THE IMPACT OF ARTIFICIAL INTELLIGENCE ON EMPLOYMENT TRENDSAND THE DEMANDS ON VIETNAMESE UNIVERSITIES

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Abstract: This article conducts a desk review on the impact of artificial intelligence on employment trends in various countries worldwide, with a focus on the United States as a representative example, and the demands it places on universities in Vietnam. The research highlights that artificial intelligence (AI) is reshaping future career trends and the required skill sets for the workforce. Higher education, as the hub for cultivating skilled and highly qualified human resources, must create optimal conditions for training a workforce that can meet the demands of digital transformation and the significant influence of AI. In the context of a developing countries like Vietnam, universities also need to innovate their curriculum and foster closer partnerships between academia and industry to equip students with lifelong learning skills.

I. Introduction

Emerging technologies are rapidly transforming the job market, or in other words, the job market is being influenced by these new technologies. From artificial intelligence (AI) to automation, the Internet of Things (IoT), and blockchain, these technologies are changing how we work and the types of jobs available. Artificial intelligence, as a revolutionary new technology (Aghion et al., 2018), has been rapidly advancing in recent decades, garnering widespread attention for its impact on employment (Goos et al., 2009; David, 2017; Oschinski and Wyonch, 2017; Acemoglu et al., 2022). Studies on the impact of AI on employment have primarily focused on developed countries such as Europe, Japan, Canada, the United States, and China (citation).

These studies suggest that the impact of AI on labor markets varies across

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countries. For instance, in the Canadian labor market, only 1.7% of jobs are at high risk of automation, while in the United States, the rate of jobs susceptible to computerization is as high as 47%, and in Japan, it's 55%. In China, Chengzhang Wang (2023) estimated that 54% of jobs in the country are at high risk of replacement, particularly those requiring significant cognitive and dexterous tasks (Chengzhang Wang a, Min Zheng b, Xiaoming Bai c, Youwei Li d, 2023). In some Southeast Asian countries, including Vietnam, the International Labour Organization (ILO) predicts that over the next two decades, around 56% of the workforce in these countries is at risk of losing their jobs to robots (VTV New, 2017). Thus, the continuous advancement of digital technology and artificial intelligence brings about significant changes, even displacing jobs traditionally performed by humans (Ford, 2015; Spencer, 2018). Studies anticipate that many tasks will undergo substantial changes, and many workers will need to adapt to new skill requirements (Spencer, 2018).

Higher education institutions are considered centers of advanced learning designed to provide conducive environments for teaching and professional development (Naqshbandi et al., 2023). These institutions are of great interest to governments as they play a vital role in economic development and national progress (Trevitt et al., 2017). Therefore, universities are expected to become active learning organizations to enhance operational effectiveness and promote sustainable development (Trần & Phạm, 2019). According to Patterson (1999),

universities can be seen as learning organizations when they adapt to changing environmental conditions by vigorously implementing new ideas and changing their operational methods. Consequently, universities face increasing pressure to enhance competitiveness both nationally and globally (Bui & Baruch, 2010). Universities worldwide are grappling with significant challenges on various fronts, including digital transformation, diverse student populations, meeting the employability expectations of graduates in the labor market, and providing lifelong learning capabilities to graduates (Voolaid & Ehrlich, 2017). Concerns are raised about the lag in education related to new technologies and innovations, often not included in the curriculum at universities (Ilori & Ajagunna, 2020). Lack of essential employability skills is a top cause of unemployment (Dogara et al., 2019). Higher education must keep pace with technological advancements, ensuring the development of necessary technical and non-cognitive skills to maintain future employment; jobs will be scarce for those without the required skills. Universities must innovate teaching and learning processes to effectively address the skills demand of the job market in the context of new technologies (Ilori & Ajagunna, 2020) (Goulart et al., 2022). Vietnamese universities are no exception to this scenario. Therefore, to better prepare for the training of high-quality human resources in the face of AI's impact, Vietnamese universities need to prepare for ongoing changes.

II. Method

We used a desk-review to study the impact of Artificial Intelligence on

employment trends. We focused on relevant documentation, such as research papers, and information from reports, especially reports on global labor market forecasts, reports on the impact of AI on the US, EU, China and report on employment trends of university graduates in Vietnam. From there, we provide implications for training for students in Vietnam, responding to the context of AI's impact.

III. Results

3.1. Artificial intelligence

According to the OECD, artificial intelligence (AI) is defined as "machine-based systems that can affect the environment in various ways by producing output (predictions, recommendations, or decisions for a specific target set). It uses data and machine and/or human-based inputs to: (i) perceive the real or virtual environment; (ii) abstract these perceptions into models through automatic analysis (e.g., by machine learning) or manually; and (iii) use the model-based inference to formulate outcomes. AI systems are designed to operate at various levels of autonomy" (US-EU Trade and Technology Council Inaugural Joint Statement, 2022).

AI has become pervasive in the lives of 21st-century citizens and is hailed as a tool that can be used to enhance and develop various aspects of life (Górriz et al., 2020). The power of AI stems from the use of machine learning, a branch of statistical computation focused on designing algorithms that can automatically and iteratively build analytical models from new data without requiring explicit programming solutions. Over the past decade, the use of machine learning as a predictive technology has significantly advanced. Pandora, for instance, learns to make better music recommendations based on user preferences; Google can automatically translate content into different languages based on previously translated documents found online; and Facebook predicts individual responses to personalized supplementary content to support ad distribution through its News Feed. One of the most common applications of machine learning is computer vision, or the use of computers to extract information from images and videos, which is a primary focus of research and reflects its significance across a range of applications, from identifying the content of online images for tagging or moderation, enabling self-driving cars, to retrieving specific images or videos from databases. Presently, AI tools include applications like ChatGPT.

3.2. Impact of artificial intelligence on future employment trends

AI has emerged as a transformative force, revolutionizing various industries, and reshaping the future of work. AI influences shifts in future employment trends and transforms the skillsets required by the workforce.

3.2.1. Impact on the job market

AI is altering the job market by changing the nature of work, creating new jobs, and in some cases, leading to the replacement (or loss) of certain specific jobs. Here are some ways in which AI is affecting the job market:

Increased labor productivity: AI is being used to automate repetitive

tasks such as data entry, sorting, and analysis, tasks previously performed by humans. This helps free up human workers to focus on higher-level tasks that require creativity and problem-solving skills. Thus, AI not only contributes to increased labor productivity but also leads to a shift in job roles across various industries. With the role of automation technology, AI promises cost savings and productivity gains, enabling labor users to gain a competitive advantage. AI technologies like machine learning, natural language processing, and robotics can automate everyday, repetitive tasks, enhancing productivity and cost savings. The automation capabilities of AI have the potential to impact various industries, including manufacturing, transportation, customer service, and data analysis. With its ability to process and analyze vast amounts of data, AI has the potential to improve business operations significantly. The McKinsey Global Institute predicts that about 70% of companies will have implemented at least one type of AI technology by 2030, and less than half of large companies may fully utilize AI technologies. Price Waterhouse Coopers predicts that AI could increase global GDP by an additional 14% by 2030 (PwC, 2017). Meanwhile, workers may benefit through improved job quality, worker benefits, and job satisfaction, as AI has the capability to eliminate hazardous or mundane tasks, replacing them with more complex and interesting tasks. It can promote worker engagement, empower workers with higher levels of autonomy, and even contribute to improved mental well-being.

Enhanced decision-making: AI is being used to analyze vast amounts of data and provide predictions and trends, serving as a basis for better decision-making by leaders. This leads to an increasing demand for experts who can understand and interpret data as well as effectively communicate detailed information.

Reduced demand for certain jobs and creation of new ones: In some cases, the application of AI may lead to the elimination of specific jobs, and AI is replacing certain other specific jobs, such as customer service representatives, bank tellers, and administrative assistants. It is easy to see that jobs related to manual labor, data entry, or information processing may be particularly susceptible to automation. This shift presents challenges for individuals who may need to acquire new skills to transition into new roles. On the other hand, AI also has the potential to create new jobs and transform existing ones. As AI technology advances, the demand for specialized experts to develop, deploy, and monitor AI systems is expected to grow. Artificial intelligence can enhance human capabilities, allowing workers to focus on tasks that require more creativity, critical thinking, and emotional intelligence. The labor market will shift towards demanding more complex and specialized skills, emphasizing the need for upskilling and reskilling programs. Overall, AI is creating new jobs in fields such as data science and machine learning, which require relevant knowledge and expertise in AI development, deployment, and monitoring. AI is transforming existing jobs by emphasizing the need for adaptability and continuous learning.

AI is also believed to have a disruptive impact on the labor market's structure. Autor (2015) provides evidence that the labor market has become increasingly polarized in recent decades, leaning toward low-skilled and high-skilled jobs, while avoiding middle-skilled jobs due to the emergence of computers. However, he suggests that this polarization may be reversed, as some low and middle-skilled jobs may be relatively difficult to automate, while certain high-skilled jobs, which are often more routine, may be automatable (potentially with technologies like AI). Petropoulos and Brekelmans (2020) conclude that, unlike the computer and robot revolution, the revolution with artificial intelligence is unlikely to cause job polarization because it will affect the change of all jobs, from low-skilled to high-skilled. Recent research on the impact of AI on the labor market has expanded. Frank and colleagues (2019) classify current research on the impact of AI on the labor market based on two main perspectives: the doomsday view and the positive view. Doomsday proponents believe that the replacement of labor by AI will harm employment. Frey and Osborne (2013) estimated that 47% of total US jobs are at risk of automation in the next decade (Frey, 2013). Their research shows that a significant portion of employment in the service sector - where most job growth in the United States has occurred in recent decades - is highly susceptible to computerization. Bowles (2014) used Frey and Osborne's (2013) framework to estimate that 54% of jobs in the EU are at risk of computerization. Acemoglu and Restrepo (2017) provide a historical example of over-automation significantly negatively affecting the labor market due to weak productivity and recovery effects, the areas in the United States most exposed to industrial automation in the 1990s and 2000s suffered large and strong negative effects on employment and wages (Acemoglu, 2017).

Optimists believe that the recovery and productivity effects of AI will be more than sufficient to offset replacement effects. Some predictions suggest that AI and robots will create up to 90 million jobs by 2025, indicating a strong positive impact on the labor market. The World Economic Forum in October 2020 concluded that while AI may take away 85 million jobs globally by 2025, it will also create 97 million new jobs in fields ranging from big data to machine learning, information security, and digital marketing. Lawrence and colleagues (2017) argue that the automation of AI is unlikely to have a long-term negative impact on the labor market due to the large positive spillover effects (recovery effects) that counteract the direct negative effects of job replacement in the labor market and may even be considered a Schumpeterian creative destruction (Lawrence, M, 2017). They believe that automation has the potential to transform rather than eliminate jobs. On the contrary, other studies find larger negative effects. Arntz et al. (2016) estimated that only 9% of jobs in the UK are likely to be automated in the next decade. They believe that instead of replacement, transformation is more likely to occur, with 35% of jobs changing completely over the next two decades (Arntz, M, 2016). Nakamura

and Zeira (2018) constructed a task-based theoretical model showing that AI automation does not necessarily lead to long-term unemployment (Nakamura, 2018). Somers and colleagues (2022) systematically assessed experimental evidence of technology change and its impact on employment and found that more studies support the effect of labor replacement, with more studies supporting the creation/renewal of labor and the actual income effect of new technology. Furthermore, they found that studies analyzing the net employment impact of technology changes show that the net impact on labor is more positive than negative, reaffirming this narrative. Bholat (2020) also noted that job loss in specific fields due to new technology has been balanced by broad benefits in real income because these technologies create higher-quality, lower-priced goods and services (Bholat, 2020).**

3.2.2. Transformation of work skills

As AI becomes increasingly prevalent in the job market, the necessary skills for the workforce are also changing. Soft skills such as creativity, critical thinking, and communication are becoming more important because machines have difficulty replicating them. Research by the McKinsey Global Institute (MGI - US) has categorized individual activities into five main skill types: physical and manual, basic cognitive, advanced cognitive, social, emotional, and technology. The research results confirm the trend: the future workforce will require more technological skills, but physically demanding jobs will not disappear (Figure 1).
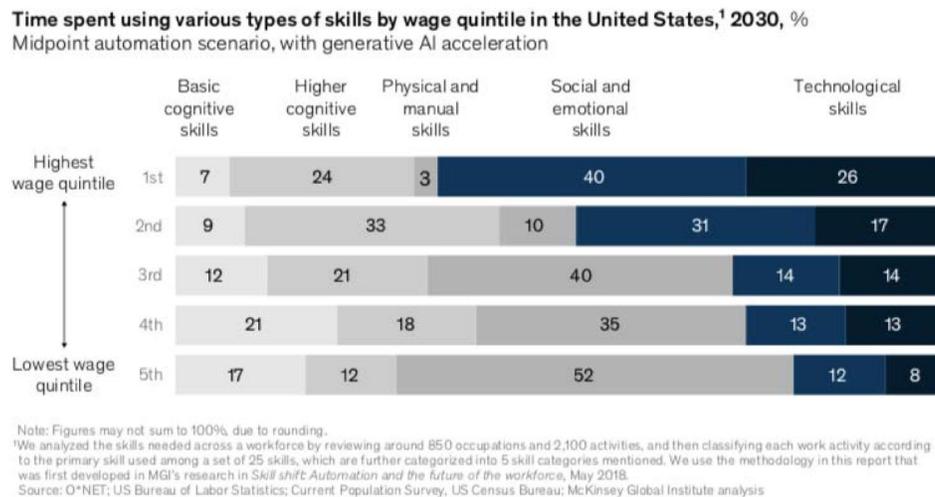
Time spent using various types of skills by wage quintile in the United States,[1] 2030, %
Midpoint automation scenario, with generative AI acceleration

		Basic cognitive skills	Higher cognitive skills	Physical and manual skills	Social and emotional skills	Technological skills
Highest wage quintile	1st	7	24	3	40	26
	2nd	9	33	10	31	17
	3rd	12	21	40	14	14
	4th	21	18	35	13	13
Lowest wage quintile	5th	17	12	52	12	8

Note: Figures may not sum to 100%, due to rounding.
[1] We analyzed the skills needed across a workforce by reviewing around 850 occupations and 2,100 activities, and then classifying each work activity according to the primary skill used among a set of 25 skills, which are further categorized into 5 skill categories mentioned. We use the methodology in this report that was first developed in MGI's research in *Skill shift: Automation and the future of the workforce*, May 2018.
Source: O*NET; US Bureau of Labor Statistics; Current Population Survey, US Census Bureau; McKinsey Global Institute analysis

Figure 1. Time allocation for different skill types by wage group in the United States, 2030

Social, emotional, and technological skills:

Due to the impact of automation on individual activities and the expected structural changes in occupational demand as forecasted, research suggests that social, emotional, and technological skills will be in the highest demand by 2030. These skills are particularly critical in the economy, healthcare, and STEM professions.

Social and emotional skills (such as empathy) consistently play a vital role in healthcare, and this will remain paramount. However, healthcare services are increasingly utilizing digital systems. A study showed that digital content in healthcare roles, like nursing, increased by over 40% from 2002 to 2016. This aligns with the observed rise in digital content in jobs during the same period.

The shift in skill requirements within professions presents opportunities for individuals to align themselves more towards higher-value work, organization, and time allocation. For instance, retail employees may spend less time on transactional tasks and more time providing superior customer support. Healthcare workers may reallocate time spent on paperwork to interact with patients. Importantly, managers can save time on administrative tasks, enabling them to focus on training and collaborating more. Any potential increase in managerial capacity for team building and human development is crucial, especially at a time when supervisors are highly valued and fostering a sense of familiarity is essential for employees considering whether to continue in their current roles. To transition into higher-paying professions, workers will need more training in social, emotional, and technological skills.

3.3. Implications for higher education in the context of AI-driven job trends in Vietnam

The digital transformation is driving changes in higher education, not only in terms of teaching techniques but also in the need to incorporate new skills, combining technical, managerial, and non-cognitive abilities that were previously less emphasized. Non-cognitive skills, such as soft skills, have become crucial in the age of digital transformation, particularly for professionals involved in operations, decision-making, problem-solving, and management (Dolce et al., 2020). The focus on social and emotional skills has emerged as well. Many services now require stronger communication abilities to address and decisively resolve issues (Cunningham and Villasenor, 2016; Dreyfus and Dreyfus, 1986; Urdinola and Gukovas, 2018). Recent studies have identified the most important soft skills for Industry 4.0 as teamwork, creativity, problem-solving, negotiation and communication skills, adaptability, ability to meet deadlines and social pressure, and analytical, interdisciplinary, and systemic thinking (Erol et al., 2016; Hecklau et al., 2016).

Social and emotional skills involve the development of social competencies. Through this process, individuals can effectively absorb and apply the knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, perceive and express empathy toward others, establish and maintain positive relationships, and make responsible decisions (Garner, 2010). It may be essential to establish a framework for enhancing soft skills, but what's crucial is how these skills are integrated into a continuous, evolving process in which individuals learn to contextualize them to fit various activities and environments (Fettes et al., 2020).

Recent studies have investigated the use of collaborative learning environments to develop soft skills and the extent to which external parties can participate in curriculum development (Samkin and Keevy, 2019). Pedagogical strategies aimed at developing soft skills in universities, which are often used to promote student engagement in activities, can benefit from their integration with the job market (Mareque et al., 2019). The education system must ensure the quality of teaching soft skills to ensure that students find employment after graduation, especially in the context of changing employment trends (Peters, 2020). Universities play a particularly vital role in addressing unemployment issues related to technology, especially in developing countries like Vietnam. Labor shortages with the consequences of unemployment are severe issues in these economies (Bashir, 2007). Unemployment, often associated with low-quality technical and university education, is one of the most significant factors leading to poverty in developing countries (Sevilla and Farias, 2020). In these economies, technology and innovation are crucial elements for promoting development. Preparing a workforce for the challenges of the Fourth Industrial Revolution and the impact of artificial intelligence must be a top priority, with universities taking a leadership role in the current context. Although the labor market is evolving, there is still a shortage of adequately trained experts with the necessary new skills (Goulart et al., 2021).

While universities in developing countries have a crucial leadership role in addressing this issue, they tend to operate inefficiently. Universities appear to function primarily as certifying bodies for expertise rather than organizations with a social purpose to train professionals who meet both technical and civic standards (Caplan, 2018). The impact of this failure is especially alarming in the case of technical education. For instance, in Brazil, a 2018 report noted that out of 584,000 available positions in the technology job market, 252,000 positions were filled, with 57% of the positions remaining vacant due to a lack of necessary skills (Censup, 2018). Universities need to provide the necessary skills for the workforce to meet the demands of digital transformation and Industry 4.0 (Blackler and Orbone, 2003; Goulart et al., 2021). One of its limitations is "a lack of connection between academic education and the needs of the job market; managers note that student education not only fails to train them in new technologies but also fails to develop them into contributing members of society" (Goulart et al., 2022).

In the context of Vietnam becoming a high-tech potential country with millions of new jobs in various fields, workers need to adapt quickly to production changes. Therefore, universities, as providers of high-level human resources to society, must comprehensively change their models, program content, and teaching methods (Tri et al., 2021). With approximately 60% of the population in the working age group, Vietnam is still in the demographic "golden" period. However, due to the severe shortage of skilled labor and skilled technical workers, the competitiveness index of Vietnam's labor force is only 3.39 out of 10 points,

and Vietnam's economic competitiveness ranks 73rd out of 133 countries. Currently, about 52% of the Vietnamese population uses the internet, and it is estimated that by 2020, there will be about 100,000 employees working in the information technology field (Cheng et al., 2021; Altbach, 1998). These are critical platforms and advantages that many high-tech corporations like Fujitsu, Intel, Samsung, Siemens, and Alcatel are utilizing to expand their investments in Vietnam. The current Vietnamese labor force is not lacking in quantity but is deficient in professional knowledge, problem-solving skills, leadership, and communication, leading to low labor productivity. With this situation, the advantage of low labor costs in Vietnam is gradually losing its appeal to foreign investors. According to

Vietnam's employment and labor market report (2020): "In 2016, a total of 233 universities conducted surveys on student employment after graduation. The report results showed that 82% of surveyed graduates found employment within 12 months. The fields with the highest unemployment rates included education (19%), social work (19%), environmental science (17%), and law (17%). The fields with the lowest unemployment rates were architecture (7%), healthcare (7%), and technology (9%) (page 22). Additionally, the survey results in this report also indicate the highest missing and weak skills of graduates upon graduation, primarily lacking practical experience and professional skills, as well as lacking communication skills (Figure 2).
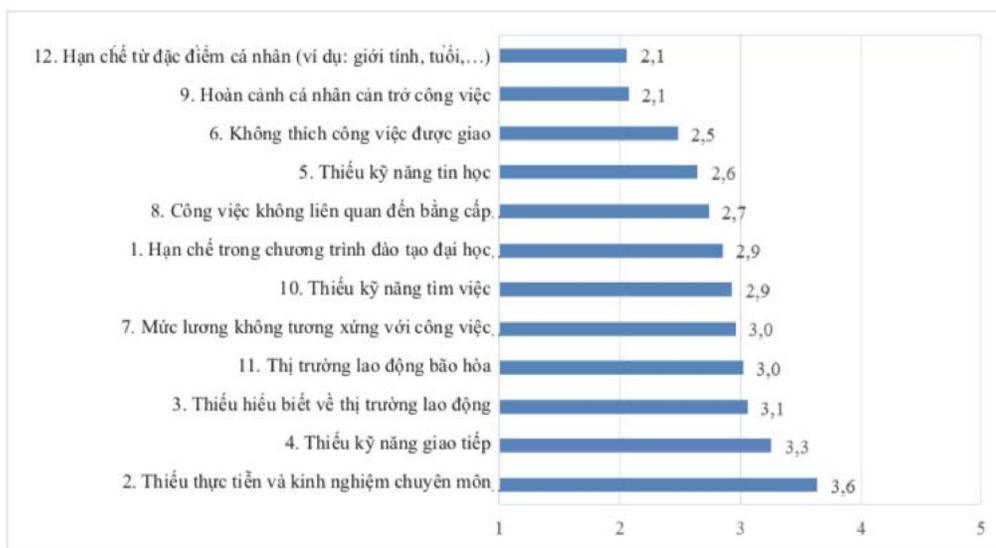

Figure 2. Assessment of factors influencing student employment

(Nguyen Van Thang and colleagues, 2020)

Under the influence of AI, the interaction between devices and between devices and humans will create new products. Some new skills will be

mandatory requirements for employees, such as problem-solving skills, critical thinking, communication skills, collaboration, creativity, and innovation.

This is a crucial point of orientation when implementing changes in training programs and establishing new majors at universities.

In parallel with educational activities, the scientific research activities of universities in Vietnam must also innovate and compete in the development of AI. Many economic and industrial corporations have the scientific, human, and financial resources and practical experience that university researchers and lecturers do not possess. To ensure the transformation in the labor market, cooperation between the government, industry, and academia is essential. Public policies need to be promoted by attracting businesses and educational organizations to identify emerging AI-driven job trends, develop industry standards, and design targeted policies. Close collaboration also provides favorable conditions for the development of ethical principles in AI application, ensuring transparency and accountability in technology deployment.

Leading and guiding the ethical application of artificial intelligence (AI) is also one of the tasks of today's universities. Although there have been many discussions on this topic recently, unfortunately, only a few actions have been taken to date. Governments and businesses must prioritize the ethical use of AI to prevent social disruptions. Regulations and guidelines need to be implemented to address issues of privacy, bias, fairness, and data accountability. Regular checks and evaluations of AI systems can minimize potential risks and build public trust in AI technology.

IV. Conclusions

Artificial intelligence (AI) has deeply influenced the labor market. While there are concerns about job displacement and social disruption, proactive preparation by universities can help minimize these challenges. Higher education is a source of global innovation, policy, knowledge, and assets (Ilori and Ajagunna, 2020). Its importance in developing new professional skills is paramount (Kurbanov et al., 2020), and this function is essential for lifelong learning principles. By investing in professional and soft skills training, promoting collaboration, and ensuring ethical AI application, governments and businesses can create a comprehensive and flexible labor market, harnessing the benefits of AI while supporting workers in the changing landscape.

While most discussions about future job trends focus on large-scale training programs, many skill development activities occur daily in the workplace. Previous research by the MGI on the labor force examined shifts in jobs carried out by millions of workers over a decade and found that individuals' experience and career development contributed to 40% of an individual's average lifetime income in the United States. Learning skills on the job play an even more significant role for individuals with lower levels of education, starting with lower incomes. The MGI study showed that nearly one-third of American workers transitioning to higher-income groups did so primarily because of new skills, implying that most people can learn and do more than they currently do. This emphasizes the human capacity for lifelong learning.

The key to success for each student lies in adaptability, continuous learning, and a proactive approach to skill enhancement. By harnessing AI's potential, higher education institutions - the providers of high-quality human resources meeting the demands of socio-economic development - can guide the evolving job market and future development. Additionally, universities need to equip students with soft skills, adaptability, and lifelong learning abilities to keep pace with the current pace of AI development.

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