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EMBRACING TECHNOLOGY FOR ENHANCED LEARNING AND ADMINISTRATION IN FEDERAL POLYTECHNICS IN ENUGU: THE ERA OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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Abstract
The study examined embracing technology for enhanced learning and administration in polytechnics in era of artificial intelligence, AI, and machine learning, ML. The study employed a descriptive survey research design. The area of the study was Federal Polytechnic Ohodo, Enugu State. The population consisted of 272 staff and students of the institution. A census sampling technique was employed for the study. The instrument for data collection was a researcher-structured questionnaire titled Questionnaire on Embracing Technology for Enhanced Learning and administration in the Era of Artificial Intelligence and Machine Learning (QOETELAFPEAIM). The validity of the instrument was tested using content analysis. Reliability was tested using Cronbach's Alpha which gave a value of 0.833. SPSS statistical tool was employed for analysis. Research questions were answered using measure of central tendency. Findings revealed that technology enhances learning outcome and efficient administration**;** technology **(**Artificial Intelligence and Machine Learning) threaten the position of administrative managers in Polytechnics**.** It further revealed that polytechnic administrators should integrate technology into administration**.** The finding implies that the integration of AI and ML is important at this time but the implementation may lead to job loss. It was recommended that technology **(**Artificial Intelligence and Machine Learning) should be integrated into polytechnics administration to the extent that it will not take over human roles and create job loss.
Keywords: Technology. AI. ML. Administration. Polytechnic

1.0 INTRODUCTION

Background to the Study

Amidst technological traversing of all sectors and spheres of human existence and endeavors, artificial intelligence (AI) and machine learning (ML) have emerged as a change agent or force within the education sector. These technological breakthroughs have transformed how we live, work, and interact with the educational world. It has the potential to transform polytechnic administration practices such as planning, organizing, directing, and controlling; providing new ways of enhancing student learning outcomes, and streamlining administrative processes (Holmes et al 2021 & Igbokwe, 2023). It has the potential to personalize learning experiences, and reshaping the way of delivering education to students. By analyzing students' learning pattern, preferences, and performances, artificial intelligence (AI) algorithms can adapt educational content and activities to meet the individual needs of each student. Nye (2015); Timms (2016); & Aftab et al, (2022) all agree that artificial intelligence and machine learning also can identify patterns and trends; automate administrative processes, by streamlining and automating administrative processes, enhance administrative efficiency and resource optimization (Ihmeideh, 2020; & Sadiku et al, 2021).

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However, the potential benefits of AI and ML notwithstanding, there are significant challenges. Data security and privacy, ethical considerations and equity issues are some of the challenges. Others include the fear that AI may eliminate the role of humans (VanLehn, 2011; & Girard, 2018). More so, inclusion and equity issues in education have remained a subject of debate as it affects developing countries such as Nigeria, especially those in the remote villages that are at risk of being left behind with the integration of AI in Polytechnic administration. In their views, Zawacki-Richter and Anderson (2014); Veletsianos (2019 and Smith (2022) agree that there are issues of data privacy or data security hence, the concerns about data privacy, security, and consent which points to the potential legal impediments that might arise as a result; ranging from discriminations to impersonation, intellectual property rights issues, issues of data protection and privacy rights; lack of accountability, and defamation.

Polytechnic administration is known to be a human-based activity that involves planning, organizing, directing, and controlling both human, financial, and material resources of an educational institution to achieve optimal educational goals such as curriculum development, training and development, budgeting, and student assessment. These have often been done using the traditional approach which is characterized by bureaucratic bottlenecks, delays in processes, loss of valuable time, inaccurate forecasting, ambiguous data analytics, human errors, lack of scale potentials, generalized system of learning and limited and ineffective learning outcomes among others. However, the emergence of AI and ML comes with potentials to transform administration practices by streamlining administrative processes, enhanced personalized learning experiences and influence the management and administration for more efficiency, through feasible and cost-effective plans, formulation of responsive policies, enhance data-backed decision-making; monitor and evaluate educational outcomes if adopted. Consequently, this study sort to know whether the integration of AI and ML into Polytechnic administration will enhance learning outcome and administration in polytechnics. Specifically, the study sought to:

i. Investigate the extent to which artificial intelligence and machine learning enhance effective and efficient Polytechnic administration;
ii. Ascertain whether artificial intelligence and machine learning threaten the position of educational managers in Polytechnic administration.
iii. Examine the extent to which administrative managers can integrate artificial intelligence and machine learning to enhance Polytechnic administration.

The following research questions were formulated to guide the study:

1. To what extent does artificial intelligence and machine learning enhance Polytechnic administration?
2. Does artificial intelligence and machine learning threaten the position of administrative managers in Polytechnics?
3. To what extent should administrative managers integrate artificial intelligence and machine learning into Polytechnic administration?

This study will be of great significance to learners, administrative managers in polytechnics, researchers and research institutions, and the ministry of education**.** Learners and research institutions, as well as scholars will find this study a reference material during subsequent researches and learning endeavours. It will also increase the knowledge store already existing for scholars who may delve into this research area. Review of this work will avail them the findings, knowledge and possible gap for further study.
The scope of the study considered embracing technology for enhanced learning and administration in federal polytechnics in Enugu in the era of artificial intelligence and machine learning. The geographical scope was Enugu Nigeria. The theoretical scope was artificial intelligence, machine learning and enhanced learning outcome and administration.

2.0 Review of Related Literature
Conceptual Review

Artificial Intelligence (AI)
In recent years, artificial intelligence (AI) has emerged as a promising tool for enhancing learning outcome and efficiency in administration. Artificial intelligence is an advancement in technology that is smart. It has the ability to predict accurately; recognizing trends or patterns, and judging like humans. Artificial Intelligence refers to the development of computer systems that can perform tasks that typically require human intelligence, such as learning, problem-solving, decision-making, and perception (Kurzweil, 2005). AI involves the use of algorithms, statistical models, and computer programs to enable machines to think and act like humans. In the context of education, AI can be applied to personalize learning, automate administrative tasks, and improve student outcomes (Bakia et al., 2012). Artificial intelligence is an advancement in technology that is smart and can think like humans. AI technology can process large amounts of data in dimensions different from humans, resulting to better outcomes.

Machine Learning (ML)
Machine Learning is an aspect of AI that uses algorithms and statistical models to enable machines to learn from data and trends without being explicitly programmed (Mitchell, 1997). ML algorithms have the potentials to analyze large data, identify patterns, and make data-based predictions. In polytechnics, ML can be used to develop personalized learning systems, predict student performance, and identify areas where such a student has special needs for additional support (Romero & Ventura, 2010).

Enhanced Learning Outcome
Enhanced learning outcome refers to the use of technology, including AI and ML, to improve the learning experience and results for students (Garrison & Anderson, 2003). Enhanced learning involves the use of digital tools and platforms to provide personalized learning experiences, assessments and real-time feedback. AI and ML can enhance learning by providing students with tailored learning pathways, adaptive assessments, and intelligent tutoring systems (Ritter et al., 2007).

Administration in Polytechnics
Administration in polytechnics refers to the management and organization of educational institutions, including the provision of support services, facilities, and resources (Bolman & Deal, 2017). Effective administration is critical to ensuring that polytechnics can provide high-quality education and training to students. AI and ML can enhance administration in polytechnics by automating routine tasks, improving data analysis and decision-making, and enhancing student support services (Kukulska-Hulme, 2012).

Conceptual Framework
This work is built on the frame work that embracing AI and ML in polytechnics will influence teaching, learning outcome and administrative processes. The framework consists of components such as learning analytics, tailored learning experiences and aids automates administrative processes through automation of grading process, reducing the workload on instructors, and providing more work time to research; facilitates automation of routine administrative tasks, such as data entry, document processing, and student information management. Budgeting, forecasting and decisions are major aspects of this aspect of integration framework.
The integration of AI and ML in polytechnics can bring several benefits such as improved student outcomes. AI and ML can help improve learning outcomes by providing personalized learning

experiences, real-time feedback, and targeted interventions to individual students' need. Enhanced Student Experience is achievable because AI and ML can provide students with regular and uninterrupted support, answering frequently asked questions, and helping students navigate difficult areas of their pathway. Increased efficiency in administration is enhanced by AI and ML through the automation of routine administrative tasks, reducing the workload of instructors and administrators, and freeing up resources for more strategic activities. Data-Driven Decision Making is enhanced by utilizing insights provided by AI and ML about what to improve on in order to enhance teaching and learning. Polytechnics that embrace AI and ML can gain a competitive advantage in the market, attracting students who are looking for institutions that are at the forefront of innovation and technology. Thereby increasing IGR and providing more infrastructure and staff and students welfare.

While the integration of AI and ML in polytechnics can bring numerous benefits, there are also challenges and limitations that need to be considered. Very prominent among these challenges is the high implementation costs especially at the initial stage and during subsequent updates. There is also the issue of data privacy, data security, data quality and availability. Most of the reservations expressed by people over AI has been the quality of output because AI and ML is about garbage-in, garbage-out. Data source, quality and availability undermine the gains of AI and ML. notable about the challenges is change management, encompassing employees' resistance and training need, as well as fairness, transparency, legal compliance need and effective regulation. These are issues that need strong framework in order to address them properly.

Theoretical Review

The Theory of Planned Behavior was propounded by Icek Ajzen (1985). The theory postulates that individuals' intentions and behaviors are influenced by their attitudes, subjective norms, and perceived behavioral control. The Theory of Planned Behavior posits that human behavior is influenced by three main factors: (a) Attitude. (b) Subjective Norms. (c) Perceived Behavioral Control. Though the theory of Planned Behavior is a widely used and influential framework in social psychology and behavioral science, it is not without its criticisms such as overemphasis on rationality, limited predictive power, and lack of consideration for context such as cultural, social, and environmental factors on behavior. Despite these criticisms, the Theory of Planned Behavior remains a valuable framework for understanding and predicting human behavior in many contexts. It suggests that by understanding and addressing attitudes, subjective norms, and perceived behavioral control, policymakers, and polytechnics can effectively promote and technological integration into polytechnic administration. Hence, this study is anchored on the principle of the theory of planned behavior.

Empirical Review

Artificial Intelligence, AI, Machine Learning (ML) and Enhanced Learning Outcome and Administration

The integration of Artificial Intelligence (AI) and Machine Learning (ML) in educational institutions has gained significant attention in recent years. Polytechnics, as institutions of higher learning, are not exempt from this trend. A study by Pedro et al (2019) show that the adoption of AI and ML can enhance learning, leading to improved student outcomes in France.

AI and ML can also be used to enhance administrative tasks in polytechnics, such as student enrollment, course scheduling, and resource allocation. A study by Castañeda and Selwyn (2018), investigated the use of AI-powered chatbots in student enrollment and registration processes in a polytechnic in Canada. The

study found that the chatbot was able to reduce the time spent on enrollment and registration by 30%, freeing up staff to focus on more critical tasks.
Despite the prospects of AI and ML, there are still issues of factors that militate against its effective adoption. A study by Onyema et al (2019), identified some of the challenges faced by schools in implementing mobile technology to including lack of infrastructure, limited technical expertise, and concerns about data privacy and security.

In their study, Sadiku et al (2021) found that in education management, AI can optimize resource allocation. Optimization of resource allocation can result to freeing up more resources for the handling of other relevant issues in education. Meanwhile, AI has the potential to enhance learner engagement. The work of Agarry et al (2022) points out that AI-powered tools like chatbots and virtual assistants can enhance stakeholder engagement. It can do this by providing personalized and timely responses to inquiries or queries related to sustainability performance. This can improve transparency and trust between organizations and their stakeholders, and ensure safe and sustainable practices by corporate bodies, especially as it concerns sustainability. However, the researcher further posit that the adoption of AI and ML into procedures can also lead to job displacement and changes in the roles people play.
The study by Mosteiro et al (2022) found that the use of AI-powered adaptive learning systems can improve student performance in mathematics and science subjects in schools. The study, which involved 150 students from a polytechnic in the United States, revealed that students who used the AI-powered system showed a significant improvement in their grades compared to those who did not use the system.

Another study by Gazquez-Linares et al (2023) explored the use of ML algorithms in predicting student academic performance in a secondary school in Nigeria. The study, which involved 300 students, found that the ML algorithm was able to predict student performance with a high degree of accuracy, suggesting that ML can be a useful tool for identifying at-risk students and providing early interventions.
Another study by Galdames, (2025) explored the use of ML algorithms in optimizing course scheduling in a polytechnic in Australia. The study found that the ML algorithm was able to generate optimal course schedules that minimized conflicts and maximized resource utilization, leading to improved student satisfaction and reduced administrative costs.
In summary, the issue of artificial intelligence and machine learning have remained a continuous discuss on the field of research with numerous studies being carried out to examine the challenges and opportunities of AI and ML in the scheme of things in all relevant sectors. While, PwC (2019) studied AI in transport management; Adewumi, and Adewumi, (2018) studied AI in education; Onyema et al (2019); Sadiku et al (2021) studied AI in primary and secondary schools. A few others like Castañeda and Selwyn (2018) studied AI in polytechnics in Canada; Mosteiro et al (2022) examined that impact of AI and ML on polytechnic in USA. While Pedro, Subosa et al (2019) considered France. Consequently, this work considered the polytechnic sector in Nigeria, hence the researchers studied, embracing technology for enhanced learning and administration in federal polytechnic Ohodo, Enugu state, with the aim to ascertain whether the integration of technology will enhance learning outcome and administration, and to further examine whether its adopt option will constitute a threat to the position of administrative managers, and to what extent should this technological concept be accepted.

3.0 Research Methodology

The study employed a descriptive survey research design. The area of the study was the Federal Polytechnic Ohodo, Enugu. The population consisted of 272 staff and students of the polytechnic. A census sampling technique was employed for the study. The instrument for data collection was a

researcher-structured questionnaire titled Questionnaire on Embracing Technology for Enhanced Learning and administration in the Era of Artificial Intelligence and Machine Learning (QOETELAEAIM). The validity of the instrument was tested using content analysis. Reliability was tested using Cronbach's Alpha. It gave a Cronbach's Alpha of 0.833. The questionnaire had two sections, A and B. While section A, deals with information about the respondents, section B is the question set on the topic of study. It consists of statement items employed in three clusters. The researcher adopted 4 (four) Likert's points scaling techniques where responses were graded from, "Strongly Agree (SA) 4 points, and Agree (A) 3 points, to Disagree (D) 2 points and Strongly Disagree (SD) 1 point. The method of data collection adopted by the researcher was the administration of the questionnaire by the researcher and the use of proxies to reach the respondents. Data was presented and analyzed by mean score and standard deviation.

4.0 DATA PRESENTATION AND ANALYSIS

Statistical Analysis of Survey Data

Table 1: Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	Number of Items
.833	5

Source: SPSS 26 Output, 2024

The reliability statistics in Table 4.a.i.1 indicate that the survey scale measuring the extent to which artificial intelligence and machine learning enhance efficient Polytechnic administration demonstrates high internal consistency, as evidenced by a Cronbach's Alpha of 0.833 across five items. Cronbach's Alpha, which ranges from 0 to 1, reflects the degree to which items on a scale measure the same underlying construct. Generally, a Cronbach's Alpha above 0.8 is considered strong, indicating that the items in this survey reliably capture the intended concept in this case, the impact of technology on polytechnic administration and learning outcome.

In terms of administrative efficiency and learning outcome, this reliability score suggests that respondents' perceptions are consistent across different survey items, implying a clear understanding of the questions and the consistency of responses in evaluating polytechnics administrative efficiency and learning outcomes when technology is integrated. This level of reliability is essential for accurately interpreting how embracing technology may enhance learning outcome and administrative efficiency.

Table 2: Descriptive Statistics

		Artificial intelligence and machine learning tools enhance personalized learning experiences for students in polytechnics	To a great extent, artificial intelligence and machine learning technologies support staff professional development and training in planning of human resources?	Artificial intelligence and machine learning technologies contribute to the optimization of resource allocation and budgeting in Polytechnic administration	Artificial intelligence and machine learning technologies contribute to the identification and support of students with special needs for specialized infrastructure and attention	There are potential long-term impacts of artificial intelligence and machine learning on the future of Polytechnic administration.
N	Valid	272	272	272	272	272
	Missing	0	0	0	0	0
Mean		3.43	3.27	3.18	3.23	3.49
Std. Deviation		.923	.900	1.161	.863	.819
Skewness		-1.384	-1.046	-1.004	-1.083	-1.537
Std. Error of Skewness		.148	.148	.148	.148	.148
Kurtosis		.604	.159	-.636	.632	1.444
Std. Error of Kurtosis		.294	.294	.294	.294	.294

Source: SPSS 26 Output, 2024

Table 2 shows that each item had 272 valid responses, indicating no missing data which allows for a reliable analysis of participant responses. The mean values for the five items range from 3.18 to 3.49, with "There are potential long-term impacts of artificial intelligence and machine learning on the future of learning outcomes and Polytechnic administration" having the highest mean (3.49). This suggests that, on average, participants tend to agree with the statements, implying positive perceptions of embracing technology for enhanced learning and administration in polytechnics. Standard deviations for the items range from 0.819 to 1.161, showing a moderate level of response variation. The highest standard deviation (1.161) appears for the item regarding the Artificial intelligence and machine learning technologies' contribution to the optimization of resource allocation and budgeting in Polytechnic administration. This suggests that perceptions on this point varied more widely among respondents, indicating that some respondents possess different levels of awareness of this aspect of the subject.

The skewness values, which range from -1.004 to -1.537, indicate negative skew across all items, meaning responses were generally concentrated toward higher agreement levels. The negative skew is more prominent for "There are potential long-term impacts of artificial intelligence and machine learning on the future of learning outcomes and Polytechnic administration" with a skewness of -1.537, highlighting that a significant number of respondents strongly agreed with this statement.

Kurtosis values range from -0.636 to 1.444, showing some variability in the peakedness of response distributions. A kurtosis of 1.444 for "There are potential long-term impacts of artificial intelligence and

machine learning on the future of learning outcomes and Polytechnic administration" indicates a more peaked distribution, suggesting that responses to this item were concentrated around the mean with fewer outliers. On the other hand, the negative kurtosis of -0.636 for "Artificial intelligence and machine learning technologies contribute to the optimization of resource allocation and budgeting in Polytechnic administration" implies a flatter distribution, supporting the notion that there was greater variability in responses to this item.

In summary, the descriptive statistics reveal generally positive perceptions of embracing technology for enhanced learning and administration in polytechnics in era of artificial intelligence and machine learning. The variation in standard deviations, skewness, and kurtosis across items points to differing levels of agreement, with some items resonating more uniformly among respondents than others. These findings suggest that participants perceive embracing of technology for enhanced learning and administration in polytechnics in era of artificial intelligence and machine learning as beneficial, though experiences and opinions may differ slightly on specific aspects, such as its effectiveness in enhancing learning outcome and efficiency in administration.

Table 3: Responses on how does artificial intelligence and machine learning enhance Polytechnic administration and learning?

Statements	Frequency	Percent	Mean	Standard Deviation	Decision
Artificial intelligence and machine learning tools enhance personalized learning experiences for students in polytechnics					
Strongly Disagree (SD) (1)	15	5.5			
Disagree (D) (2)	37	13.6			
Agree (A) (3)	36	13.2			
Strongly Agree (SA) (4)	184	67.6			
Total	**272**	**100.0**	**3.43**	**0.923**	**Agree (Mean > 2.5)**
To a great extent, artificial intelligence and machine learning technologies support staff professional development and training in planning of human resources?					
Strongly Disagree (SD) (1)	16	5.9			
Disagree (D) (2)	35	12.9			
Agree (A) (3)	81	29.8			
Strongly Agree (SA) (4)	140	51.5			
Total	**272**	**100.0**	**3.27**	**0.900**	**Agree (Mean > 2.5)**
Artificial intelligence and machine learning technologies contribute to the optimization of resource allocation and budgeting in Polytechnic administration					
Strongly Disagree (SD) (1)	46	16.9			
Disagree (D) (2)	25	9.2			
Agree (A) (3)	36	13.2			

Strongly Agree (SA) (4)	165	60.7			
Total	**272**	**100.0**	**3.18**	**1.161**	**Agree (Mean > 2.5)**
Artificial intelligence and machine learning technologies contribute to the identification and support of students with special needs for specialized infrastructure and attention to such a person.					
Strongly Disagree (SD) (1)	18	6.6			
Disagree (D) (2)	23	8.5			
Agree (A) (3)	110	40.4			
Strongly Agree (SA) (4)	121	44.5			
Total	**272**	**100.0**	**3.23**	**0.863**	**Agree (Mean > 2.5)**
There are potential long-term impacts of artificial intelligence and machine learning on the future of Polytechnic administration.					
Strongly Disagree (SD) (1)	10	3.7			
Disagree (D) (2)	27	9.9			
Agree (A) (3)	54	19.9			
Strongly Agree (SA) (4)	181	66.5			
Total	**272**	**100.0**	**3.49**	**0.819**	**Agree (Mean > 2.5)**
Weighted Average Mean and Standard Deviation			**3.32**	**0.933**	

Source: Field Survey, 2024

The findings in Table 3 reveal broad consensus on how artificial intelligence and machine learning enhance effective and efficient Polytechnic administration**.** With an overall weighted mean of 3.3 across all responses, participants generally agree that artificial intelligence and machine learning enhance effective and efficient Polytechnic administration. Each statement scored above the midpoint (2.5), indicating that the respondents view the system as positively influential. This high agreement level suggests that the adoption of technology will enhance learning outcome, foster effective and efficient Polytechnic administration system which will benefit the polytechnic sector while contributing to the overall development of the country's manpower sector and the Nigerian economy as a whole.

The statement, artificial intelligence and machine learning tools enhance personalized learning experiences for students in polytechnics, yielded a high mean of 3.43, with a standard deviation of 0.923. This result reflects a strong consensus, with 67.6% of participants expressing strong agreement. This level of support indicates that most respondents recognize the system's direct benefits in improving learning outcome, efficiency and effectiveness of administration within the polytechnic community.

Participants also agreed (mean of 3.18) that technology (Artificial intelligence and machine learning) contributes to the optimization of resource allocation and budgeting in Polytechnic administration. This statement had a slightly higher standard deviation (1.161), suggesting some variation in responses but still

reflecting overall approval. As a result, students and mangers of polytechnics are likely to experience more efficient system. This variability, however, may indicate that some participants feel other aspects of technology have a more direct impact on learning outcome and administration. With a weighted average mean of 3.3, participants show high levels of agreement on the impact of technology.

Table 4: Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	Number of Items
.713	5

Source: SPSS 26 Output, 2024

To address Research Question II which sort to uncover how artificial intelligence and machine learning threaten the position of educational managers in Polytechnic administration, Table 4.1.4 presents reliability statistics that assess the internal consistency of the items used to measure these underlying mechanisms. The Cronbach's Alpha coefficient of 0.713 indicates a good level of reliability for the scale, as values above 0.7 typically suggest that the items consistently measure the same construct. This consistency is important for validating the responses, ensuring that the items provide stable and meaningful insights into the study. The Cronbach's Alpha of 0.713 provides confidence that the items reliably measure how the adoption of technology threatens the position of administrative managers in Polytechnics.

Table 5: Descriptive Statistics

		Integration of artificial intelligence and machine learning technologies absorb the roles and responsibilities of administrative managers.	Administrative managers perceive the integration of artificial intelligence and machine learning technologies as threats to their relevance within the polytechnics	To a great extent, artificial intelligence and machine learning technologies absorbs the leadership and strategic planning capabilities of managers in polytechnics	Artificial intelligence and machine learning have potential implications for the job security and job prospects of admin staff and managers in the future.	To a great extent, artificial intelligence and machine learning algorithms automate tasks traditionally performed by administrative managers, potentially reducing the need for human intervention
N	Valid	272	272	272	272	272
	Missing	0	0	0	0	0
Mean		3.08	3.27	3.13	3.23	3.38
Std. Deviation		.826	.900	.908	.863	.833
Skewness		-.752	-1.046	-.981	-1.083	-1.270
Std. Error of Skewness		.148	.148	.148	.148	.148
Kurtosis		.184	.159	.285	.632	.906
Std. Error of Kurtosis		.294	.294	.294	.294	.294

Source: SPSS 26 Output, 2024

Table 5 shows that the first statement has a mean of 3.08. This reflects a recognition of the capacity of technology to takeover human job roles, with some participants' likely feeling less strongly about its impact. The second statement, has the highest mean score of 3.27. This indicates a strong perception that embracing technology brings about job loss to machines and software, by replacing human roles with machine roles. The relatively higher mean highlights the sense of insecurity by administrative mangers in polytechnics. More so, the suggestion that, to a great extent, artificial intelligence and machine learning algorithms automate tasks traditionally performed by administrative managers, potentially reducing the need for human intervention received the highest mean score of 3.38. This suggests a strong consensus on the threat that embracing technology to enhance learning outcome and administrative efficiency poses to human job positions and human discretionary interventions in line of their duties. The standard deviations for all statements indicate a moderate level of agreement among respondents, as the values range from .826 to .908. The negative skewness values, especially for the last statement, indicate a tendency for participants to lean towards more positive responses affirming the otherwise, suggesting an overall favorable perception to the displacement role of technology on human roles and interventions. The kurtosis values, which are all less than 3, suggest that the distribution of responses is relatively flat, indicating a diversity of opinions among participants regarding the impact of technology and its potential threats to the job security of admin managers in polytechnics. In summary, the descriptive statistics presented in Table 4.1.5 highlight a generally favourable opinion to the threat that embracing technology in order to enhance learning outcome and administrative efficiency, will pose to the job security of admin managers.

Table 6: Responses on the extent to which artificial intelligence and machine learning threaten the position of administrative managers in Polytechnics

Statements	Frequency	Percent	Mean	Standard Deviation	Decision
Integration of artificial intelligence and machine learning technologies absorb the roles and responsibilities of administrative managers.					
Strongly Agree (SA) (4)	90	33.1			
Agree (A) (3)	130	47.8			
Disagree (D) (2)	37	13.6			
Strongly Disagree (SD) (1)	15	5.5			
Total	**272**	**100.0**	**3.09**	**0.822**	**Agree (Mean > 2.5)**
Administrative managers perceive the integration of artificial intelligence and machine learning technologies as threats to their relevance within the polytechnic.					
Strongly Agree (SA) (4)	140	51.5			
Agree (A) (3)	81	29.8			
Disagree (D) (2)	35	12.9			
Strongly Disagree (SD) (1)	16	5.9			
Total	**272**	**100.0**	**3.27**	**0.900**	**Agree (Mean > 2.5)**
To a great extent, artificial intelligence and machine learning technologies absorbs the leadership and strategic planning capabilities of managers in polytechnics					
Strongly Agree (SA) (4)	108	39.7			
Agree (A) (3)	116	42.6			

Disagree (D) (2)	24	8.8			
Strongly Disagree (SD) (1)	24	8.8			
Total	**272**	**100.0**	**3.13**	**0.908**	**Agree (Mean > 2.5)**
Artificial intelligence and machine learning have potential implications for the job security and job prospects of admin staff and managers in the future.					
Strongly Agree (SA) (4)	121	44.5			
Agree (A) (3)	110	40.4			
Disagree (D) (2)	23	8.5			
Strongly Disagree (SD) (1)	18	6.6			
Total	**272**	**100.0**	**3.23**	**0.863**	**Agree (Mean > 2.5)**
To a great extent, artificial intelligence and machine learning algorithms automate tasks traditionally performed by administrative managers, potentially reducing the need for human intervention					
Strongly Agree (SA) (4)	153	56.3			
Agree (A) (3)	81	29.8			
Disagree (D) (2)	26	9.6			
Strongly Disagree (SD) (1)	12	4.4			
Total	**272**	**100.0**	**3.22**	**0.865**	**Agree (Mean > 2.5)**
Weighted Average Mean and Standard Deviation			**3.19**	**0.872**	

Source: Field Survey, 2024

Table 6 shows that the first statement examines whether integration of artificial intelligence and machine learning technologies absorb the roles and responsibilities of administrative managers. A significant number of respondents—80.9%—either agreed (47.8%) or strongly agreed (33.1%) that it does absorb their roles. With a mean score of 3.09 and a standard deviation of 0.822, the findings indicate a general consensus on tendency of AI and ML absorbing the roles and responsibilities of administrative managers and also subjects the learners to laziness. The second statement explores how administrative managers perceive the integration of artificial intelligence and machine learning technologies as threats to their relevance within the polytechnic sector. This statement received the highest level of agreement among all responses, with 81.3% affirming its validity—51.5% strongly agreeing and 29.8% agreeing. The mean score of 3.27, and a standard deviation of 0.900, highlights respondents' belief in that embracing technology will threaten the position of managers. This finding suggests that participants view the technology as a means of staff retrenchment. Finally, the fifth statement examines whether artificial intelligence and machine learning algorithms automate tasks traditionally performed by administrative managers, potentially reducing the need for human intervention. A strong consensus emerged, with 86.1% of respondents affirming this viewpoint—56.3% strongly agreeing and 29.8% agreeing. The mean score of 3.22 and a standard deviation of 0.865 suggest a clear recognition of technology automating tasks traditionally performed by learners and administrative managers, potentially reducing the need for human involvements, tasking of the creative minds of humans and the intervention. Overall, the weighted average mean of 3.19 and a weighted standard deviation of 0.872 indicate a strong

agreement across all statements, affirming that the administrative managers perceive the integration of technology as threats to their relevance within the polytechnic. These insights are crucial for policymakers and stakeholders looking to embrace technology more in the sector.

Table 7: Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	Number of Items
.799	5

Source: SPSS 26 Output, 2024

To address Research Question III, which seeks to establish the extent to which administrative mangers integrate artificial intelligence and machine learning into Polytechnic administration, Table 4.1.7 presents reliability statistics that assess the internal consistency of the items used to measure these underlying mechanisms. The Cronbach's Alpha coefficient of 0.799 indicates a good level of reliability for the scale, as values above 0.8 typically suggest that the items consistently measure the same construct. This consistency is important for validating the responses, ensuring that the items provide stable and meaningful insights into the study. Technology is usually adopted to enhance efficiency and predictability of a system, inherently structured to foster trust, and a watertight system of administration. The Cronbach's Alpha of 0.8 provides confidence that the items reliably measure the extent to which technology can be integrated for enhanced efficiency.

Table 8: Descriptive Statistics

		To a great extent, administrative managers should adopt and integrate AI and ML technologies into polytechnic administration	Integration of AI and ML into Polytechnic administration will save cost, create more time for managers to focus on other important courses to create more values for all stakeholders.	Administrative managers should be trained to develop the necessary skills and competencies to effectively utilize AI and ML technologies at full scale while on their roles.	AI and ML algorithms can be used to enhance data analytics and forecasting for making informed decisions	Administrative managers can leverage artificial intelligence and machine learning technologies to improve decision-making processes and strategic planning.
N	272	272	272	272	272	272
	0	0	0	0	0	0
Mean		3.43	3.27	3.33	3.23	3.47
Std. Deviation		.926	.900	.979	.863	.854
Skewness		-1.369	-1.046	-1.289	-1.083	-1.525
Std. Error of Skewness		.148	.148	.148	.148	.148
Kurtosis		.545	.159	.434	.632	1.353
Std. Error of Kurtosis		.294	.294	.294	.294	.294

Source: SPSS 26 Output, 2024

Table 8 shows that the statement "to a great extent, administrative managers should adopt and integrate AI and ML technologies into polytechnic administration" has the highest mean score of 3.43. This indicates a strong belief among participants that the integration of technology will enhance efficiency in administration and improve learning outcome. The second statement, "integration of AI and ML into Polytechnic administration will save cost, create more time for managers to focus on other important courses to create more values for all stakeholders," has a mean of 3.27. This score reflects the view that the adoption of technology will save cost, enhance more value creation for all stakeholders. Participants also expressed positive views on the ability to enhance data analytics and forecasting for making informed decisions using technology if integrated. This is evident with the mean score of 3.23 for the statement, "AI and ML algorithms can be used to enhance data analytics and forecasting for making informed decisions. Finally, the statement that administrative managers can leverage artificial intelligence and machine learning technologies to improve decision-making processes and strategic planning received the highest mean score of 3.47. This suggests that participants strongly believe that AI and ML provide admins with the skills and knowledge necessary to strategically plan the running of the institution efficiently, thereby reinforcing learning and learning outcome. The standard deviations for the statements range from .854 to .979, indicating a moderate level of agreement among respondents regarding the adoption and integration of technology into the administrative procedure of polytechnics. The negative skewness values, particularly for the statement about leverage AI and ML technologies to improve decision-making processes and strategic planning (skewness of -1.525), suggest that participants generally lean towards integration to a great extent, reflecting a favorable attitude. The descriptive statistics in Table 4.1.8 illustrate a strong belief that administrative mangers can integrate artificial intelligence and machine learning into Polytechnic administration to a great extent. Participants recognize the system's role in providing timely data analytic reports, accurate predictions and decision, and strategic planning approach to administration.

Table 9: Responses on the extent to which administrative mangers can integrate artificial intelligence and machine learning to enhance Polytechnic administration

Statements	Frequency	Percent	Mean	Standard Deviation	Decision
To a great extent, administrative managers should adopt and integrate AI and ML technologies into polytechnic administration					
Strongly Agree (SA) (4)	184	67.6			
Agree (A) (3)	35	12.9			
Disagree (D) (2)	38	14			
Strongly Disagree (SD) (1)	15	5.5			
Total	**272**	**100.0**	**3.43**	**.926**	**Agree (Mean > 2.5)**
Integration of AI and ML into Polytechnic administration will save cost, create more time for managers to focus on other important courses to create more values for all stakeholders.					
Strongly Agree (SA) (4)	140	51.5			
Agree (A) (3)	81	29.8			
Disagree (D) (2)	35	12.9			
Strongly Disagree (SD) (1)	16	5.9			

Total	**272**	**100.0**	**3.27**	**0.900**	**Agree (Mean > 2.5)**
Administrative managers should be trained to develop the necessary skills and competencies to effectively utilize AI and ML technologies at full scale while on their roles.					
Strongly Agree (SA) (4)	164	60.3			
Agree (A) (3)	58	21.3			
Disagree (D) (2)	25	9.2			
Strongly Disagree (SD) (1)	25	9.2			
Total	**272**	**100.0**	**3.33**	**0.979**	**Agree (Mean > 2.5)**
AI and ML algorithms can be used to enhance data analytics and forecasting for making informed decisions					
Strongly Agree (SA) (4)	121	44.5			
Agree (A) (3)	110	40.4			
Disagree (D) (2)	23	8.5			
Strongly Disagree (SD) (1)	18	6.6			
Total	**272**	**100.0**	**3.23**	**0.863**	**Agree (Mean > 2.5)**
Administrative managers can leverage artificial intelligence and machine learning technologies to improve decision-making processes and strategic planning.					
Strongly Agree (SA) (4)	179	65.8			
Agree (A) (3)	54	19.9			
Disagree (D) (2)	26	9.6			
Strongly Disagree (SD) (1)	13	4.8			
Total	**272**	**100.0**	**3.47**	**0.854**	**Agree (Mean > 2.5)**
Weighted Average Mean and Standard Deviation			**3.35**	**0.904**	

Source: Field Survey, 2024

Table 9 shows that a significant majority of participants (67.6%) strongly agree that to a great extent, administrative managers should adopt and integrate AI and ML technologies into polytechnic administration for efficiency of administration and enhanced learning outcome. The mean score of 3.43 indicates that respondents view this system as a vital pathway for progress. Furthermore, respondents acknowledge that integration of AI and ML into Polytechnic administration will save cost, create more time for managers to focus on other important courses to create more values for all stakeholders. With 51.5% of participants strongly agreeing with this statement and a mean score of 3.27, it is evident that the integration is seen as crucial for development and improvement of Nigerian polytechnics. Administrative managers should be trained to develop the necessary skills and competencies to effectively utilize AI and ML technologies at full scale while on their roles, is another critical aspect highlighted in the responses. A substantial 60.3% of participants strongly agree that the integration of technology should facilitate training and development of staff, to ensure knowledge transfer. This is

supported by a mean score of 3.33. This indicates a strong belief that the integration of technology does not only create atmosphere of proactive administration, but also leverages the wisdom and experience of previous generations to enhance sustenance and continuity within the polytechnic system. Such intergenerational transfer of skills is fundamental in maintaining culture of administrative excellence while ensuring advancement and reinforcing enhanced learning outcome. In terms of the perceived positive impact of technology on educational system especially in Nigerian polytechnics, that statement that AI and ML algorithms can be used to enhance data analytics and forecasting for making informed decisions pulled a result that shows that 44.5% of respondents strongly agree, while an additional 40.4% agree with the statement. The mean score of 3.23 suggests a robust belief in the system integration and its effectiveness in enhancing administration and learning outcomes. This view reinforces the idea that technology is the future of education. Finally, the respondents overwhelmingly agree (65.8%) that the administrative managers can leverage artificial intelligence and machine learning technologies to improve decision-making processes and strategic planning. The mean score of 3.47 highlights the consensus that the system plays a significant role in key decision areas that are crucial for a robust system that enhance learning outcomes. The weighted average mean of 3.35 and a standard deviation of 0.904 indicate a high level of agreement among participants that to a great extent, administrative mangers can integrate artificial intelligence and machine learning to enhance Polytechnic administration**.**

Discussion of Findings

The Extent to Which Artificial Intelligence and Machine Learning Enhance Polytechnic Administration.

The findings regarding the extent to which artificial intelligence and machine learning enhance polytechnic administration suggest that the there are benefits attached to integrating technology into administration. The overall weighted mean score of 3.32, along with the majority of respondents expressing agreement that the system enhances administration, indicates a strong belief in its effectiveness. Artificial intelligence and machine learning technologies contribute to the optimization of resource allocation and budgeting, identifying areas of special needs and attention. These technologies also contribute to the identification and support of students with special needs for specialized infrastructure and attention, while also supporting staff professional development and training in planning of human resources. The low standard deviations in responses suggest a consensus among respondents on the position that technology enhances administrative efficiency in polytechnics. Hence, it was concluded that the integration of artificial intelligence and machine learning enhance administrative efficiency and improve learning outcome in polytechnics. This implies that the adoption and integration of AI and ML technologies into Polytechnic administration will result in efficiency and effectiveness. The finding is in alignment with the view of (Ihmeideh, 2020) and who opines that AI and ML have the capacity to enhance administrative efficiency and resource optimization; streamline administrative processes, reduce manual work load and eliminate administrative bottlenecks. Akinwale et al (2016); Alabi, and Adewumi, (2018); and Adewumi, and Adewumi, (2018) in their various studies have a common understanding and agree that by analyzing large datasets, Artificial intelligence can identify trends, patterns, and areas for improvement, enabling administrative managers to make informed decisions and enhance their efficiency and learning outcome from students.

Artificial Intelligence and Machine Learning Threaten the Position of Administrative Managers in Polytechnics

The findings related to artificial intelligence and machine learning threaten the position of administrative managers in Polytechnics, as indicated by a weighted average mean of 3.19 conveys the knowledge that participants expressed agreement on various aspects of the threats. The respondents believe that the integration of AI and ML will absorb the roles of the managers and render them redundant. This why majority of the administrative managers perceive the integration of artificial intelligence and machine learning technologies as threats to their relevance within the polytechnics. Additionally, the integration reduces man power need and increase machine hours. A reduction in reliance on human judgment. These are reasons for the delay in integration of AI and ML into administrative system of many polytechnics. By the initiative to integrate technology, many managers and other role players are likely to be rendered redundant and subsequently retrenched. The high percentage of respondents acknowledging the system's role in absorbing the leadership and strategic planning capabilities of managers in polytechnics, and having belief that there may be other potential negative implications for the job security and job prospects of admin staff and managers in the future, the resistance to change is often boosted. However, the high inclination of participants towards the negative prospects of integrating technology into polytechnic administration calls for serious attention such that the risks and threats can be mitigated. The consensus of the majority of the respondents on the threat that such integration poses, both on the short term and the long-term, it was concluded that the integration of AI and ML into administration process threatens the position of administrative managers in polytechnics. This is in alignment with the position of VanLehn, (2011) and Girard, (2018) who maintained that the integration of AI and ML into Polytechnic administration might as well erase human judgment and empathy in administration; question the role of humans in decision-making, and interpersonal relationships and threaten the employment of education managers. However, the finding contradicts the position of Zawacki-Richter and Anderson (2014) and Ihemeideh (2020) who posit that the integration of AI and ML holds opportunities for educational managers to gain further skills through need-assessed training programs; gain mastery of their roles, discharge their responsibilities within the shortest possible time while having more time to focus on other important issues.

The Extent to which Administrative Mangers should Integrate Artificial Intelligence and Machine Learning into Polytechnic Administration

Research question three sort to find out the extent to which administrative staff should adopt and integrate artificial intelligence and machine learning into the administration process in polytechnics. Finding shows that respondents want technology integration. The strong evidence supporting the position that to a great extent, administrative managers should adopt and integrate AI and ML technologies into polytechnic administration is underscored by the significant number of respondents (67.6%) who responded on the affirmative. This finding can be attributed to the belief that integration of technology will save cost, create more time for managers to focus on other important courses to create more values for all stakeholders. It is believed that for integration to take place, comprehensive training and other skill acquisition support may be provided to staff. These are essential for a successful administrative career. The significant mean score of 3.43 regarding the extent of adoption and integration of technology highlights its role in enhancing administration and improving learning outcome. It was concluded that administrative managers can integrate artificial intelligence and machine learning to a great extent. The implication of the finding is that the adoption and integrations of AI and ML technologies should not be relegated but should be given immediate attention. The finding is in alignment with the findings of Adewumi, and Adewumi, (2018); Sadiku et al (2021) who are of the view that AI and ML have the capacity to optimize resource allocation, and free up more resources for educators and administrators to engage more strategic initiatives.

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5.0 SUMMARY OF FINDINGS AND CONCLUSION AND RECOMMENDATIONS

After examining the work, embracing technology for enhanced learning and administration in polytechnics: the era of artificial intelligence and machine learning, the following findings were made:

1. Integration of artificial intelligence and machine learning enhance administrative efficiency and improve learning outcome in polytechnics.
2. Integration of AI and ML into administration process threatens the position of administrative managers in polytechnics
3. Administrative managers can integrate artificial intelligence and machine learning to a great extent

In conclusion, flowing from the findings and the subsequent discussion of results, the researcher concluded that AI and ML enhance learning outcome and efficient Polytechnic administration to a very great extent. It was further concluded AI and ML threaten the position of admin managers in Polytechnic administration to a very great extent**,** even as administrative mangers can integrate artificial intelligence and machine learning into Polytechnic administration to a very great extent**.** The implication of the findings is that the integration of AI and ML are important at this time but the implementation may lead to job loss by administrative managers. To a great extent, the success of adoption and integration hinges on a holistic and well-informed approach that prioritizes the needs effective and efficient discharge of management roles and the broader interest of Polytechnic administration in an era of AI and ML while navigating the complex landscape this technological advancement.
Based on the findings of the study, the researchers recommended that AI and ML technologies should be integrated into Polytechnic administration but in phases, and to the extent that it will not take over human roles and create job loss.

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