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Artificial Intelligence: A Paradigm Shift in Education and Management of Public Senior Secondary Schools in Rivers State

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Abstract

The study examined the relationship between artificial intelligence paradigm shift in education and the management of public senior secondary schools in Rivers State. 2 research questions and 2 null hypotheses guided the study. The study adopted a correlational research design. The population of the study was 311 principals from 311 senior secondary schools in the 23 local government areas of Rivers State. The entire population was used as the sample of the study, depicting census sampling technique. The instruments of the study were titled, " Artificial Intelligence: A paradigm shift in Education Questionnaire (AIPSE) and Management of Public Senior Secondary School (MPSSS) Questionnaire." The instruments were structured on a four-point rating scale and validated by experts. The Cronbach Alpha statistics were used to obtain the reliability indexes of 0.81 and 0.81. A total of 311 copies of the instruments were administered to the respondents, retrieved and used for data analyses. The research questions were answered using Pearson Product Moment Correlation, while the null hypotheses were tested using t-transformation statistics at 0.05. level of significance. The finding revealed that symbolic and machine-learning artificial intelligence have a significant relationship with the management of public senior secondary schools in River State. Based on the findings of the study, it was recommended, among others, that the government should provide the basic infrastructure and train principals on the basic skills needed for effective adoption of artificial intelligence in the management of public senior secondary schools for efficacy and effective achievement of educational goals and objectives.

Keywords: Artificial intelligence, Management, Symbolic artificial intelligence, and Numeric or Machine learning artificial intelligence.

Introduction

Artificial is made or produced by human beings rather than occurring naturally, especially as an imitation of, or as a substitute for something natural, for example, simulated artificial intelligence (Collins, 2024). Intelligence is the general mental capacity involving the ability to solve problems, learn from experience, reason, think abstractly, plan, learn quickly, and comprehend complex ideas, not just academic skills or test-taking smart; it has to do with a broader and deeper capacity for comprehending our surroundings, catching on, making sense of things, or figuring out what to do (Gottfredson, 1997). In the same vein, Sharma (2008) opined that, intelligence is the ability to perceive or infer information and to retain it as

knowledge to be applied to adaptive behaviour in an environment or context. Similarly, Hulter (2007), conceived that intelligence measures an agent's ability to achieve goals in a wide range of environments, which has been mathematically formalised. Goh, Nam and Park (2003) stated that, intelligence has been observed in plants, humans, and non humans. They further stated that, intelligence in a computer or other machine is called artificial intelligence. Mishlove (2011) opined that the term "artificial intelligence" was coined by Prof. John McCarthy in 1955, and in 1956 he organised an academic conference in Dartmouth that started AI as a field. Roberts (2016) stated that, Prof. John McCarthy, in 1955, defined artificial intelligence as the science and engineering of making intelligence machines, especially computers. Artificial intelligence is a technology that created machines imitating human intelligence using a process or set of rules to be followed in calculation or other problem-solving to stimulate human-like behaviours and decision-making (Priya, 2023). In the same vein, McCorduck (2004) opined that, artificial intelligence is computer-based intelligence as opposed to human.

Artificial intelligence encompasses advanced Web engines, for example, Google self-driving cars (way motion), generative or creative tools (chat, GPT, and AI art), automated decision-making, and recommended systems used by YouTube, Amazon, and Nelfix to understand human speech (such as Siri and Alexa) (Semaan, 2012). Artificial intelligence approaches can be grouped into two main categories. The numeric or machine artificial intelligence and symbolic artificial intelligence. Ben (2019) stated that, symbolic artificial intelligence is also known as classical artificial intelligence, rule-based AI, and good old-fashioned AI. It is the embedding of human knowledge and behaviour rules into computer programming using symbols. He further stated that symbolic artificial intelligence uses search as a method of solving problems, which means that the computer tries different situations step by step to validate the results. Rodney (1999) stated that, symbolic artificial intelligence uses tools such as semantic networks, log programs, and production rules to develop applications such as knowledge-based systems (extent systems), symbolic mathematics, automated theorems, and automated planning and scheduling systems. It was generally used in simple robotics, performing routine tasks with clearly defined variables and output, natural language processing, expert systems, and robotics. Data Camp (2024) stated that, symbolic AI is a technology that helps digital assistants like Siri comprehend natural language and respond to commands. Symbolic AI, a branch of artificial intelligence, excels at handling complex problems that are challenging for conventional AI methods. It operates by manipulating symbols to derive solutions, which can be more sophisticated and interpretable. This interpretability is particularly

advantageous for tasks requiring human-like reasoning, such as planning and decision-making, where understanding the AI's thought process is crucial (Walter, 2024). Symbolic AI algorithms work by processing symbols, which represent objects or concepts in the world, and their relationships. The main approach in symbolic AI is to use logic-based programming, where rules and axioms are used to make inferences and deductions (Jack, 2012). Jack further stated that symbolic AI is based on knowledge representation and reasoning, while machine learning learns patterns directly from data. The second main approach to AI is numerical or machine artificial intelligence. The term " machine learning was coined by Arthur Samuel, an international business machine computer scientist and a pioneer in AI and computer games. Samuel designed a computer program for playing checkers. The more the program played, the more it learnt from experience, using algorithms to make predictions (Expertise AI, 2024).

Deepail (2024) claims that machine learning began in 1943 by Frank Rosenblatt, a psychologist at Cornell University, who was working on developing a machine that could recognise the letters in his name, alphabets Rosenblatt. 1957, 1959, and 1960. Discrete and analogue signals were used by this device. It also included a threshold component that distinguished between continuous and discrete impulses. It started out as an early version of contemporary artificial neural networks. The author further stated that its learning theory was similar to the learning theories of animals and humans in psychology. It was Rosenblatt who conducted the first mathematical studies of perceptions. However, the Novikoff theorem; Novikoff, 1962 which describes the requirements for a perceptron learning algorithm to be completed in a certain number of steps. Machine learning is a subset of AI, which uses algorithms that learn from data to make predictions. These predictions can be generated through supervised learning, where algorithms learn patterns from existing data, or unsupervised learning, where they discover general patterns in data. (Malt, 2024) Machine learning algorithms contribute to strategic decision-making in the management of educational institutions. These insights aid in designing effective policies, identifying potential dropout risks, and allocating resources judiciously to foster an environment conducive to teaching and learning success.

Applications of AI in education span from personalised learning to evaluation and feedback (Jay, 2019). Beyond the confines of the classroom, AIs impact on education resonates in management tasks such as optimising resource allocation to predict student outcomes and trends. Artificial intelligence (AI) can evaluate past data to predict student performance, identify students who are at risk of falling behind even more, and recommend early

interventions for teachers to provide early assistance that lowers dropout rates and improves overall student success with the use of predictive models that provide a more thorough understanding of student behaviours and results than human beings do (Ecker, Langer, Kong and Schmitz, 2018). Artificial intelligence (AI) can improve management effectiveness by personalising learning, supporting teachers, facilitating decision-making, and encouraging accessibility and inclusivity (Rose and Kim 2018). It has the capacity to greatly raise educational standards and make learning more effective, efficient, and accessible for both students and institutions.

The process of planning, organising, directing, and controlling resources, financial, and physical within an educational institution is known as educational management. It includes many different tasks, such as supervising teachers, evaluating student activities, and providing a conducive teaching and learning environment for the achievement of educational goals and objectives (Koko and Dike, 2022). They further stated that, for educational institutions to function effectively and give students a high-quality education, management of those institutions is crucial; educational institutions can be primary, secondary, or tertiary. Secondary education is the consumer of products from primary school and the producer of the product for higher education. The transition from primary to postsecondary education is facilitated by secondary education. It has a significant impact on national development because it aims to create middle-class workers for businesses, industries, and other related organisations. Enrolment ages of children in secondary schools are between 10 and 12 years. In achieving these aims and objectives, Bush and Glover (2014) opined that the realm of education stands on the brink of a technological renaissance, where the seamless integration of Al techniques offers transformative possibilities across multiple facets of the learning experience and holds the potential to reshape traditional educational paradigms and elevate education. A paradigm is a pattern or a model of something. While a paradigm shift is the fundamental change in approach or perspective within a discipline. Cammuffo and Gerli (2023) stated that, paradigm shift in educational management involves a transformation in methods and applications that guide the management of education, leading to a new way of using artificial intelligence, such as symbolic and machine-learning artificial intelligence, in the management of public secondary schools.

Statement of Problem

Education, as a transformative force, often struggles to effectively address the complex social, economic, and environmental challenges facing modern society. The current education system frequently prioritises rote in traditional management system and standardised testing over critical thinking, creativity, and emotional intelligence. However, the rapid advancement of Artificial Intelligence (AI) technologies presents both opportunities and challenges for education, highlighting the need for innovative solutions that harness AI's potential to enhance management, teaching, learning, and societal impact.

Despite the growing potential of artificial intelligence (AI) in transforming education, public senior secondary schools in Rivers State still face significant challenges in harnessing AI-driven solutions to improve teaching, learning, and administrative efficiency. The existing management systems in these schools are often characterised by insufficient resources and infrastructure for effective AI integration. The slow adoption of AI-driven solutions in public senior secondary schools hinders the realisation of these institutions' full potential by ultimately affecting the quality of education and the preparedness of students for an increasingly complex and technology-driven world. The question is, is there any relationship between artificial intelligence paradigm shift in education and the management of senior secondary schools? Proving solutions to these problems prompted the study.

Purpose of the Study

This study investigated the relationship between artificial intelligence paradigm shift in education and the management of public senior secondary schools in Rivers State. Specifically, the study sought to find the relationship between:

1. symbolic artificial intelligence and the management of public senior secondary schools in Rivers State.
2. numerical or machine-artificial intelligence and the management of public senior secondary schools in Rivers State.

Research Questions

The following research question guided the study.

1. What is the relationship between symbolic artificial intelligence and the management of public senior secondary schools in Rivers State?
2. What is the relationship between numeric or machine learning and the management of public senior secondary schools in Rivers State?

Hypotheses

1. There is no significant relationship between symbolic artificial intelligence and the management of public senior secondary schools in Rivers State.
2. There is no significant relationship between numeric or machine-learning artificial intelligence and the management of public senior secondary schools in Rivers State.

Methodology

This study investigated the relationship between the artificial intelligence paradigm shift in education and the management of public senior secondary schools in Rivers State. The study adopted a correlational survey research design. The population of the study comprised of 311 principals. The sample size of the study was 311 principals. This was so because the census sampling technique was adopted. The study utilised two major instruments, which were titled, Artificial Intelligence Paradigm Shift in Education Questionnaire (AIPSE) and Management of Public Senior Secondary Schools Questionnaire (MPSSS). The ratings of both AIPSE and MPSSS were on a four-point rating scale of Strongly Agree (SA) with a score of 4; Agree (A) with a score of 3; Disagree (D) with a score of 2; and Strongly Disagree (SD) with a score of 1. The instruments were validated by three experts in educational management and measurement and evaluation. Copies of the instruments were distributed to these experts for face and content validity. Appropriate adjustments were made on the instruments before the final copies were produced, which were used for data collection. The instrument was administered once to 20 respondents, comprising vice principals. The result was subjected to an internal consistency reliability test using Cronbach Alpha to obtain the reliability coefficients of 0.81 and 0.88. A total of 311 copies of the instruments were administered to the respondents. To enhance data retrieval of the instruments, four trained research assistants were used, which resulted in a 100% retrieval rate. The research questions were answered using the Pearson Product Moment Correlation to ascertain the relationship between artificial intelligence and management of public senior secondary schools. Values of r between 0 and 0.19 were considered negligible. Values of r ranging from 0.20 to 0.49 were considered weak. Values of r ranging from 0.50 to 0.69 were considered average, while values of r ranging from 0.70 to 1.00 were considered high. The hypotheses were tested by transforming the r-calculated values to t-calculated values using t-Transformation with a critical z-value of ±1.96.

Results

Research Question 1: What is the relationship between symbolic artificial intelligence and management of public senior secondary schools in Rivers State?

Table 1: Summary of the Pearson Product Moment Correlation on the Relationship between Symbolic Artificial Intelligence and the Management of Public Senior Secondary Schools in Rivers State

		Symbolic Artificial Intelligence	Management of Public Senior Secondary Schools
Symbolic Artificial Intelligence	Pearson Correlation	1	.818
	Sig. (2-tailed)		.000
	N	311	311
Management of Public Senior Secondary Schools	Pearson Correlation	.818	1
	Sig. (2-tailed)	.000	
	N	311	311

**. Correlation is significant at the 0.05 level (2-tailed).

Researchers' SPSS Data Output (2024)

The result on Table 1 above showed the summary of the Pearson Product Moment Correlation. on the relationship between symbolic artificial intelligence and management of public senior secondary schools in Rivers State. The result showed that, there is a high and positive relationship between symbolic artificial intelligence and management of public senior secondary schools in Rivers State with a Pearson Product Moment Correlation Coefficient value of .818. Based on the result, it was concluded that, symbolic artificial intelligence has a high and positive relationship with management of public senior secondary schools in Rivers State.

Research Question 2: What is the relationship between numeric or machine artificial intelligence and management of public senior secondary schools in Rivers State?

Table 2: Summary of the Pearson Product Moment Correlation on the Relationship between Numeric or Machine Artificial Intelligence and Management of Public Senior Secondary Schools in Rivers State

		Numeric or Machine Artificial Intelligence	Management of Public Senior Secondary Schools
Numeric or Machine Artificial Intelligence	Pearson Correlation	1	.738
	Sig. (2-tailed)		.000
	N	311	311
Management of Public Senior Secondary Schools	Pearson Correlation	.738	1
	Sig. (2-tailed)	.000	
	N	311	311

**. Correlation is significant at the 0.05 level (2-tailed).

Researchers' SPSS Data Output (2024)

The result on Table 2 above showed the summary of the Pearson Product Moment Correlation on the relationship between numeric or machine artificial intelligence and management of public senior secondary schools in Rivers State. The result showed that there is a high and positive relationship between numeric or machine artificial intelligence. and management of public senior secondary schools in Rivers State with a Pearson Product Moment Correlation Coefficient value of .738. Based on the result, it was concluded that, numeric or machine-artificial intelligence has a high and positive relationship with management of public senior secondary schools in Rivers State.

Hypothesis 1: There is no significant relationship between symbolic artificial intelligence and management of public senior secondary schools in Rivers State.

Table 3: Summary of t-Transformation Result on the Significant Relationship Between Symbolic Artificial Intelligence and Management of Public Senior Secondary Schools in Rivers State

Variables	N	Df	PPMCC	t-cal	t-crit	LS	Decision
Symbolic Artificial Intelligence	311						
		309	.818	24.905	±1.96	0.05	Rejected

Management of Public Senior Secondary Schools	311

Researchers: SPSS Data Output (2024)

The result on Table 3 above showed the summary of the t-Transformation on the significant relationship between symbolic artificial intelligence and management of public senior secondary schools in Rivers State. The result showed that, the calculated t-value of 24.905 was greater than the t-critical value of ±1.96. Therefore, the null hypothesis was rejected at 0.05 level of significance and 309 degree of freedom, while the alternative hypothesis was upheld, which states that, there is a significant relationship between symbolic artificial intelligence and management of public senior secondary schools in Rivers State.

Hypothesis 2: There is no significant relationship between numeric or machine artificial intelligence and management of public senior secondary schools in Rivers State.

Table 4: Summary of t-Transformation Result on the Significant Relationship Between Numeric or Machine Artificial Intelligence and Management of Public Senior Secondary Schools in Rivers State

Variables	N	Df	PPMCC	t-cal	t-crit	LS	Decision
Numeric or Machine Artificial Intelligence	311						
		309	.738	18.083	±1.96	0.05	Rejected
Management of Public Senior Secondary Schools	311						

Researchers: SPSS Data Output (2024)

The result on Table 4 above showed the summary of the t-Transformation on the significant relationship between Numeric artificial intelligence and management of public senior secondary schools in Rivers State. The result showed that, the calculated t-value of 18.083 was greater than the t-critical value of ±1.96. Therefore, the null hypothesis was rejected at 0.05 level of significance and 309 degree of freedom, while the alternative hypothesis was upheld, which states that, there is a significant relationship between Numeric or machine Artificial Intelligence and management of public senior secondary schools in Rivers State.

Discussion of Findings

The result for Research Question 1 on Table 1 showed a high and positive relationship between symbolic artificial intelligence and management of public senior secondary schools in Rivers State with an r value of.818. The result for the corresponding hypothesis 1 on Table 3 also showed a significant relationship between symbolic artificial intelligence and management of public senior secondary schools in Rivers State with a t-transformation value of 24.905 which is greater than the t-critical value of ±1.96. The results are consistent with research by Igbokwe (2023), titled: application of artificial intelligence in educational management. The findings revealed that, the use of artificial intelligence (AI) in educational management has the potential to completely transform the industry. Igbokwe further stated that, AI can improve personalised learning and student engagement and help schools to optimise resource allocation, automate grading and assessments, and streamline administrative duties. AI in educational administration has enormous potential to raise educational standards and efficacy.

The result for Research Question 2 on Table 2 showed a high and positive relationship between numeric or machine artificial intelligence and management of public senior secondary schools in Rivers State with an r value of.738. The result for the corresponding hypothesis 2 in Table 4 above showed that, there is a significant relationship between numeric or machine artificial intelligence and management of public senior secondary schools in Rivers State with a t-transformation value of 18.083, which was greater than the t-critical value of ±1.96. The findings agreed with Aieman (2024), who carried out a study on the impact of artificial intelligence on the school management: a study of opportunities and challenges in Jordan, wherein the study revealed that, AI (numeric or machine learning AI) has demonstrated its potential to revolutionise administrative practices, enrich learning outcomes, and create tailored educational experiences. Aieman further stated that, the ongoing advancements in AI technology are reshaping traditional educational approaches, profoundly impacting school management worldwide. The integration of AI holds promise in optimising administrative and instructional procedures, refining decision-making processes, and managing resources efficiently. AI's role in education extends beyond routine tasks, contributing to elevated instructional quality, increased efficiency, enhanced student experiences, and many more.

Conclusion

Based on the findings of the study, it was concluded that, symbolic artificial intelligence and numerical or machine learning artificial intelligence have strong and high positive relationship with management of public senior secondary schools in Rivers State.

Recommendations

It was recommended, that:

1. the government should provide the basic educational infrastructure to encourage symbolic AI-powered platforms and tools in the management of public senior secondary schools in Rivers State for efficacy and effective achievement of educational goals and objectives.
2. the government should provide training and support professional development opportunities for principals to develop AI literacy to enable them to effectively integrate numeric or machine AI-powered tools in management of public senior secondary schools in Rivers state.

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