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Exploring the Relationships between Artificial Intelligence, Attitude & Skill, Big Data, and Knowledge Acquisition: A Study on Students in Ho Chi Minh City

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Abstract. This study aims to explore the adoption of artificial intelligence (AI) for knowledge acquisition among high school and university students in Ho Chi Minh City, Vietnam. Using a sample of 275 respondents and applying smart-PLS analysis, this study examines the mediating role of big data and skill and attitude in the relationship between AI adoption and knowledge acquisition. The findings indicate that big data plays a significant mediating role in the relationship between AI adoption and knowledge acquisition, while skill and attitude have a significant moderating effect on this relationship. Furthermore, the study suggests that high school students have a more positive attitude towards AI adoption for knowledge acquisition than university students. The study concludes by providing insights and recommendations for educational institutions and policymakers to improve AI adoption and knowledge acquisition among students in Ho Chi Minh City.

Keywords: Artificial Intelligence, Big Data, Knowledge Acquisition, Skill and Attitude, Student Perspective

1. Introduction

The emergence of artificial intelligence (AI) has transformed various industries, including education and knowledge acquisition (Mendes, 2022). AI has been touted as a game-changer in the education sector, providing opportunities to enhance the learning experience, improve student engagement and performance, and increase the efficiency of knowledge acquisition processes. However, the successful adoption of AI for knowledge acquisition is contingent on various factors, including the availability of big data, the attitudes and skills of educators and learners, and the effectiveness of knowledge acquisition processes (Anh et al., 2022).

The role of big data in the adoption of AI for knowledge acquisition is critical. Big data refers to the vast amounts of information generated through various sources, such as social media, online platforms, and mobile devices (Kumar et al., 2022). The analysis of big data can provide insights into the learning behaviour of students, identify knowledge gaps, and inform personalized learning interventions. Thus, big data can play a significant role in enhancing the effectiveness of AI-based knowledge acquisition processes.

However, the adoption of AI for knowledge acquisition is also influenced by the attitudes and skills of educators and learners. The success of AI adoption is contingent on the willingness of educators and learners to accept and integrate AI-based technologies into the learning environment (Long, Ooi, et al., 2023). Additionally, the skills of educators and learners in using AI-based tools and technologies are critical in ensuring the effective use of AI in knowledge acquisition processes.

Therefore, this study aims to explore the mediating role of big data, and attitude and skill in the adoption of AI for knowledge acquisition. By investigating these factors, this study seeks to provide insights into the factors that facilitate or hinder the successful adoption of AI-based technologies in the education sector. Furthermore, it provides recommendations for high school students to improve the adoption of artificial intelligence for knowledge acquisition based on the findings of the study.

2. Literature Review

The adoption of artificial intelligence (AI) has become increasingly popular in recent years, it could play a significant role in knowledge acquisition. However, there are many factors that can influence the successful adoption of AI for knowledge acquisition. This literature review will explore the mediating role of big data, and attitude and skill in the adoption of AI for knowledge acquisition.

2.1. Previous Studies

AI has been described as an enabling technology that can transform how people acquire knowledge. It has the potential to provide new insights and perspectives on data, which can then be used to inform decision-making processes. AI can be used to perform a variety of knowledge acquisition tasks, such as information retrieval, natural language processing, and predictive analytics. AI is a rapidly evolving field that has received a great deal of attention in recent years. AI has emerged as a critical tool for businesses seeking to improve their operations, decision-making, and customer experiences (Long, Ooi, et al., 2022). AI implementation requires high-quality data, effective algorithms, sufficient computing power, skilled professionals, and ethical and legal considerations (UNESCO, 2022).

Big data is another important factor that can influence the adoption of AI for knowledge acquisition. The five main and innate characteristics of big data are the 5V (velocity, volume, value, variety, and veracity). Knowing the 5V enables data scientists to extract more value from their data while also enabling the scientists' organization to become more customer-centric. Big data was only discussed in the early part of this century in terms of the three V namely volume, velocity, and variety. Two more V namely value and veracity have been added over time to assist data scientists in better articulating and communicating the important characteristics of big data. The number five represents the five fundamental questions that every news article should address. However, organizations are not required to follow one data guideline over another (S. Gillis, 2021).

Attitude and skill are also important factors that can influence the adoption of AI for knowledge acquisition. Attitude refers to a person's overall assessment of a particular technology, whereas skill refers to a person's ability to use technology effectively. The attitude and skill of the users may influence the adoption of AI for knowledge acquisition. Attitude and skill are important factors influencing the use of AI for knowledge acquisition. Here are the five important factors of attitude and skill that can impact the adoption of AI for knowledge acquisition: perceived usefulness, perceived ease of use, self-efficacy, social influence, training and support (Kelly et al., 2023).

Big data analytics impact organizational performance in higher education mediated by knowledge management (Marchena Sekli & De La Vega, 2021). The idea that big data can influence the relationship between AI adoption and knowledge acquisition outcomes is referred to as the mediating role of big data. Big data has been proposed to improve the effectiveness of AI in knowledge acquisition by providing more comprehensive and accurate insights. As a result, it is critical to investigate big data's mediating role in the adoption of AI for knowledge acquisition.

The role of attitude and skill refers to the idea that the relationship between the adoption of AI and the outcomes of knowledge acquisition may be influenced by the users' attitude and skill. Across multiple industries, perceived usefulness, performance expectancy, attitudes, trust, and effort expectancy significantly and positively predicted intention, willingness, and use behaviour of AI (Long, Mackechnie, et al., 2023). Individuals with positive attitudes toward AI may be more likely to adopt the technology for knowledge acquisition, whereas those with high levels of skill may be more effective at using the technology for knowledge acquisition. As a result, it is critical to investigate the role of attitude and skill in the adoption of AI for knowledge acquisition (Hupfer, 2020; Pillai & Sivathanu, 2020; UNESCO-UNEVOC, 2021).

In AI adoption, knowledge acquisition is crucial for successful implementation and reaping its benefits (Perifanis & Kitsios, 2023). The term learning outcomes refers to the knowledge and skills acquired, whereas the term learning environment refers to the resources, interactivity, and feedback quality. Interest, relevance, and perceived usefulness are all factors that influence motivation. Feedback and reinforcement help learners identify areas for improvement and stay motivated, and prior knowledge influences learning outcomes and speed (Joseph & Arun, 2021; Long, Duong, et al., 2022; McKendrick, 2021).

2.2. Literature Gaps

Despite the growing body of literature on the adoption of AI for knowledge acquisition, there are still some gaps that need to be addressed. First, most existing research has concentrated on the technological aspects of AI adoption, ignoring the human factors that may influence its adoption. As a result, more research on the role of attitude and skill in the adoption of AI for knowledge acquisition is required. Second, while the significance of big data in the context of AI adoption for knowledge acquisition has been acknowledged, there is still a lack of research on big data's mediating role in this process. As a result, it is necessary to investigate the role of big data in mediating the relationship between AI adoption and knowledge acquisition. Third, while previous research has examined the benefits and challenges of using AI for knowledge acquisition, more research is needed to investigate the specific benefits and challenges associated with big data's mediating role of attitude and skill in this process. There is a need for a more comprehensive understanding of the adoption of AI for knowledge acquisition, taking into account both technological and human factors, as well as the mediating role of big data of attitude and skill.

3. Methodology and Research Model

The methodology for research is collected from 275 respondents. The research aimed to explore the mediating role of Big Data and Attitude and Skill in the adoption of Artificial Intelligence for knowledge acquisition. The data was collected using a questionnaire that was distributed to high school

students and related personels in Ho Chi Minh City. The questionnaire consisted of multiple-choice questions and a 5-point Likert scale to measure the variables. The variables measured were Artificial Intelligence (AI), Attitude and Skill, Big Data, and Knowledge Acquisition. After collecting the data, Smart-PLS was used to analyze the data. Firstly, the validity and reliability of the questionnaire items were assessed. Next, Structural Equation Modeling (SEM) was used to test the research hypotheses, which were developed based on the research objectives. The first step in SEM was to test the measurement model. This involved testing the relationships between the observed variables and their respective latent constructs. After confirming the measurement model, the structural model was tested, which involved testing the relationships between the latent constructs. The hypotheses were tested using path coefficients, which measured the strength and direction of the relationships between the variables. The significance of the path coefficients was evaluated using bootstrapping with 5000 samples. Finally, collinearity statistics, including the Variance Inflation Factor (VIF) and f-square, were calculated to assess the multicollinearity between the variables and the effect size of the variables on the model.

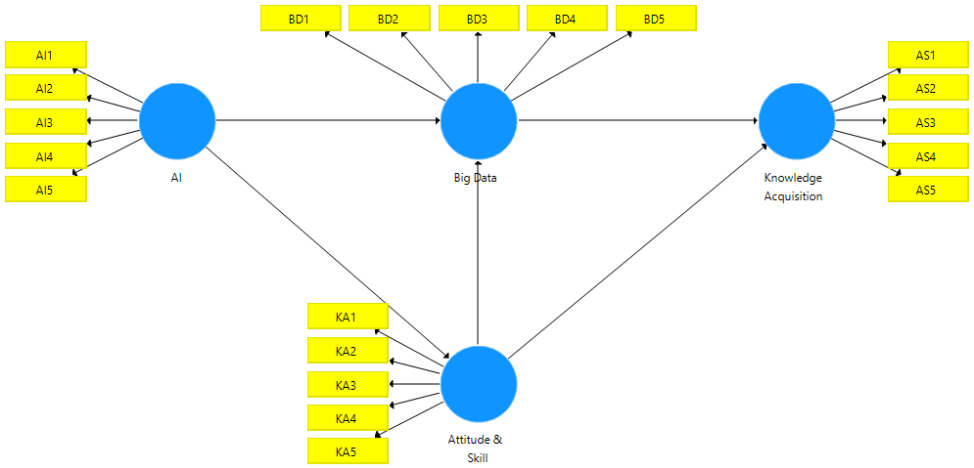

Fig. 1: Theoretical Framework

The methodology used in this research allowed for the collection and analysis of data using Smart-PLS to test the research hypotheses and achieve the research objectives.

- H1: There is a relationship between artificial intelligence and big data.
- H2: There is a relationship between big data and knowledge acquisition.
- H3: There is a relationship between artificial intelligence and attitude and skill.
- H4: There is a relationship between attitude and skill and knowledge acquisition.
- H5: There is a mediating role of big data in the relationship between and the adoption of artificial intelligence for knowledge acquisition.
- H6: There is a mediating role of attitude and skill in the relationship between and the adoption of artificial intelligence for knowledge acquisition.

4. Results and Discussion

4.1. Demographic Profile

The demographic profile of the respondents in this study consists of 275 individuals. In terms of the frequency of AI usage, approximately 6.2% reported using it for about 6 hours a week, 12.7% reported using it for about 12 hours a week, and the majority, accounting for 81.1%, reported using it for more than 12 hours a week. In terms of age distribution, 48% of the respondents were below 18 years old, 40% were between 18 and 29 years old, and 12% were between 30 and 60 years old. The gender distribution among the respondents was 46.5% male, 50.9% female, and 2.5% preferred not to say. In terms of education level, 48% had studied in high school, 37.5% were undergraduate students, and 14.5% had postgraduate qualifications. In terms of occupation, 82.9% of the respondents were learners, either

high school students or undergraduate students, 12.7% were educators, such as teachers, lecturers, or professors, and 4.4% were professionals in fields like engineering, medicine, law, researcher, or government officer.

Table 1: Demographic Profile

No.	Category		Frequency (N=275)	Percent (%)
1	Frequency of Using	About 6 hours a week	17	6.2%
		About 12 hours a week	35	12.7%
		More than 12 hours a week	223	81.1%
2	Age	Below 18 years old	132	48.0%
		Between 18 – 29 years old	110	40.0%
		Between 30 – 60 years old	33	12.0%
3	Gender	Male	128	46.5%
		Female	140	50.9%
		Prefer not to say	7	2.5%
4	Education Level	Secondary Education	132	48.0%
		Undergraduate	103	37.5%
		Postgraduate	40	14.5%
5	Occupation	Learner: High School Student/ Undergraduate Student	228	82.9%
		Educator: Teacher/ Lecturer/ Professor	35	12.7%
		Professional: Engineer/ Doctor/ Lawyer, Researcher/ Government officer…	12	4.4%

4.2. Construct Quality Measurement

Table 2 shows the results of a construct quality measurement for four constructs, namely Artificial Intelligence, Attitude and Skill, Big Data, and Knowledge Acquisition.

Table 2: Construct Quality Measurement

No.	Construct	Item	Mean	Outer loadings	Cronbach's Alpha (CA)	Composite Reliability (CR)
1	Artificial Intelligence	High-quality data	3.6	0.838	0.902	0.927
		Algorithms	3.5	0.897		
		Computing power	3.3	0.793		
		Human Expertise	3.3	0.840		
		Ethical and Legal Considerations	3.4	0.865		
2	Attitude and Skill	Perceived usefulness	3.2	0.789	0.887	0.917
		Perceived ease of use	3.6	0.880		
		Self-efficacy	3.6	0.839		
		Social influence	3.1	0.780		
		Training and support	3.4	0.876		
3	Big Data	Volume	3.4	0.798	0.879	0.912
		Velocity	3.1	0.830		
		Variety	3.2	0.763		
		Veracity	3.2	0.848		
		Value	3.2	0.862		
4		Learning outcomes	3.2	0.818	0.890	0.919

No.	Construct	Item	Mean	Outer loadings	Cronbach's Alpha (CA)	Composite Reliability (CR)
	Knowledge Acquisition	Learning environment	3.6	0.780		
		Motivation	3.4	0.869		
		Prior knowledge	3.2	0.831		
		Feedback and reinforcement	3.3	0.851		

Factor loadings in Table 2 ranging from above 0.763 to 0.897, indicating components converged satisfactory. Cronbach's Alpha (CA) and Composite reliability (CR) values of all constructs are greater than 0.7, demonstrating that they are adequate according to the standards and complete all the minimum requirements of the specific items. Based on the measurements, the constructs are of good quality and can be considered reliable and valid for the purposes of the analysis.

4.3. Construct Convergent and Discriminant Validity

The Heterotrait-Monotrait (HTMT) ratio for discriminant validity is shown in Table 3, which is a method for determining whether measures of one construct are distinct from measures of other constructs.

Table 3: Construct Convergent and Discriminant Validity

Construct	AVE	AI	Attitude & Skill	Big Data	Knowledge Acquisition
AI	0.718				
Attitude & Skill	0.598	0.515			
Big Data	0.550	0.709	0.779		
Knowledge Acquisition	0.706	0.592	0.274	0.654	

Table 3 shows that all constructs have Average Variance Extracted (AVE) values above the recommended threshold of 0.5, indicating good convergent validity. All of the HTMT ratios are below the recommended threshold of 0.85, indicating that the measures of each construct are distinct from measures of other constructs and that the discriminant validity is supported. The ratio between AI and Attitude & Skill is 0.515, Attitude & Skill and Big Data is 0.779, and Big Data and Knowledge Acqusition is 0.654 which are below the threshold of 0.85, indicating that the measures of AI are distinct from measures of Attitude & Skill, Big Data and Knowledge Acqusition.

4.4. Predictive Accuracy and Effect Size, Collinearity Statistics

Table 4 shows the values of the construct's R2, f2, and VIF. The adjusted R-squared is a metric that measures how well the model fits the data, or how much of the variability in the outcome variable can be explained by the predictor variables. The f2 value represents the effect size of the construct, whereas the VIF value indicates the degree of multicollinearity between the constructs.

Big Data has the highest adjusted R squared value of 0.534, indicating that 53.4% of the variability in the outcome variable can be explained by the predictor variables in the Big Data construct. Knowledge Acquisition has an adjusted R squared value of 0.329, indicating that 32.9% of the variability in the outcome variable can be explained by the predictor variables in the Knowledge Acquisition construct. Attitude and Skill has the lowest adjusted R-squared value of 0.201, indicating that only 20.1% of the variability in the outcome variable can be explained by the predictor variables in the Attitude & Skill construct.

Table 4: Predictive Accuracy (R2) Effect Size (f2) and Collinearity Statistics (VIF)

Construct	R Square Adjusted	Attitude & Skill		Big Data		Knowledge Acquisition	
		f Square	VIF	f Square	VIF	f Square	VIF
AI		0.257	1.000	0.265	1.257		
Attitude & Skill	0.201			0.373	1.257	0.037	1.707

Construct	R Square Adjusted	Attitude & Skill		Big Data		Knowledge Acquisition	
		f Square	VIF	f Square	VIF	f Square	VIF
Big Data	0.534					0.416	1.707
Knowledge Acquisition	0.329						

The f square statistic is reported for the predictors AI, Attitude and Skill, and Big Data on the outcome variables of Attitude and Skill, and Big Data. Table 4 shows that for the Attitude and Skill outcome variable, AI has an f square of 0.257, indicating a medium effect size. For the Big Data outcome variable, AI, and Attitude and Skill have f square values of 0.265 and 0.373, indicating medium and big effect sizes. For the Knowledge Acquisition outcome variable, Big data has an f square value of 0.416, indicating big effect sizes, and Attitude and Skill have f square values of 0.037, indicating small effect sizes.

4.5. Hypothesis Testing Results

Table 5 shows the path coefficients, original sample values, p-values, and results for six hypotheses tested in the study. The path coefficients represent the strength and direction of the variable-variable relationship. The original sample values represent the coefficient values in the original sample data. The level of significance for each hypothesis is indicated by the p-values.

Table 5: Path Coefficients and Hypothesis Testing Results

No.	Path Coefficients	Original Sample (O)	P Values	Results
H2	Big Data → Knowledge Acquisition	-0.688	0.000	Accepted
H3	AI → Attitude & Skill	0.452	0.000	Accepted
H1	AI → Big Data	0.393	0.000	Accepted
H4	Attitude & Skill → Knowledge Acquisition	0.204	0.004	Accepted
H5	AI → Big Data → Knowledge Acquisition	-0.270	0.000	Accepted
H6	AI → Attitude & Skill → Knowledge Acquisition	0.092	0.007	Accepted

All six hypotheses were accepted as the p-values for each were below the threshold of 0.05.

- Hypothesis 2 had the highest path coefficient of -0.688, indicating a strong negative relationship between Big Data and Knowledge Acquisition.
- Hypothesis 3 had a high path coefficient of 0.452, indicating a strong positive relationship between AI and Attitude and skill.
- Hypotheses 1 and 4 also had high coefficients of 0.393 and 0.204, respectively, indicating significant positive relationships.
- Hypothesis 4 had lower coefficients but was still significant in predicting knowledge acquisition.
- Hypothesis 5 was significant in predicting knowledge acquisition. The mediating role of big data was greater than Attitude and skill in the relationship between and the adoption of artificial intelligence for knowledge acquisition. The results suggest that AI adoption can negatively influence knowledge acquisition and that big data mediate this relationship.
- Hypothesis 6 was significant in predicting knowledge acquisition. The results suggest that Attitude and skill can positively influence knowledge acquisition, and that attitude & skill mediate this relationship.

The Collinearity Statistics (VIF) in Table 4 shows the variance inflation factor for each construct, which measures the extent to which a predictor variable is linearly related to other predictor variables in a regression model. In general, a VIF value of 3 indicates no collinearity, while a value greater than 3 indicates some degree of collinearity. In this case, the table shows that the VIF for each construct is below 1.5, which indicates that there is no significant collinearity among the predictor variables in the regression models.

4.6. Discussions

It is worth noting that all six hypotheses are accepted, indicating that the variables tested have strong relationships. This demonstrates the potential efficacy of AI and big data in improving knowledge acquisition outcomes. The findings of this study have practical implications for organizations looking to use AI and big data to acquire knowledge. The findings specifically indicate that focusing on student attitude and skill development may be critical to achieving successful adoption and reaping the benefits of these technologies.

The negative path coefficient (-0.688) between Big Data and Knowledge Acquisition (H2) suggests that a higher volume, velocity, variety, veracity, and value of data may hinder students' ability to effectively acquire knowledge. This finding highlights the need for educators to provide guidance and support in navigating and making sense of complex and abundant data sources.

The positive path coefficient (0.452) between AI, and Attitude and Skill (H3) indicates that students who have a positive attitude towards AI are more likely to possess the necessary skills to engage with AI technologies. This finding emphasizes the importance of fostering a favorable perception of AI among students and promoting the development of relevant competencies.

The positive path coefficient (0.393) between AI and Big Data (H1) suggests that AI technologies can facilitate the utilization and analysis of large datasets. This finding underscores the potential of AI in extracting insights and generating value from Big Data, which can inform decision-making processes and enhance students' learning experiences.

The positive path coefficient (0.204) between Attitude and Skill, and Knowledge Acquisition (H4) highlights the role of positive attitudes and relevant skills in promoting effective knowledge acquisition. Educators should focus on creating a supportive learning environment that nurtures students' attitudes toward learning and equips them with the necessary skills for acquiring knowledge.

The negative path coefficient (-0.270) between AI, Big Data, and Knowledge Acquisition (H5) indicates that the influence of AI on Knowledge Acquisition is partially mediated by Big Data. This suggests that students' engagement with AI technologies and their utilization of Big Data play a role in shaping their knowledge acquisition outcomes.

The positive path coefficient (0.092) between AI, Attitude and Skill, and Knowledge Acquisition (H6) suggests that Attitude and Skill mediate the relationship between AI and Knowledge Acquisition. This implies that students' attitudes and skills in the context of AI contribute to their ability to acquire knowledge effectively.

Collectively, these findings highlight the intricate relationships between AI, Attitude and Skill, Big Data, and Knowledge Acquisition among students. They underscore the importance of cultivating positive attitudes, developing relevant skills, and effectively utilizing AI and Big Data in educational settings to enhance students' knowledge acquisition outcomes. Educators and policymakers should consider these factors when designing curriculum and implementing educational initiatives to promote successful learning experiences.

4.7. Recommendations

Based on the study's findings, the following recommendations are proposed for high school and university students in Ho Chi Minh City:

Embrace Technology: Students should actively adopt technology and develop digital literacy skills due to the increasing integration of artificial intelligence (AI) in various industries. Integrating technology into their studies and extracurricular activities will prepare them for the skills required in the future.

Foster a Positive Attitude towards AI: Cultivating a positive attitude towards AI is crucial, as the study highlights its influence on knowledge acquisition. Students should recognize AI's potential benefits in both academic and professional contexts.

Prioritize Learning Outcomes: To enhance knowledge acquisition, students should focus on developing skills and knowledge relevant to their academic and future careers. Engaging with AI systems can positively impact learning outcomes.

Seek Feedback and Reinforcement: Encouraging students to seek feedback from educators, peers, and AI systems will aid in identifying areas for improvement and adapting learning strategies accordingly.

Cultivate Critical Thinking Skills: Given the growing prevalence of AI, cultivating critical thinking skills is essential. Students must learn to analyze and evaluate AI-generated information for reliability and validity to make informed decisions.

Promote Digital Literacy and AI Education: Educational institutions should integrate digital literacy and AI education into their curricula. This equips students with the necessary competencies to navigate and utilize AI technologies effectively.

Enhance Big Data Utilization Skills: Providing training in collecting, analyzing, and interpreting Big Data is crucial. Teaching data handling techniques, visualization, and data-driven decision-making empowers students to extract insights from large datasets.

Encourage Positive Attitudes towards AI: Educators can dispel misconceptions and showcase AI's practical benefits through awareness campaigns, guest lectures, and interactive workshops, fostering positive attitudes.

Implement Feedback Mechanisms: Establish mechanisms for timely and constructive feedback on learning progress. Regular assessments, personalized feedback sessions, and self-reflection opportunities reinforce positive learning behaviors.

These recommendations intend to equip high school students with the necessary skills, attitudes, and knowledge to navigate the AI-driven future effectively.

5. Conclusions

In conclusion, this research has provided valuable insights into the relationships between Artificial Intelligence (AI), Attitude & Skill, Big Data, and Knowledge Acquisition among students in Ho Chi Minh City. The findings reveal significant and accepted path coefficients, indicating the presence of meaningful associations between these constructs. Specifically, Big Data negatively impacts Knowledge Acquisition, suggesting that students may face challenges in effectively acquiring knowledge when exposed to a greater volume, velocity, variety, veracity, and value of data. On the other hand, Attitude & Skill and AI have positive effects on both Big Data and Knowledge Acquisition, indicating that students with positive attitudes and relevant skills are more likely to benefit from Big Data and enhance their knowledge acquisition abilities. Moreover, the specific indirect effects demonstrate the interplay between Attitude & Skill, Big Data, and Knowledge Acquisition, emphasizing the sequential impact of these variables. These findings contribute to our understanding of the factors influencing knowledge acquisition in the context of AI and Big Data. They have implications for educational institutions, policymakers, and students, highlighting the importance of integrating AI and Big Data into educational curricula and fostering positive attitudes and skills that align with the demands of the digital era.

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