

The Current Status and Proposed Solutions For Human Resource Development in Support of Artificial Intelligence Advancement in Vietnam

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ABSTRACT

AI is a key driver of the Fourth Industrial Revolution, increasing demand for skilled human resources in Vietnam. Despite the growth of AI programs, challenges persist in outdated curricula, limited faculty, and lack of practical skills. This paper proposes five solutions: modernizing curricula, developing faculty, investing in research infrastructure, strengthening industry-academia ties, and ensuring long-term policy support. Coordinated efforts among stakeholders are essential to improve training quality and meet global AI demands.

Keywords: *Artificial Intelligence, AI workforce training, Fourth Industrial Revolution, education, enterprise collaboration, curriculum modernization, lecturer development, policy support.*

1. THEORETICAL FRAMEWORK AND RESEARCH METHODS

1.1. Theoretical Framework

AI drives the Fourth Industrial Revolution, impacting sectors like manufacturing, healthcare, finance, education, and governance. It offers innovation opportunities but requires a skilled workforce. Nguyen Van A (2023) highlights AI's potential to boost economic growth by automating tasks and creating jobs. In education, AI enhances personalized learning, leading to curriculum updates. Countries like the U.S., China, and Singapore have adopted national AI training strategies. Vietnam must prioritize AI workforce development to stay competitive in the digital era.

1.2. Related Studies on Human Resource Training Solutions for Artificial Intelligence Development

AI development will reshape the labor market, requiring adaptable education systems and skilled workers. The World Economic Forum (2022) predicts that 85 million jobs may be lost by 2025, but 97 million new, tech-intensive roles will emerge. McKinsey (2021) found that countries investing in AI talent see faster GDP growth, particularly when AI is integrated with data science. UNESCO (2023) highlights the importance of fostering soft skills like critical thinking, creativity, and collaboration in AI training.

1.3. Research Methods

This study uses the following methods: Literature Review: Analyzing AI workforce training studies from reliable sources like the World Economic Forum, UNESCO, and McKinsey; International Comparison: Comparing AI training models in the U.S., China, and Singapore to derive lessons for Vietnam; Field Survey: Surveying AI training institutions in Vietnam to assess current challenges in workforce development.

2. LESSONS FROM SELECTED COUNTRIES

2.1 United States

The U.S. leads in AI development, supported by top universities like MIT, Stanford, and Carnegie Mellon, which offer AI programs that blend theory with practical fields. These institutions collaborate with tech giants such as Google, Microsoft, and OpenAI for hands-on training. The "American AI Initiative" (2019) promotes research funding, talent development, and ecosystem growth, while the JAIC focuses on AI for national security. A thriving AI startup ecosystem, backed by venture capital, further strengthens U.S. dominance. This synergy between academia, industry, and policy ensures a continuous pipeline of high-quality AI talent.

2.2 China

China is investing heavily in AI to become a global leader by 2030, supported by the "Made in China 2025" strategy and the 2017 National AI Development Plan. Billions are allocated to AI R&D, with strong support for tech giants like Baidu, Alibaba, Tencent, and Huawei. Leading universities such as Tsinghua, Peking, and Shanghai Jiao Tong offer comprehensive AI programs. Government initiatives like "AI+X" promote AI applications in healthcare and finance. Training centers in major cities offer both advanced and short-term AI education. This approach positions China as a rising AI powerhouse.

2.3 Singapore

Singapore aims to be Southeast Asia's AI hub via its 2019 National AI Strategy, targeting sectors like healthcare, finance, and education. Top universities like NUS and NTU offer strong AI programs, with close industry ties. Initiatives such as AIAP and Skills Future provide hands-on training and upskilling. SGInnovate supports startups, while strategic investment in talent and innovation strengthens Singapore's AI leadership.

Table 1. Lessons for Vietnam from the AI Training Experiences of Three Countries

Country	AI Experiences & Strategies	Lessons for Vietnam
United States	<ul style="list-style-type: none"> Invest heavily in AI research at top universities (MIT, Stanford, Carnegie Mellon, etc.). The government has a supportive AI strategy through the "American AI Initiative." Tech companies collaborate closely with universities. The AI startup ecosystem is thriving with numerous investment funds. 	<ul style="list-style-type: none"> Build strong AI research centers in universities. Create mechanisms to encourage businesses to collaborate with training institutions. Support AI startups through funding and investment policies.
China	<ul style="list-style-type: none"> The "Made in China 2025" strategy aims to become an AI powerhouse by 2030. The government invests heavily in AI and promotes the development of major corporations like Baidu, Alibaba, and Tencent. Universities such as Tsinghua and Peking integrate AI into curricula from undergraduate to PhD levels. Encourage collaboration between universities and businesses through programs like "AI+X." 	<ul style="list-style-type: none"> Develop a long-term AI strategy with clear objectives. Invest in AI research and support domestic tech enterprises. Integrate AI training into interdisciplinary fields such as finance, healthcare, and engineering.
Singapore	<ul style="list-style-type: none"> The government issues a "National AI Strategy" focusing on key priority sectors. A close collaboration model between government, businesses, and academia. The AI Apprenticeship Programme (AIAP) provides practical AI workforce training. The Skills Future initiative helps workers stay updated with AI-related skills. 	<ul style="list-style-type: none"> Develop an AI strategy aligned with Vietnam's strengths. Promote practical AI training programs in collaboration with businesses. Support workers in upgrading their AI skills through short-term courses.

Source: Compiled from the World Economic Forum (2022), UNESCO (2023), and McKinsey (2021)

Lessons from the U.S., China, and Singapore show that AI success relies on long-term strategy and strong government–industry–academia collaboration, with priorities in research, talent development, and ecosystem building. These insights can help Vietnam shape effective policies and drive AI growth.

3. THE CURRENT STATUS OF AI HUMAN RESOURCE DEVELOPMENT IN VIETNAM

3.1 Initial Achievements

3.1.1 Educational Institutions Providing AI Training

Many Vietnamese universities now offer AI programs at both undergraduate and graduate levels. Key institutions include HUST (~200 graduates/year), VNU-UET (~300 students/year), and FPT University with strong industry ties. HCMC University of Technology trains ~150 AI students/year, and the John von Neumann Institute produces ~50 experts annually. Nationwide, over 10,000 students are enrolled in AI-related fields, growing at ~20% per year. This reflects Vietnam's expanding AI education landscape.

3.1.2 AI Workforce Supplied by Educational Institutions

From 2020 to 2023, an estimated 5,000–7,000 AI engineers and graduates entered the labor market each year. According to a VietnamWorks survey (2023), 80% of AI graduates found jobs within six months, with an average starting salary of 15–25 million VND/month. Major corporations such as VinAI, FPT, Viettel, VNPT, MoMo, and Zalo AI have actively recruited AI talent from local institutions.

3.1.3 Current Quality of Trained AI Workforce

Despite a growing number of graduates, the overall quality remains inconsistent. According to a Navigos Search report (2023): 60% of employers believe students lack sufficient practical AI skills. 50% of new graduates require 6–12 months of additional training before becoming job-ready. Key technical skills such as Big Data, Deep Learning, and Computer Vision are below international standards.

Table 2. Current Status of AI Workforce Training in Vietnam

Category	Illustrative Details
Educational Institutions Providing AI Training	<ul style="list-style-type: none"> Hanoi University of Science and Technology: ~200 graduates/year. University of Engineering and Technology – Vietnam National University (VNU): ~300 students/year. FPT University: AI integrated into IT curricula; partnerships with Google AI, FPT AI. Ho Chi Minh City University of Technology: Offers AI-specialized Computer Science track with ~150 students/year. John von Neumann Institute (VNU-HCMC): ~50 AI experts trained annually.
AI Workforce Output	<ul style="list-style-type: none"> From 2020 to 2023: Estimated 5,000–7,000 AI engineers and graduates entering the labor market annually. 80% of AI graduates secure employment within six months of graduation. Average entry-level salary ranges from VND 15–25 million/month.
Quality of Trained AI Workforce	<ul style="list-style-type: none"> 60% of enterprises believe graduates lack sufficient practical skills in AI. 50% of new graduates require 6–12 months of additional training to meet job requirements. Key technical weaknesses include Big Data, Deep Learning, and Computer Vision.

Source: Compiled from reports by the Ministry of Education and Training, Vietnam Works, and Navigos Search (2023).

Vietnam has over 10,000 students in AI-related programs, growing 20% annually. Top universities like HUST, VNU-UET, and FPT University provide AI training with strong industry links. Key outputs include 200–300 graduates and about 50 AI experts yearly from leading institutions.

3.2 Limitations and Challenges in AI Human Resource Training in Vietnam

3.2.1 Curriculum-Related Limitations

Lack of practical training: 60% of employers believe new AI graduates lack hands-on skills (Navigos Search, 2023). Outdated curricula: 40% of students find training too theoretical and lacking practical components (VietnamWorks, 2023). Shortage of qualified lecturers: Vietnam has fewer than 300 AI-specialized lecturers, insufficient to meet demand (Ministry of Education and Training, 2023).

3.2.2 Workforce Supply-Demand Gap

High demand vs. low supply: Vietnam is expected to need around 50,000 AI engineers by 2025, while only 5,000–7,000 graduate each year, resulting in a significant shortage (McKinsey, 2023). Limited skillsets: Half of AI graduates require 6–12 months of additional training to become job-ready (Navigos Search, 2023). Key gaps include: Big Data, Deep Learning, Computer Vision.

3.2.3 Infrastructure and Policy Constraints

Vietnam's AI training still faces key limitations in facilities, policy, and workforce quality. Most universities lack modern AI labs, with major investments seen only at a few institutions like VinAI, Viettel AI, and HUST. Moreover, the country has yet to adopt a long-term national strategy, unlike China or Singapore. To close these gaps and stay globally competitive, stronger investment from the government, academia, and industry is essential.

4. SOLUTIONS FOR AI HUMAN RESOURCE DEVELOPMENT IN VIETNAM

Based on theoretical analysis, international experiences, and current challenges, five key solutions are proposed to strengthen AI workforce training in Vietnam:

4.1. Curriculum Modernization

Develop up-to-date curricula aligned with global standards, integrating key subjects such as Machine Learning, Computer Vision, and Natural Language Processing. Emphasize hands-on training and real-world AI projects through university–industry collaboration. Expand flexible programs, including short-term and online courses tailored for working professionals.

3.2 Enhancing AI Faculty and Expertise

Attract qualified AI experts, especially Vietnamese professionals abroad, with competitive incentives. Support faculty training via advanced courses and partnerships with top AI institutions (e.g., Google AI, OpenAI, DeepMind). Promote research by providing funding for applied AI projects.

3.3 Infrastructure and Research Center Development

Establish modern AI laboratories at universities. Launch a national AI training center modeled after successful initiatives in Singapore and China. Foster international cooperation with institutions like MIT, Stanford, and Oxford AI Labs.

3.4 Strengthening Academia–Industry Linkages

Create structured AI internship programs with major tech firms (FPT, VinAI, Viettel AI, Zalo AI). Implement university–enterprise AI Labs where students participate in real industry projects. Encourage businesses to invest in AI training via tax incentives and scholarship support.

3.5 Policy Support and Long-term Strategy

Formulate a national strategy for AI human resource development through 2030. Provide financial support and national AI scholarships, especially for talented or disadvantaged students. Introduce AI and coding subjects into secondary education to build early foundations.

Table 3. Solutions for AI Human Resource Development in Vietnam

Solution Area	Key Actions
Curriculum Modernization	<ul style="list-style-type: none"> • Develop updated curricula aligned with international standards. • Integrate core AI subjects: Machine Learning, Computer Vision, Natural Language Processing. • Increase practical training and real-world project implementation. • Expand online and short-term AI courses for working professionals.
Faculty and Expert Development	<ul style="list-style-type: none"> • Attract domestic and overseas AI experts to teach in Vietnam. • Support faculty in attending advanced training programs at top AI research centers worldwide. • Provide research funding to encourage applied AI innovation in teaching.
Infrastructure and Research Centers	<ul style="list-style-type: none"> • Establish modern AI laboratories at universities. • Create a national AI academy, following successful models in Singapore and China. • Strengthening international partnerships with institutions like MIT, Stanford AI Lab, and Oxford AI.
Industry–Academia Collaboration	<ul style="list-style-type: none"> • Launch structured AI internship programs with major tech firms. • Develop AI Lab–Enterprise cooperation models, enabling students to engage in practical projects. • Offer tax incentives and financial support for businesses investing in AI talent development.
Policy and Strategic Support	<ul style="list-style-type: none"> • Implement a national strategy for AI human resource development through 2030. • Provide national AI scholarships for talented and underprivileged students. • Integrate AI and coding into secondary education to build foundational skills early.

Source: Synthesized from reports by the World Economic Forum (2022), UNESCO (2023), McKinsey (2021), and Vietnam's Ministry of Education and Training (2023)

AI is transforming socio-economic systems, and Vietnam has made progress in workforce development but still faces challenges in training and infrastructure. Building a competitive AI workforce requires modernized curricula, better faculty, strong industry–academia ties, and long-term policies. With coordinated efforts, Vietnam can become a regional leader in AI.

CONCLUSION

Artificial Intelligence (AI) is a key driver of socio-economic transformation. Vietnam has made notable progress in AI workforce development but still faces challenges in training quality, practical skills, and infrastructure. To build a competitive AI workforce, efforts must focus on modernizing curricula, enhancing faculty, and upgrading facilities. Industry–academia collaboration and long-term support policies are also essential. A coordinated and unified approach is needed for sustainable progress. With strategic action, Vietnam can strengthen its AI capabilities and become a regional leader in AI development./.

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