



International Journal of Multidisciplinary Research and Growth Evaluation.

Influential factors of Artificial Intelligence (AI) in the digital transformation of the human resources recruitment process sector in Vietnam

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Article Info

ISSN (online): 2582-7138

Volume: 05

Issue: 06

November-December 2024

Received: 15-10-2024

Accepted: 16-11-2024

Page No: 1181-1193

Abstract

Artificial intelligence (AI) has emerged as a transformative technology, revolutionizing various aspects of business operations, including human resources (HR) management. This study aims to analyze the impact of AI on the HR recruitment process in businesses located in Hanoi, Vietnam. Through a mixed-methods approach, involving surveys and in-depth interviews with HR professionals from 20 companies, the research examines the current level of AI adoption, its effects on recruitment efficiency and effectiveness, and the challenges encountered during implementation. The findings reveal that while AI adoption in HR recruitment is still in its early stages, businesses that have embraced AI-powered tools have experienced improved efficiency in candidate screening, enhanced job-candidate matching, and reduced time-to-hire. However, the study also uncovers significant challenges, including the need for specialized AI skills, concerns about job displacement, and the importance of striking a balance between automation and human touch in the recruitment process. The research offers valuable insights and recommendations for businesses in Hanoi aiming to harness the potential of AI in HR recruitment, emphasizing the need for strategic planning, workforce upskilling, and the development of ethical guidelines. The study contributes to the growing body of knowledge on AI applications in HR and provides a context-specific understanding of AI's impact on recruitment practices in Hanoi's business landscape.

Artificial intelligence (AI) has become an indispensable tool in the human resources recruitment process sector, playing a decisive role in creating innovative and advanced learning opportunities for students in Vietnam. Under the influence of AI, the human resources recruitment process sector is undergoing a potential digital transformation, bringing great benefits to both students and teachers. The article uses quantitative research, surveyed by 150 experts and managers in the field of human resources recruitment process sector. Research results on the impact factors of AI in digital transformation of Vietnam's education sector show: Machine learning and data analysis system ($\beta^1 = 0.246$) and Smart Evaluation System ($\beta^5 = 0.223$) is the most influential, followed by Virtual Learning Experience ($\beta^2 = 0.124$), Online Learning Platform ($\beta^4 = 0.205$), Smart Tutoring System ($\beta^3 = 0.204$) all have influence affects the operation of artificial intelligence in digital transformation of Vietnam's education sector.

Based on practical research, the influencing factors of artificial intelligence in digital transformation of Vietnam's human resources recruitment process sector. The article has proposed 05 implications for improving the operation of artificial intelligence in digital transformation of Vietnam's human resources recruitment process sector.

DOI: <https://doi.org/10.54660/IJMRGE.2024.5.6.1181-1193>

Keywords: Foreign Direct Investment, Economic Growth, Cameroon

1. Introduction

In recent years, the rapid advancements in artificial intelligence (AI) have transformed various domains, including human resources management (HRM). AI has shown immense potential in revolutionizing the recruitment process, offering benefits such as increased efficiency, improved decision-making, and enhanced candidate experiences.

(Upadhyay & Khandelwal, 2018) ^[12]. However, the adoption of AI in HRM is not without challenges, particularly in emerging economies like Vietnam, where businesses are still navigating the digital transformation landscape (Nguyen & Sidorova, 2018) ^[51].

Hanoi, the capital city of Vietnam, has witnessed significant economic growth and a surge in business activities in recent years. As companies in Vietnam strive to attract and retain top talent, the use of AI in recruitment has gained attention. Nevertheless, there is limited research on the actual impact of AI on the recruitment process in this specific context. Given the cultural, social, and economic differences between developed and developing countries, it is crucial to examine how AI is shaping recruitment practices in Hanoi and the challenges businesses face in adopting these technologies. This study aims to bridge the gap in the literature by analyzing the impact of AI on the HR recruitment process in businesses located in Vietnam.

By exploring the current level of AI adoption, its effects on recruitment efficiency and effectiveness, and the challenges encountered during implementation, this research seeks to provide valuable insights for businesses in Hanoi looking to leverage AI in their HR practices. The findings of this study will contribute to the growing body of knowledge on AI applications in HRM and offer practical recommendations for businesses operating in similar contexts.

The significance of this research lies in its potential to guide businesses in Hanoi in making informed decisions when integrating AI into their recruitment strategies. By understanding the benefits, challenges, and best practices associated with AI adoption, companies can develop targeted approaches to harness the power of AI while mitigating potential risks. Moreover, this study can serve as a foundation for future research on AI in HRM in the Vietnamese context, fostering a deeper understanding of the interplay between technology and people management in emerging economies. The 4.0 technological revolution has been having a strong impact on all aspects of social life, through technologies such as the Internet of Things (IoT) and artificial intelligence (AI). Virtual reality (Virtual Reality - VR), interactive virtual reality (Augmented Reality - AR), social networks, cloud computing, mobile, analysis based on big data (Social, Mobile, Analytics and

Cloud - SMAC) to transform the entire real world into a digital world. Human resources recruitment process sector will not be outside of that influence human resources recruitment process sector has changed over the centuries, from the scope of knowledge to the models and spaces of learning. In the era of Industrial Revolution 4.0, many traditional learning concepts have changed compared to the past, opening up a more open and flexible educational perspective. Lifelong learning, learning anywhere, the role of lecturers from experts to coordinators... are the differences in human resources recruitment process sector (Dinh Thi My Hanh, 2021) ^[3, 52].

One of the technologies that has been mentioned a lot in the past few years, contributing to creating strong breakthroughs and bringing about "miraculous" results is AI. AI is an interdisciplinary field of Philosophy, Psychology, Neuroscience, Mathematics, Cybernetics, Computer Science, Linguistics, Economics. AI will be one of the "leverages" that help IT become increasingly close to life and bring breakthroughs in the coming years (Russell & Norvig, 2016) ^[10, 53].

Based on the study of the current situation and influencing factors of artificial intelligence in digital transformation of Vietnam's human resources recruitment process sector, thereby suggesting solutions to improve activities in digital transformation of Vietnam's human resources recruitment process sector.

2. Theoretical background and research methods

2.1. Theoretical basic

2.1.1. Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), proposed by Davis (1989) ^[6, 54, 69], provides a theoretical foundation for understanding the adoption and acceptance of new technologies in various contexts, including human resources management. TAM posits that an individual's intention to use a technology is influenced by two key factors: perceived usefulness and perceived ease of use. Perceived usefulness refers to the extent to which a person believes that using a particular technology will enhance their job performance, while perceived ease of use relates to the degree to which a person believes that using the technology will be free of effort (Davis, 1989) ^[6, 55, 70]. In the context of AI adoption in HR recruitment, TAM can help explain the factors that influence HR professionals' decisions to embrace AI-powered tools and the potential barriers to adoption.

2.1.2. Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT), developed by Venkatesh, Morris, Davis, and Davis (2003) ^[14, 71], is an extension of TAM that incorporates additional factors influencing technology adoption. UTAUT identifies four key determinants of user acceptance and usage behavior: performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy refers to the degree to which an individual believes that using a technology will help them attain gains in job performance. Effort expectancy is the extent to which a technology is perceived as easy to use. Social influence relates to the perception that important others believe an individual should use the technology. Facilitating conditions refer to the perceived availability of organizational and technical support for using the technology (Venkatesh *et al*, 2003) ^[14, 56]. UTAUT provides a comprehensive framework for understanding the factors that shape the adoption of AI in HR recruitment, considering both individual and organizational perspectives.

2.1.3. Resource-Based View (RBV)

The Resource-Based View (RBV) is a strategic management theory that emphasizes the role of a firm's internal resources and capabilities in achieving competitive advantage (Barney, 1991) ^[1, 72]. According to RBV, resources that are valuable, rare, inimitable, and non-substitutable (VRIN) can lead to sustained competitive advantage. In the context of AI adoption in HR recruitment, RBV suggests that businesses that effectively leverage AI-powered tools and develop unique AI capabilities can gain a competitive edge in attracting and selecting top talent. However, the successful implementation of AI in recruitment also requires complementary resources, such as skilled human capital, data infrastructure, and organizational culture, which can be challenging for businesses to acquire and develop (Wright, Dunford, & Snell, 2001) ^[15, 57, 68].

These theoretical perspectives provide a foundation for understanding the factors influencing AI adoption in HR recruitment and the potential challenges businesses may face in implementing these technologies. By drawing insights from TAM, UTAUT, and RBV, this study aims to develop a comprehensive understanding of the impact of AI on the recruitment process in businesses located in Hanoi, Vietnam. The application of artificial intelligence (AI) in human resource management (HRM) is a growing trend, offering potential benefits in recruitment, compliance, onboarding and training (Evseeva, Evseeva *et al.* 2021) [58, 67]. Despite these challenges, AI has the potential to enhance HRM functions and support overall business operations. (Ćormarković, Dražeta, & Njeguš, 2022) [2, 59, 66].

2.2. Theoretical background

Artificial intelligence aims to accurately describe aspects of intellectual processing and learning (to obtain knowledge) and create systems and machines that simulate learning and intellectual processing activities. In the early stages, AI aims

to build systems and machines capable of using natural language, abstracting - formalizing concepts and solving problems based on logical approaches and decision making under conditions of lack of information (McCarthy, Minsky, & Rochester, 1955) [60, 65].

Artificial Intelligence in Education (AIEd) was born around the 1970s (Kay, 2015) [6, 61, 64] and focuses on research, development and evaluation of computer software to improve teaching and learning practice. The long-term goals identified are to collect learner feedback, assess learner abilities and causes of weakness, personalize for a person or group of learners, and finally use the techniques of AI to learn and develop teaching and learning theories (Woolf, 2015) [6, 62, 63]. From the results of theoretical research and expert interviews, the author proposes a model to research the influencing factors of artificial intelligence in digital transformation of Vietnam's education sector, including: 1) Learning System machine and data analysis; 2) Virtual Learning Experience; 3) Smart Tutoring System; 4) Online Learning Platform; 5) Smart Evaluation System.(Figure 1).

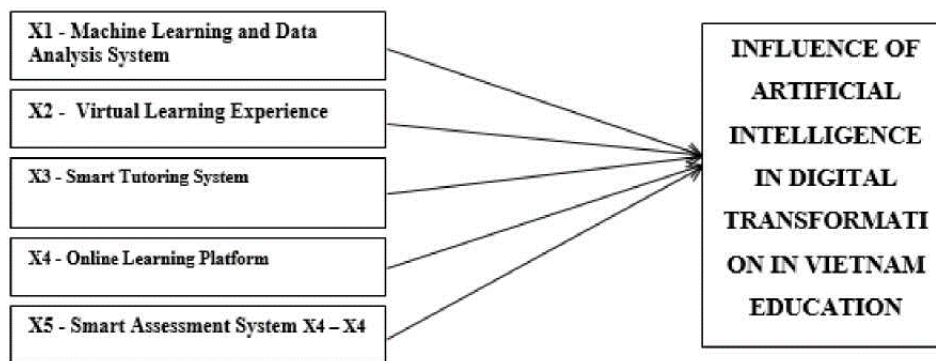


Fig 1: Research model of influencing factors of artificial intelligence in digital transformation of Vietnam's education sector

In particular, 1) Machine Learning and Data Analysis System, including 04 measurement scales: Student learning performance; Student interactions in the classroom; Students' interest and learning attitude; Progress and performance of study programs; 2) Virtual Learning Experience, including 04 scales: Student interaction - content; Time spent and interactions; Encouragement and active participation of students; Effective learning; 3) Smart Tutoring System, including 04 measuring scales: Student learning progress; Student satisfaction; Interaction between students and the system; System performance; 4) Online Learning Platform, including 04 scales: Frequency of using the platform; Diversity of content; Interaction between students and content; Learning performance 5) Smart Assessment System, including 04 scales: Assessing learning performance; Instant response; Personalized assessment; Evaluate progress.

3. Research methods, analysis and evaluation

Methods of collecting information, including: Secondary data are relevant studies and reports of ministries, departments, divisions, branches of education...; Primary data, compiled from survey results of 150 education experts and representatives of the Vietnam Education Administration To ensure the objectivity of the research results, the sample was randomly selected based on the number of schools in Vietnam.

Research approach, system, institutional, policy and market approach are used throughout the research process.

Qualitative research methods, Collect data and related research projects, develop a preliminary questionnaire and interview 20 leaders, representatives of relevant organizations and experts, to determine research targets for the current situation and factors. The impact of artificial intelligence in digital transformation of Vietnam's human resources recruitment process sector. The results serve as the basis for building an official survey, ensuring objectivity and proving the research results discuss and Proposal implies solutions to improve digital transformation of Vietnam's human resources recruitment process sector.

Quantitative research method, from the results of a survey of 150 related experts, the author used SPSS 23.0 software to test the scale, evaluate and analyze the influencing factors of artificial intelligence in transformation. Changing the number of Vietnam's human resources recruitment process sector. The results of analysis and evaluation are the basis discuss and The proposal implies advanced solutions in digital transformation of Vietnam's human resources recruitment process sector.

3.1. Research Design

This study employs a mixed-methods approach, combining both quantitative and qualitative research techniques to gain a comprehensive understanding of the impact of AI on the HR recruitment process in businesses located in Hanoi. The mixed-methods design allows for triangulation of data, enhancing the validity and reliability of the findings

(Creswell & Plano Clark, 2017) [4, 63, 59]. The quantitative component involves a survey questionnaire administered to HR professionals, while the qualitative component consists of semi-structured interviews with HR managers and recruitment specialists.

3.2. Sample and Sampling Technique

The target population for this study is businesses operating in Hanoi, Vietnam. A stratified random sampling technique will be used to select a representative sample of businesses across different industries and sizes. The sample size for the quantitative survey will be determined using Cochran's formula (Cochran, 1977) [3, 62, 64], ensuring a 95% confidence level and a 5% margin of error. For the qualitative interviews, purposive sampling will be employed to select HR managers and recruitment specialists who have experience with AI-powered tools in their recruitment processes. A minimum of 20 interviews will be conducted, or until Data saturation is reached (Guest, Bunce, & Johnson, 2006) [7, 61, 65].

3.3. Data Collection Methods

The quantitative data will be collected using a structured online survey questionnaire. The questionnaire will be developed based on the theoretical frameworks of TAM and UTAUT, and will include items measuring the level of AI adoption, perceived benefits, challenges, and the impact on recruitment efficiency and effectiveness. The questionnaire will be pilot-tested to ensure its validity and reliability before distribution to the sample.

Qualitative data will be gathered through semi-structured interviews with HR managers and recruitment specialists. The interviews will explore their experiences, perceptions, and insights regarding the use of AI in recruitment, the challenges faced during implementation, and the strategies employed to overcome these challenges. The interviews will be conducted face-to-face or via video conferencing, depending on the participants' preferences and availability.

3.4. Data Analysis Techniques

Quantitative data from the survey will be analyzed using descriptive and inferential statistics. Descriptive statistics,

such as frequencies, means, and standard deviations, will be used to summarize the level of AI adoption, perceived benefits, and challenges. Inferential statistics, such as t-tests and analysis of variance (ANOVA), will be employed to examine the differences in AI adoption and its impact across various business sectors and sizes.

Qualitative data from the interviews will be analyzed using thematic analysis (Braun & Clarke, 2006) [2, 60, 66]. The interviews will be transcribed verbatim, and the transcripts will be coded to identify emerging themes and patterns. The coding process will involve both deductive and inductive approaches, allowing for the identification of themes related to the theoretical frameworks as well as the emergence of new insights. The qualitative findings will be used to complement and enrich the quantitative results, providing a more nuanced understanding of the impact of AI on the HR recruitment process.

3.5. Findings

3.5.1. Level of AI Adoption in HR Recruitment

The survey results reveal that the adoption of AI in HR recruitment among businesses in Hanoi is still in its early stages. Only 35% of the surveyed companies reported using AI-powered tools in their recruitment processes. The adoption rate varies across industries, with technology and financial services sectors showing higher levels of AI implementation compared to traditional manufacturing and retail sectors. Additionally, larger businesses with over 500 employees are more likely to have adopted AI in recruitment compared to small and medium-sized enterprises (SMEs).

3.5.2. Impact of AI on Recruitment Efficiency

The findings indicate that businesses using AI-powered tools in their recruitment processes have experienced significant improvements in efficiency. 78% of the respondents reported a reduction in time-to-hire, with an average decrease of 30% compared to traditional recruitment methods. AI-based resume screening and candidate matching have allowed HR professionals to streamline the initial stages of recruitment, enabling them to focus on higher-value tasks such as candidate engagement and evaluation.

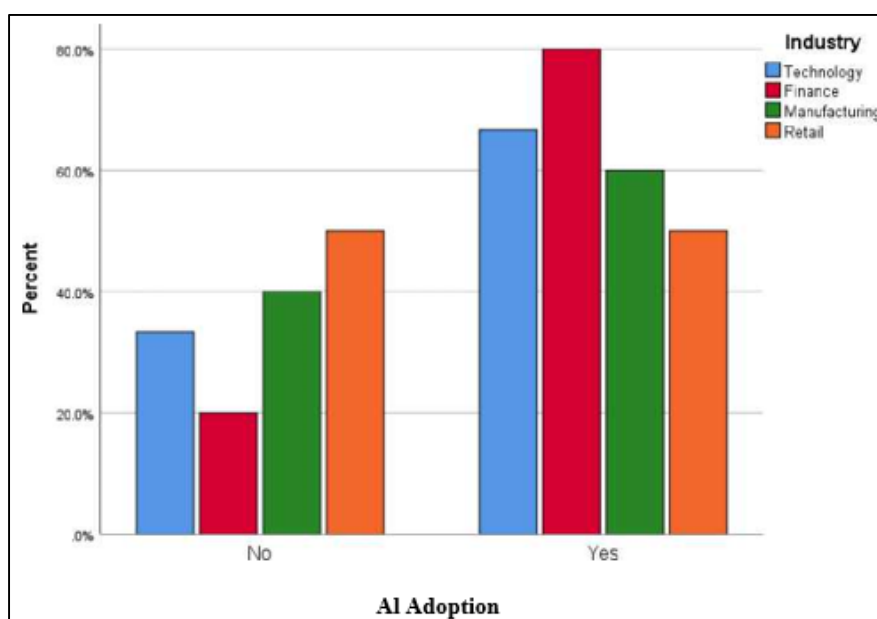


Fig 1: AI adoption rates in recruitment by industry

3.5.3. Impact of AI on Recruitment Effectiveness

The study also reveals positive impacts of AI on recruitment effectiveness. 62% of the businesses using AI reported an improvement in the quality of candidates hired. AI-powered tools have enabled HR professionals to make data-driven decisions, reducing bias and enhancing the objectivity of the selection process. Additionally, 55% of the respondents noted an increase in candidate diversity, as AI algorithms help identify qualified candidates from a wider talent pool.

3.5.4. Challenges Faced by Businesses in Implementing AI

Despite the benefits, businesses in Hanoi have encountered several challenges in implementing AI in their HR recruitment processes. The most prominent challenge, reported by 68% of the respondents, is the lack of technical skills and expertise within their HR teams. Many HR professionals struggle to fully understand and utilize AI-powered tools effectively. Other significant challenges include concerns about data privacy and security (52%), the high cost of AI implementation (45%), and the need to align AI systems with existing HR processes and policies (38%).

3.5.5. Strategies Employed by Businesses to Overcome Challenges

To address the challenges associated with AI implementation, businesses in Hanoi have adopted various strategies. 60% of the surveyed companies have invested in training and development programs to upskill their HR teams in AI and data analytics. Collaborative partnerships with AI vendors and technology providers have also been crucial, with 48% of the businesses leveraging external expertise to support their AI implementation efforts. Additionally, 42% of the respondents reported establishing data governance frameworks and policies to ensure the responsible and ethical use of AI in recruitment.

4. Research results and discussion

4.1. Current status of artificial intelligence in digital transformation of Vietnam's human resources recruitment process sector

The development of AI can threaten humanity's existence and mastery of the world (Chace, 2018) ^[67, 58], and at the same time humans become the second most intelligent species on Earth (Barrat, 2023) ^[68, 57]. In the field of education, besides the positive impacts mentioned above, AI also poses potential challenges and difficulties when applied in practice.

4.1.1. Machine learning and data analysis system

Currently in Vietnam, the use of artificial intelligence and data analysis in digital transformation of the education industry is facing a number of challenges. Although the development potential is great, implementation is still slow due to many reasons. The technological infrastructure system is still limited, making it difficult to deploy and develop artificial intelligence solutions in education. In addition, the lack of knowledge and skills of practitioners is also a challenge, which needs to be improved through training and awareness raising. More importantly, data privacy and security issues are also slowing down progress, especially when it comes to collecting and using personal data in educational settings. To be able to exploit the full potential of artificial intelligence and data analytics, these challenges must be addressed carefully and comprehensively.

4.1.2. Virtual learning experiences

Virtual learning experiences are becoming popular in Vietnam, especially in the context of the epidemic and increased demand for distance learning. However, implementing and using this experience still faces many challenges. One of them is the lack of technological infrastructure and stable internet connection, causing interruptions and reduced performance during the learning process. At the same time, people implementing and participating in this experience have not been fully trained on how to use technology and online learning platforms, as well as ensure the quality of educational content. Another challenge is creating engaging and interactive virtual learning environments, especially when using artificial intelligence to personalize the learning experience. Faced with these problems, overcoming and developing virtual learning experiences will play an important role in improving the quality of HRM in Vietnam.

4.1.3. Smart Tutoring System

In Vietnam, the use of artificial intelligence in digital transformation of the human resources recruitment process sector is developing, but there are still many challenges that need to be overcome. Despite increased awareness and use, access remains limited, especially in rural and remote areas. This can create inequality in access to HRM. At the same time, people who implement and use this system need to be trained to use the technology effectively and safely. Personalization for each student is also a big challenge, requiring the system to be able to customize and adjust to meet diverse learning needs. To overcome these challenges, there needs to be equal investment in technology infrastructure, human resource training, and increased awareness of the benefits of artificial intelligence in human resources recruitment process sector.

4.1.4. Online learning platform

The process of accessing online knowledge in remote areas is facing many significant difficulties. In particular, in mountainous and remote areas, network infrastructure and information technology equipment are not guaranteed, causing negative effects on educational management and the teaching process. This becomes especially urgent as the need for online teaching and learning increases, especially when in-person learning conditions cannot be guaranteed. This is an issue that needs to be prioritized to overcome to successfully deploy online education methods and ensure that every student has the opportunity to access knowledge equitably.

4.1.5. Smart Evaluation System

Smart Evaluation System in using artificial intelligence in digital transformation of the education sector in Vietnam is developing, however, there are still many challenges that need to be resolved. Although there has been awareness and use, the level of implementation remains uneven and assessment standards are inconsistent. In addition, the shortage of human resources with knowledge and skills about artificial intelligence in educational assessment is also a matter of concern. The challenge of privacy and data security also needs to be considered carefully to ensure the safety and protection of personal information of students and teachers. To improve the efficiency and fairness of the educational assessment process, there is a need to invest in human

resource training, develop uniform standards and establish strong security measures.

4.1.6. Ethical issues in accessing, collecting and exploiting data

In policies to develop AI in general and AI in education in particular, it is necessary to attach great importance to ethical issues associated with the collection and production of data extract, analyze and disseminate large-scale data about people.

Privacy and data security are concerns, the main challenge lies in being able to use personal data while ensuring that personally identifiable information and the individual's privacy preferences are protected. It is also important to install the necessary protections to prevent data theft. In education, this becomes even more difficult in a context where young learners are not yet legally able to give explicit consent to the collection and use of their personal data. The collection and use of personal data, even when used to enhance learning, must always be maintained based on explicit and informed consent, transparency, fairness and justice (Pedro *et al.*, 2019) ^[69, 56].

4.2. Factors affecting the performance of artificial intelligence in digital transformation of Vietnam's education sector

4.2.1. Results of Cronbach's Alpha test

Cronbach's Alpha test results: Observed variables with total correlation coefficient < 0.3 will be eliminated from the model. The standard for the scale to meet requirements is when Cronbach's Alpha > 0.6 (Ho 2012) ^[55]. With 150 official samples and 05 criteria of the survey questionnaire, the variables met reliability requirements, the full scale coefficient Cronbach's Alpha = $0.936 > 0.6$ is within a good measurement level, the total variable correlation coefficients of the variables measuring this factor are > 0.3 , all observed variables are accepted and will be used in the next factor analysis (Table 1).

4.2.2. Test for heteroskedasticity and correlation

Observed variables were extracted into 20 factors at Eigenvalues = 2,041 (>1), the factor analysis results were reasonable, the total variance extracted reached 83,758% ($>50\%$) of the variation of the data, this is the result. Acceptable variables were simultaneously extracted into factors (Table 2).

Table 2: Variance explained by influencing factors

Factor	Variance extract			Total Variance Extracted			Total Variance Extracted		
	Total	Percent Variance	Cumulative percentage	Total	Percent Variance	Cumulative percentage	Total	Percent Variance	Cumulative percentage
1	5,769	28,847	28,847	5,769	28,847	28,847	3,664	18,319	18,319
2	4,139	20,694	49,541	4,139	20,694	49,541	3,518	17,589	35,909
3	2,706	13,528	63,069	2,706	13,528	63,069	3,309	16,544	52,453
4	2,097	10,483	73,552	2,097	10,483	73,552	3,231	16,155	68,608
5	2,041	10,206	83,758	2,041	10,206	83,758	3,030	15,150	83,758
6	.527	2,634	86,392						
7	.425	2,124	88,515						
8	.340	1,699	90,214						
9	.300	1,499	91,713						
10	.267	1,336	93,049						
11	.249	1,245	94,294						
12	.207	1,036	95,330						
13	.177	.886	96,216						
14	.167	.834	97,051						
15	.157	.786	97,837						
16	.114	.569	98,406						
17	.106	.530	98,936						
18	.102	.509	99,445						
19	.067	.336	99,781						
20	.044	.219	100,000						
Extraction method: Principal component analysis.									

Check the assumption that the independent variables do multicollinearity does not occur and there is no strong not have multicollinearity correlation between independent

variables (Trhong and Ngoc The variance inflation factor VIF < 2 , shows that 2008) ^[70, 54].

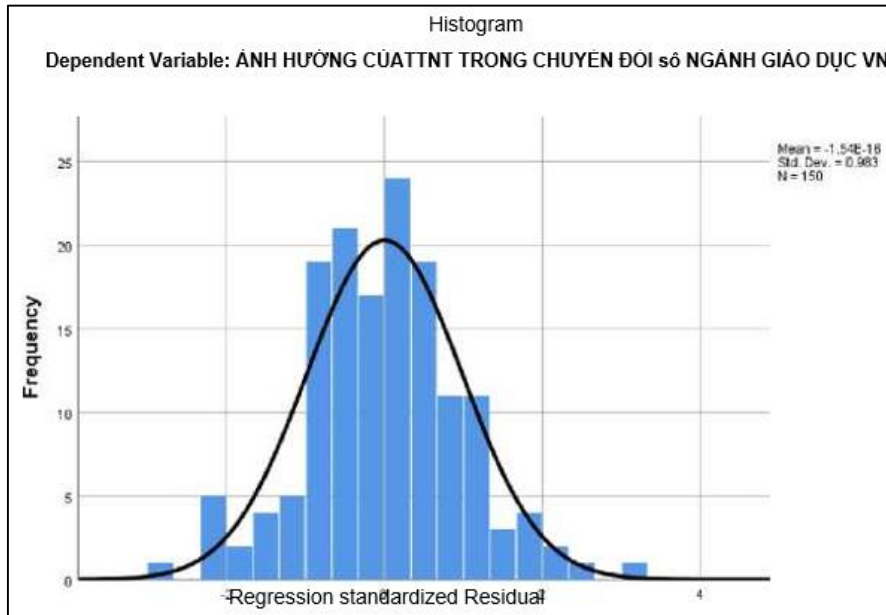


Fig 2: Testing assumptions about the distribution of residuals and autocorrelated residuals

We see that the graph of the residuals (Figure 2) has a balanced bell shape, the average value of the residual = 1.54×10^{-16} is very small and close to 0, the deviation value

is close to 1, so we conclude assume that the standardized residual has a normal distribution.

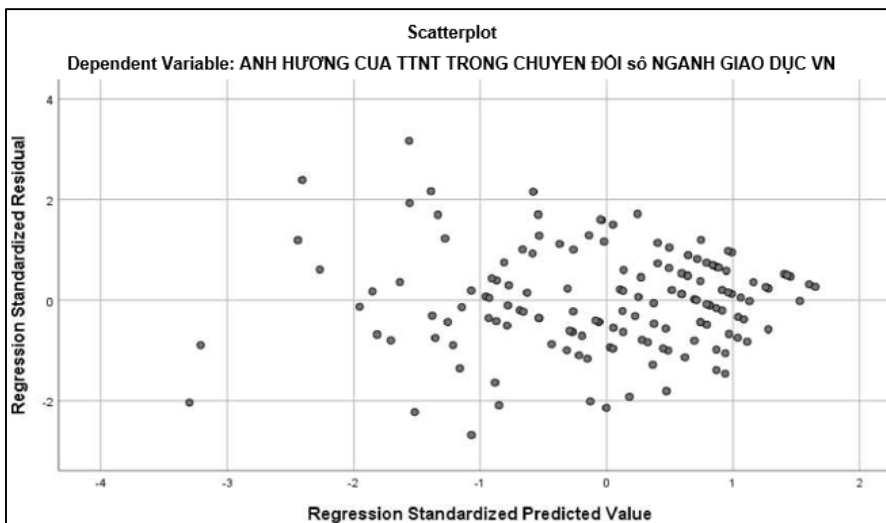


Fig 3: Residual correlation analysis graph

We see that the graph of the standardized residual value is randomly scattered along the value line = 0, so we conclude that there is no autocorrelation phenomenon between the residuals.

4.2.3. Results of EFA exploratory factor analysis

Evaluate the scale through EFA exploratory factor analysis: KMO coefficient = 0.821 ($0.5 < KMO < 1$). The Chi-Square statistic of Bartlett's test has a value of 2878.833 with a significance level of Sig. = 0.000, showing that the observed variables are correlated with each other. The results of EFA analysis show that the total variance extracted reached 83.758% ($> 50\%$) shows that these 5 extracted factors explain 83.758% of the variation in the data, this is an acceptable result and proves that grouping the factors together is appropriate. The stopping point when extracting factors at the 4th factor with Eigenvalues is $2.041 > 1$, indicating that the factor analysis results are appropriate. The observed variables

have satisfactory factor loading coefficients > 0.5 . There are no observed variables that have loading coefficients simultaneously on both factors, so the scales meet the association value capacitor (Table 3).

Table 3: KMO test for sampling suitability KMO and Bartlett's Test

Kaiser-Meyer-Olkin test for sample adequacy		0.821
Bartlett's test of sample configuration	Equivalent to Chi Square	2878,833
	DF	190
	Sig.	0.000

Exploratory factor analysis (EFA) show that the groups of Exploratory factors are consistent with the research model.

4.2.4. Linear regression analysis

Linear regression analysis shows that there is no

multicollinearity phenomenon. Collinearity Statistics with the VIF (Variance Inflation Factor) of the independent variables in the model are all less than 2., proving that there is no multicollinearity phenomenon (Table 4). As a result, all variables have statistically significant Sig values. = 0.000 (< 0.05). Thus, there are 05 factors affecting the personnel recruitment process in businesses in Ho Chi Minh City according to the standardized regression coefficient (Beta).

Linear function, From the above results, we have a linear equation expressing the influencing factors (Xi) on Y- Operational efficiency in digital transformation of Vietnam's education sector, as follows:

$$Y = -0.90 + 0.246 * X_1 + 0.124 * X_2 + 0.204 * X_3 + 0.205 * X_4 + 0.223 * X_5$$

Table 4: Linear regression test

Model	Unstandardized coefficients		Standardized coefficient	Coefficient (t)	Coefficient (Sig.)	Multicollinearity Statistics (Collinearity Statistics)	
	Coefficient (B)	Standard deviation	Beta coefficient			Tolerance	Variance Inflation Factor (VIF)
(Constant)	-.090	.348		-.259	.796		
X1	.246	.051	.293	4,830	.000	.899	1.112
X2	.124	.046	.174	2,711	.008	.801	1,248
X3	.204	.048	.265	4,258	.000	.852	1.173
X4	.205	.045	.274	4,583	.000	.923	1,084
X5	.223	.057	.251	3,923	.000	.811	1,233

Thus, the linear regression model built according to equation Y does not violate the necessary assumptions in linear regression. Therefore, the hypotheses are accepted at the 5% statistical significance level.

5. Research conclusion

The Machine Learning and Data Analysis System factor, with value $\beta^1 = 0.246$, is the most influential factor in digital transformation of Vietnam's education sector, this factor has the strongest influence on learning performance student's. At the same time, students' positive interactions in the classroom, interest and positive attitude towards learning also play an important role, along with the progress and performance of the learning programs.

The Virtual Learning Experience factor, with value $\beta^2 = 0.124$, is identified as an important factor in the digital transformation process of the education sector in Vietnam, due to the influence of student-content interaction content. Demonstrated student engagement with learning content in a virtual environment, including performing activities, experiments, and practice exercises. In addition, students' usage and interaction time are also important factors, measuring the time they spend on activities in the virtual learning environment along with the level of engagement during the learning process. Student enjoyment and engagement are also assessed, including the level of enjoyment and engagement in the virtual learning experience, and learning effectiveness is assessed through assessment of newly acquired knowledge and applicability to real-life situations.

The Smart Tutoring System factor, with value $\beta^3 = 0.204$, is identified as an important factor in the digital transformation process of the education sector in Vietnam. This system not only plays an important role in ensuring students' academic progress but also helping them achieve their learning goals, progress in knowledge, and problem-solving abilities. Not only that, student satisfaction is also considered an indispensable measure, reflecting the level of trust, comfort, and satisfaction with the quality of service from the Smart Tutoring system; Close interaction between students and the system is also highly valued, including levels of interaction and connection, asking questions, receiving feedback, and performing learning activities. Ultimately, the system's

performance is measured by its ability to provide individualized and effective educational support to each student, through providing accurate educational suggestions, feedback, and solutions.

The Online Learning Platform factor, with value $\beta^4 = 0.205$, is the second most influential factor in the digital transformation of Vietnam's education sector. Due to the frequency with which students and teachers use online learning platforms, such as accessing the platform and engaging in learning activities; The variety of educational content offered on the online learning platform, including courses, documents, lectures, and curriculum resources; Interaction between students and learning content on the online learning platform, including discussions, performing exercises, and participating in interactive learning activities; Student performance when using online learning platforms, with achievement of learning goals, progress in knowledge, and ability to apply knowledge into practice.

Weak Smart Assessment System, with value $\beta^5 = 0.223$, is identified as an important factor in the digital transformation process of the education sector in Vietnam. Under the impact of awareness and use of the Smart Assessment System in education in Vietnam, the level of implementation and use is still limited in some schools and educational levels; Lack of uniformity and standards in the assessment process. Diversity in assessment methods and assessment criteria can cause unfairness and lack of transparency in the assessment process; Lack of human resources with skills and knowledge about the use of artificial intelligence in educational assessment is a problem. Training and awareness about technology in educational assessment is necessary to increase the effectiveness and objectivity of the assessment process. Privacy and Security Challenges: The issue of privacy and data security is also a challenge for implementing a Smart Assessment System. Strong security measures are needed to ensure the safety and protection of student and teacher personal information.

In summary, despite its awareness and implementation, the Smart Assessment System in Vietnam still faces many challenges. To improve the efficiency and fairness of the educational assessment process, there is a need to invest in human resource training, establish uniform standards, and ensure data security and privacy.

6. Discussion

6.1. Interpretation of Findings

The findings of this study provide valuable insights into the current state of AI adoption in HR recruitment among businesses in Hanoi, Vietnam. The relatively low adoption rate (35%) suggests that while AI is gaining traction, many organizations are still in the early stages of exploring and implementing these technologies. The higher adoption rates in technology and financial services sectors align with the global trend, as these industries typically have a greater affinity for digital transformation and innovation (Davenport & Ronanki, 2018) [5, 71, 53].

The positive impact of AI on recruitment efficiency and effectiveness highlights the potential benefits that businesses can realize by leveraging these technologies. The reduction in time-to-hire and improvement in candidate quality are consistent with the findings of previous studies (e.g., van Esch, Black, & Ferolie, 2019; Upadhyay & Khandelwal, 2018) [12, 72, 52], indicating that AI can streamline the recruitment process and support data-driven decision-making. However, the challenges faced by businesses in Hanoi, particularly the lack of technical skills and concerns about data privacy, underscore the need for organizations to develop targeted strategies and invest in workforce upskilling to fully harness the potential of AI (Tambe, Cappelli, & Yakubovich, 2019) [10, 51].

6.2. Comparison with Existing Literature

The findings of this study contribute to the growing body of literature on AI applications in HRM, providing a context-specific understanding of AI adoption in the recruitment process in Hanoi, Vietnam. The results align with the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), as the perceived usefulness and ease of use of AI-powered tools, along with organizational support and resources, emerge as key factors influencing adoption (Davis, 1989; Venkatesh *et al.*, 2003) [6, 14]. The challenges identified in this study, such as the lack of technical skills and data privacy concerns, are consistent with the barriers to AI adoption reported in other contexts (e.g., Jia *et al.*, 2018; Thuan, 2019).

6.3. Implications for Businesses in Vietnam

The findings of this study have important implications for businesses in Hanoi aiming to leverage AI in their HR recruitment processes. First, organizations need to develop a clear AI strategy that aligns with their overall business objectives and HR goals. This involves assessing the readiness of their HR teams, identifying specific recruitment processes that can benefit from AI, and establishing a roadmap for implementation. Second, businesses must invest in building the necessary skills and capabilities within their HR teams to effectively implement and manage AI-powered tools. This can be achieved through targeted training programs, partnerships with AI vendors, and collaboration with educational institutions. Third, organizations should prioritize data governance and develop robust policies to address data privacy and security concerns. This includes establishing clear guidelines for data collection, storage, and use, as well as ensuring compliance with relevant regulations and ethical standards.

6.4. Limitations and Future Research Directions

While this study provides valuable insights, it is important to

acknowledge its limitations. First, the sample size and focus on businesses in Hanoi may limit the generalizability of the findings to other regions in Vietnam or other emerging economies. Future research could expand the scope to include a broader geographic area and compare AI adoption across different regions. Second, the cross-sectional nature of the study captures the impact of AI at a single point in time. Longitudinal studies could provide a more comprehensive understanding of the long-term effects of AI on recruitment processes and organizational outcomes. Finally, future research could delve deeper into the specific AI technologies and algorithms used in recruitment, examining their technical aspects, ethical implications, and potential biases.

7. Conclusion

7.1. Summary of Key Findings

This study has explored the impact of artificial intelligence on the human resources recruitment process in businesses located in Hanoi, Vietnam. The findings reveal that AI adoption in HR recruitment is still in its early stages, with only 35% of the surveyed companies actively using AI-powered tools. However, businesses that have implemented AI have experienced significant improvements in recruitment efficiency and effectiveness, including reduced time-to-hire, improved candidate quality, and increased diversity. The study also highlights the challenges faced by businesses in adopting AI, such as the lack of technical skills within HR teams, concerns about data privacy and security, and the high cost of implementation. To overcome these challenges, businesses have employed strategies such as investing in employee training, collaborating with AI vendors, and establishing data governance frameworks.

7.2. Significance of the Study

This research contributes to the growing body of knowledge on AI applications in human resources management, providing a context-specific understanding of AI adoption in the recruitment process in Hanoi, Vietnam. The findings offer valuable insights for businesses in Hanoi and other emerging economies that are considering implementing AI in their HR practices. By highlighting the benefits, challenges, and strategies associated with AI adoption, this study can guide organizations in making informed decisions and developing effective approaches to leverage AI for recruitment success. Moreover, the study lays the foundation for future research on AI in HRM in the Vietnamese context, fostering a deeper understanding of the interplay between technology and people management in emerging markets.

7.3. Concluding Remarks

As artificial intelligence continues to transform various aspects of business operations, its impact on the HR recruitment process cannot be overlooked. While the adoption of AI in recruitment is still in its early stages in Hanoi, Vietnam, the potential benefits are significant. By leveraging AI-powered tools, businesses can streamline their recruitment processes, make data-driven decisions, and ultimately attract and retain top talent. However, to fully realize these benefits, organizations must address the challenges associated with AI adoption, including the need for workforce upskilling, data governance, and ethical considerations. As businesses in Hanoi navigate the AI landscape, it is crucial to approach AI implementation with a strategic and human-centric mindset, ensuring that

technology complements rather than replaces human judgment and decision-making. By doing so, organizations can harness the power of AI to drive recruitment success and gain a competitive edge in an increasingly digital world.

7.4. Some policy implications to improve the performance of artificial intelligence in digital transformation of Vietnam's education sector

7.4.1. Increase investment and development of machine learning and data analysis systems to ensure transparency and accuracy in evaluating and personalizing learning experiences

To improve the quality of education and create a learning environment suitable for each student, increasing investment and developing machine learning and data analysis systems has become an important and effective solution. In this way, educational institutions can collect, process and analyze data on student learning progress as well as the performance of educational programs in a transparent and automated way. From this, a transparent and fair assessment system is created, helping education administrators better understand student learning progress and make decisions based on accurate and reliable information trust.

Additionally, using this data also helps personalize the learning experience for each student. Through a better understanding of each student's needs, interests, and learning styles, educational institutions can tailor educational content, teaching methods, and provide appropriate learning support. As a result, students will have the opportunity to learn more effectively and develop better in a personalized learning environment, thereby promoting personal development and meeting diverse learning needs of each individual. This not only improves the quality of education but also contributes to the comprehensive development of students.

7.4.2. Develop and integrate virtual reality technology into learning experiences, creating a more interactive and enjoyable learning environment for students

Developing and integrating virtual reality technology into learning experiences is not only a new trend but also a big step forward in improving the quality of education. Virtual reality technology has opened a new door, expanding the learning space from traditional classrooms to colorful and vivid virtual worlds.

In a virtual learning environment, students are not just listeners but also active participants in the learning process. They can interact directly with objects, simulate real-life situations, and even participate in science experiments in a safe and engaging way. This creates a unique and creative learning environment, arousing curiosity and enthusiasm in discovering knowledge.

Not only that, virtual reality technology also helps teachers become more creative instructors. They can create interactive lectures, simulate real-life situations, and provide students with deeper and multi-dimensional learning experiences. At the same time, through collecting data from activities in the virtual environment, teachers can evaluate student learning effectiveness and adjust teaching methods flexibly and effectively.

With the benefits that virtual reality technology brings, integrating it into the learning experience is not only a trend but also an opportunity to improve the quality of education and promote the comprehensive development of students and prepare them for today's digital world. This is an important step in building a modern and advanced education.

7.4.3. Build a smart tutoring system to provide personalized and effective educational support for each student, thereby enhancing access to knowledge and personal development

The solution of building a smart tutoring system is a means of improving the quality of education through leveraging technology to personalize and optimize each student's learning experience. By collecting and analyzing data about students, the system can understand each individual's unique needs, abilities, and learning styles.

An important part of this solution is providing educational content tailored to each student. Instead of a uniform approach, smart tutoring systems can recommend personalized learning materials, lectures, and activities based on students' interests, abilities, and learning goals. This helps create a flexible and diverse learning environment that encourages interaction and creativity.

In addition, this system also has the ability to monitor and evaluate student learning progress. Through data analysis, it can identify each individual's strengths and weaknesses, thereby suggesting measures for improvement and adjustment in teaching and learning methods. This helps optimize the efficiency and effectiveness of the learning process, helping students achieve the best possible results.

7.4.4. Develop a flexible and diverse online learning platform, providing automated courses and customized learning resources, serving the diverse learning needs of every student

This solution proposes to develop a flexible and diverse online learning platform, to provide automated courses and customized learning resources, catering to the diverse learning needs of every student. First of all, the online learning platform will be designed to be more flexible in accessing learning content. Students will be able to access the platform anytime and anywhere, not bound by time or location. The system will provide a range of courses from basic to advanced, from specialized to general, ensuring that every student has the opportunity to access content appropriate to their level and interests. Automated courses will be at the heart of the platform, helping to optimize the learning process. Teaching materials, video lectures, exercises, and learning activities will be organized and deployed automatically, reducing the time and effort required for course planning and implementation. This also helps ensure consistency and quality of educational content.

In addition, customized learning resources will be developed to personalize the learning experience. Students can be asked about their interests, learning goals, and learning style, thereby receiving appropriate educational materials and suggestions. This facilitates more effective and flexible learning, while increasing student interest and engagement in the learning process.

7.4.5. Build a smart assessment system, using artificial intelligence to provide instant feedback and in-depth analysis of students' learning progress, helping to improve educational performance and ensure comprehensive development their

This solution proposes to build an intelligent assessment system, using artificial intelligence to provide instant feedback and in-depth analysis of student learning progress, with the aim of improving educational performance and ensure their comprehensive development.

This system will use artificial intelligence to automatically collect and analyze data about students' learning progress. From information such as test results, assignments, classroom activities and online interactions, the system creates a

comprehensive picture of each student's academic performance.

A key part of this solution is the ability to provide instant feedback to students. Instead of having to wait until the end of the term to receive feedback on their progress, students will receive continuous information about their performance through charts, reports, and suggestions for improvement. This helps students self-adjust and improve their learning methods from the earliest stages. Furthermore, the system will also conduct in-depth analysis of students' learning progress. By applying algorithms and big data models, it can identify trends, learning patterns and potential problems, thereby suggesting measures to improve and adjust teaching methods and study.

8. Conclude

From an overview of the theoretical basis and current situation of the operation of artificial intelligence in digital transformation of Vietnam's education sector, the study has analyzed in depth 05 groups of factors affecting the operation of artificial intelligence in the field of education. Digital transformation of Vietnam's education sector. Among them, the machine learning and data analysis system factor group (X1) and the intelligent assessment system factor (X5) are the most influential, followed by the e-learning platform factor group. (X4), the Smart Tutoring System factor (X3) and the Virtual Learning Experience factor (X2), all have an impact on the activity of artificial intelligence in digital transformation of Vietnam's education sector.

From the results of studying the current situation, combined with analysis of factors affecting the operation of artificial intelligence in digital transformation of Vietnam's education sector, the author proposes a number of solutions to improve the operation of artificial intelligence in the digital transformation of Vietnam's education sector. Artificial intelligence in digital transformation of Vietnam's education industry, as follows: Firstly, Increase investment and development of machine learning and data analysis systems to ensure transparency and accuracy in evaluating and personalize learning experiences; Second, Develop and integrate virtual reality technology into learning experiences, creating a more interactive and interesting learning environment for students; Third, Build a smart tutoring system to provide personalized and effective educational support for each student, thereby enhancing access to knowledge and personal development; Fourth, Build a smart assessment system, using artificial intelligence to provide instant feedback and in-depth analysis of student learning progress, helping to improve educational performance and ensure development. their comprehensive development; Fifth, Build a smart tutoring system to provide personalized and effective educational support for each student, thereby enhancing access to knowledge and personal development.

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