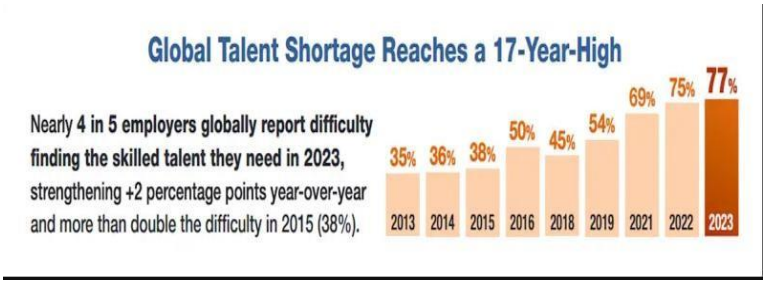
In the USA, employment announcements for January 2024 were 33,727 higher than the December 2023 figure, the largest monthly increase in a year. Open positions related to software development, IT project management, data analysis and science, IT support and systems analysis and engineering have been of great interest to employers. In January 2024, the number of job advertisements offering hybrid, remote, or work-from-home options exceeded 30,000, up about 5,000 from December 2023. Technology vacancies continue to be at the top of the list of open jobs and strongly, so that employers in the United States announced about 3.13 million vacancies in the field of information technology in 2023, the list included a wide range of jobs, including support and infrastructure, software, data and cybersecurity. In December 2023, the most important technical job postings by vacancies in the United States were:

- Software developers and engineers: 40,490 jobs
- IT Project Management, Data Analysts: 27,853 jobs
- IT Support Professionals: 16,526 positions
- Systems Analysts and Engineers: 12,513jobs
- Data Scientists: 10,293 jobs

"Seventy-six percent of IT employers have difficulty finding the talent they need," said Jer Doyle, senior vice president of IT recruiting firm Experis. "Supporting people to gain experience and develop new skills will be key to alleviating talent shortages and helping people build long-term employability," IT recruiting firm Manpower Group said in a

statement. With an ongoing talent shortage crippling hiring, U.S. employers expect thoughtful hiring in the first quarter of 2024. According to the latest employment outlook survey from recruitment firm Manpower Group. With seasonal changes removed from the data, the US Neo forecast is +35%.

Figure 04 : Global Talent Shortage Reaches Highlevel since 17 year



Source:(Mearian, 2024)

The tech sector added 191,000 new jobs in January 2024, signaling stabilization in the sector's labor market. Software developers and IT support specialists saw the largest increase in job openings. Job posting data has shown that there are a variety of pathways to get a job in the sector, with many job advertisements not specifying academic requirements.

On the unemployment front, the overall unemployment rate in the US has not changed much and stood at 3.8% in March 2024. Growth in the tech workforce is expected to continue in the near future. (Lucas, 2024) Movement in the labor market is expected to increase in 2024, as 60% of employees will move to new jobs. Professionals are looking for opportunities that provide competitive compensation and opportunities for growth and skill development. Employers focus on employee engagement and transparent compensation structures to attract and retain top talent. There is a shift towards skills-based recruitment and the use of AI in recruitment processes. Learning, development, diversity and inclusion initiatives are increasingly important in companies. The 2024 U.S. labor market exemplifies a combination of continuity and change, with a focus on wellbeing and skills-based employment. It requires adaptation, technological proficiency, and a commitment to employee engagement and development to succeed in the strong U.S. labor market. (https://www.linkedin.com/pulse/us-labor-market-set-robust-activity-2024-phoenixsearch-5dvxe/ ‹2024)

The evolution of the US market requires experts with specialized technical skills, such as cybersecurity, artificial intelligence, cloud security, and data analysis. There is a shortage of talent in these areas, making skill improvement essential. Demand for these skills is expected to increase significantly by 2025. Companies are looking for experts in these fields to secure their systems and achieve digital transformation. The integration of cloud technologies and data analysis increases market opportunities, and makes obtaining relevant certifications essential for excellence in the labor market.

(https://www.talentinternational.com/top-5-us-tech-skills-in-2024/, 2024)

High-value technical skills play an important role in many industries, as they are the desired commodity among employees. These skills fit most other industries such as healthcare and finance. Having a range of technical skills can lead to a higher paying job. Some of the most

important technical skills that individuals should have now include basic programming skills such as Python, C, C+ +, Java and C#, UI/UX design, data engineering with knowledge of Python, SQL or Java or Scala and cloud computing platforms such as Amazon Web Services (AWS), and data visualization to make information easier to understand and manage. For payroll, some of the highest paid technical jobs required include Application Engineer Big Data Engineer, Systems Security Manager, IT Manager, Enterprise Resource Planning (ERP) Integration Manager, and Network/Cloud Engineer. (REBECCA, 2024).Digital transformation is the fundamental driver of the Fourth Industrial Revolution, which in turn has led to a radical change in the workplaces of various sectors, around the world . As a result, both the productive and service sectors were quick to integrate the skills of the twenty-first century into the labor market, changing the employment strategy.

The search for competencies and skills began in order to achieve economic growth that keeps pace with scientific and technological development. The largest job offers for vacancies were in the fields of artificial intelligence, big data analysis, the use of blockchain and advanced technologies in the field of technology and computing, and the use of new digital technologies. The purpose of requiring these skills is to ensure competitiveness in global markets, amid economic uncertainty and continuing geopolitical tensions. The departure of institutions and companies in the search for these skills has caused a significant crack in the labor market environment, so that the shortage of global talent according to Figure 04 has reached 77% at its highest level in 17 years, a very large percentage that suggests the size of the repercussions of the Fourth Industrial Revolution, and the strength of the scientific and technological development taking place. Therefore, those in charge of the higher education sector in various countries of the world must sound the alarm, in order to think seriously about finding appropriate solutions to fill the skills gap in the labor market, to ensure sustainable development and saturate the digital market with a qualified workforce, who master the required digital skills. In order to achieve this, the infrastructure of the sector must be reviewed, the methodology and method of learning must be restructured, and its methods must be adapted to the requirements of the labor market, and the outcomes of the technology and technology revolution must be adapted.

The latest studies suggest that Industry 4.0 technology could significantly impact the labor market, as low-skilled labor could be replaced by AI and automation. There are also concerns about the impact of technology on the middle class, as some high-paying jobs could be replaced by automation. Therefore, there is an urgent need to develop emerging skills and learn modern technology to avoid a skills gap in the labor market. Government and non-government bodies need to collect and analyse data systematically to identify market-demanding skills. Thanks to digital advancements, more jobs are being deployed. (Andrius, Morteza, Mantas, Mantas, & Šarkauskaite, 2020)

4. Conclusion:

The university is the main pillar for building developed societies that have the ability to deal with the challenges of the future. At the end of our study, we conclude that the transition towards a smart university is inevitable, in light of the digital transformation revolution taking place in our world today. The university's employment of advanced technology and modern

learning methods will contribute greatly to providing an interactive learning environment that enables students to acquire digital and technical skills that are a priority in employment in the labor market. Within the framework of its modern directions, the higher education sector seeks to develop and encourage research and innovation within smart universities to provide a stimulating environment for students to participate in finding new digital solutions to support economic development. The study also showed the need for university graduates to be familiar with technical skills, and 21st century skills such as the desire for creativity and critical thinking, to reduce the gap between the skills required in the digital economy and those available in the labor market.

5. Recommandations:

- Government agencies responsible for the higher education and scientific research sector should develop policies and legislative frameworks in order to move towards smart transformation and meet the needs of the labor market.
- It is necessary to provide the necessary support within the framework of government policy to modernize the technological infrastructure in universities, especially in developing countries, to include Internet networks, cloud systems, and data security.
- Work to update the educational curricula to include the skills of the twenty-first century within the requirements of the Industrial Revolution 4.0, such as programming, artificial intelligence, data analysis, and cybersecurity, in order to effectively prepare students to enter the digital labor market with confidence.
- Supporting scientific research and innovation in universities and various educational institutions to provide innovative technologies that will contribute to economic and social development.
- Enhancing effective cooperation between universities, the economic sector and various social partners, to develop programs that comply with the requirements of the labor market.
- The need to adopt technology effectively in the educational process, to ensure that students acquire various digital and innovative skills
- Working to encourage research and innovation in the field of the digital economy by providing the necessary resources, support and sufficient motivation for researchers and students.

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