Entrepreneurial Artificial Intelligence for Self-Reliance in Vocational Development

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Abstract
This paper proposes a novel archetype termed "Entrepreneurial Artificial Intelligence (E-AI) aimed at fostering self-reliance through the vocational use of AI technologies and entrepreneurial principles. In an era marked by rapid technological advancements and socio-economic transformations, achieving self-reliance has become a paramount goal for individuals, communities, and nations. E-AI represents an innovative approach to addressing this imperative by empowering individuals to leverage entrepreneurial artificial intelligence tools and business strategies for self-sufficiency and resilience in vocational development. Through a comprehensive exploration of E-AI, this paper examines its theoretical foundations, practical applications, apprenticeship, and potential socio-economic impacts on modern facilities. This strategic plan integrates AI into vocational development to enhance self-reliance among entrepreneurs. By developing AI-powered training platforms, automation tools, and data analytics systems, aim to equip individuals with the skills and resources needed to thrive in a competitive educational curriculum to support better decision-making, thereby empowering individuals and businesses to achieve greater success and self-reliance to optimize learning experiences, improve operational efficiencies, and Additionally, by enhancing AI capabilities such as machine learning, natural language processing, and data analytics to improve individuals engagement in opportunities for solving economic and developmental complex challenges for creating values in diverse economic sustainable domains. By promoting the integration of EAI into educational implementation frameworks and entrepreneurial ecosystems, we can nurture a new generation of self-reliant innovators equipped to navigate the challenges and opportunities of the 21st century. This paper brings to the fore imperative of AI for societal benefit, highlighting the transformative potential of EAI in advancing self-reliance and vocational independence.

Keywords: *Entrepreneurship, vocational development, Artificial intelligence, self-reliance, innovation, and empowerment, Entrepreneurial Artificial Intelligence.*

Introduction

The focus of this paper is to identify and analyze how artificial intelligence can be used to enhance the quality of learning, skill development, and the relevance of vocational education programs. This will provide a deeper understanding of the role of artificial intelligence in vocational education and provide a framework that can be used as a guide in implementing artificial intelligence in this context. Usoro, E. B. (2015). It is expected that this will assist educators and decision-makers in effectively harnessing artificial intelligence to improve learning and skills and the preparation of vocational students for the ever-evolving workforce. To address the challenges of the current job market, Schneier, Bruce (2015). the focus must be

on igniting the interest and acceptance of vocational students towards new technologies like artificial intelligence (AI) and their application in digital entrepreneurship. Digital entrepreneurship is a specific type of entrepreneurship that utilizes emerging technology, such as artificial intelligence, in innovative ways. This approach can help alleviate the job market challenges faced by recent graduates and are considered the most efficient solution to address the significant impact of the present employment crisis. (Nobanee & Dilshad, 2020). Digital entrepreneurship refers to the act of actively seeking out and capitalizing on new business prospects that arise from the emergence of new media and artificial intelligence.
This entails integrating AI and related technologies into the curriculum and enhancing students' technical application abilities and innovative thinking through hands-on projects and informal entrepreneurial activities, as today the Rector of the Abia State Polytechnic in Aba Nigeria, as local content, makes AI mandatory for all students in the Polytechnic Okoro C.K. (2024). Cultivating digital entrepreneurial traits in students is crucial for reducing dependence on the traditional job market and for driving economic transformation (Soluk & Darwin, 2021). Therefore, it is vital to provide a learning environment that not only sparks students' innovative interests but also offers real-world application opportunities. This approach ensures that students are prepared to adapt to a digitalized work environment and to utilize technological innovations for launching their entrepreneurial ventures, thereby fostering economic transformation and growth and equipping them for future economic demands. In the realm of digital entrepreneurship, there is a growing demand for effective strategies that leverage artificial intelligence (AI).

Self-Reliance

An individual is said to be self-reliant when she or he can depend less on other people and his family in the management of her human and material resources. The citizens will be self-reliant when they have a possible cause to access and utilize the essentials of life, which include good food, clothing, shelters, medication, transportation, and functional education (Ofoye, 2010). A self-reliant individual must be enterprising; he/she is enterprising when there are attributes of verbal skills for selling, dominating, leading, conceiving himself as a strong, masculine leader, avoids well-defined language or work situations requiring long periods of intellectual efforts, is extraceptive, differs from the conventional types in that he prefers ambiguous social tasks and has a greater concern with power status, and leadership is orally aggressive (Okorie, 2000). Vocational preferences include business executive, buyer hotel manager, industrial relations consultant, manufacturers, representative, master of ceremonies, political campaign manager, real estate salesman, restaurant workers, speculator, sports promoter, stock and bond salesman, television producer, traveling salesman, and entrepreneurs that are self-reliant (Okorie, 2000:28).

Job Creation

A job can be defined as work done for which you receive regular payment. The Oxford Advanced Learner's Dictionary defined job as post, position, vacancy, placement, appointment, or opening Hornby (2006). The creation of a job can be possible if the candidate or personnel has the acquired entrepreneurial, technical, or vocational skills needed to create or secure a job either in the industrial sector or as a self-reliant individual. A job in the real sense is created for those that need it, desire it, and can effectively perform the expected skills to achieve the objectives of the company. The trained entrepreneur or technical or vocational personnel can decide to be self-reliant and also create jobs by employing others. The government of federal state, local, non governmental agencies, international organizations, the United Nations, and individuals can create jobs in order to maximize profit. The multinational

oil companies wearing the cap of investment can create jobs in their exploration drive in Nigeria Umunadi (2010). The reason for job creation is to produce goods and services, and the establishment of the company must require skilled personnel to actualize the objectives of the company.

Self-Reliance and Job creation

The social and economic environment in Nigeria with respect to technical and vocational education calls for the creation of a full partnership between employers and educators in preparing individuals for the world of work. This is particularly true for those looking forward to wage employment. However, for those who may finish with the hope and desire for self-employment, then the involvement of small businesses in technical and vocational education programs becomes an absolute necessity. Technical and vocational education can expand its horizons to provide new options for youth and contribute to increased productivity through involvement in entrepreneurship education Mndebele and Lukhele (1995). With a limited industrial base, entrepreneurship education and self-employment should be presented to students as career options in addition to the technical and vocational education. Processes for entrepreneurship should be initiated at both the secondary and postsecondary levels. The term entrepreneurship describes individuals who have economic opportunities for themselves and others through their ability to look beyond what presently exists within the job opportunity arena Mndebele and Lukhele, (1995). He further explained that entrepreneurs create new businesses and can also reshape jobs into positions that are more productive. Objective of the study **is** to ascertain the extent of vocational skill for business education using entrepreneurship for self reliance Specifically, the study first Promote Self-Sufficiency in Vocational Skills Development through AI Integration and Secondly to Enhance Accessibility and Efficiency in Vocational Education with AI-Driven Solutions.

Literature Review

Review of Intelligent Tutoring Systems Using Bayesian Approach with advancement in computer science research on artificial intelligence and in cognitive psychology research on human learning and performance, Okwelle, P. C. (2013). the next generation of computer-based tutoring systems moved beyond the simple presentation of pages of text or graphics. These new intelligent tutoring systems (ITSs), called cognitive tutors, incorporated model-tracing technology, which is a cognitive model of student problem solving that captures students' multiple strategies and common misconceptions. Such intelligent tutoring systems or knowledge-based tutoring systems can guide learners to progress in the learning process at their best.

Oduolowu, E. A. (2007) One of the biggest challenges in designing intelligent tutoring systems (ITSs) is the effective assessment and representation of the student's knowledge state and specific needs in the problem domain based on uncertainty information. The task of dealing with the uncertainty management for the student model is thus challenging. Various approaches in artificial intelligence have been proposed for uncertainty reasoning, including. (i) Rule-based systems (ii) Fuzzy logic (iii) Dempster Shafer theory of Evidence (iv) Neural networks and (v) Bayesian networks.

Bayesian networks are a powerful approach for uncertainty management in artificial intelligence. The recent trend in ITS involves the creation of systems that can make decisions based on uncertain or incomplete information. One formal framework for uncertainty management is Bayesian networks, which use probability theory as a formal framework for uncertainty management in artificial intelligence (Pearl, 1988). A Bayesian network (BN) is a graphical description of a probability distribution that permits efficient probability propagation

combined with a rigorous formalism. A BN for a given domain represents the joint probability distribution, p(x), over the set of random variables, X, of the domain, as a set of local distributions combined with a set of conditional independence assertions. Researchers have applied Bayesian networks to many tasks (Johnson, 2001), including Student Modeling, E-Commerce, skill acquisition and Multi Agents. Nwazor (2023) In student modeling, there are two tasks involved in helping a student navigate in a personalized learning environment.

1. The structure of the problem domain must be modeled.
2. Student knowledge regarding each concept in the problem domain should be tracked.

A Bayesian network (BN) consists of a directed acyclic graph (DAG) and a corresponding set of conditional probability distributions (CPDs). Based on the probabilistic conditional independence encoded in the DAG, the product of the CPDs is a joint probability distribution (JPD). In other words, Bayesian networks serve as both a semantic modeling tool and an economical representation of a JPD. There are many inference algorithms in BNs for computing probabilities of variables given other variables to take on certain values.

Research Questions

ii) To what extent do business educators teach skills, generate relationships, initiate models, practice reflection and respond to contexts in self reliance

ii) What are the constraints to effective entrepreneurship of business education in skill development.

i) To provide people who apply scientific knowledge to the improvement and solution of environmental problems for the use and convenience of man.

Material and Method

This paper utilizes the literature review materials which provides an overview of studies conducted on a specific topic, identifies what has been studied. This work provides literature on the role of artificial intelligence in vocational education. Literacy refers to the language used in the research data. Data collection for this study involves gathering journals, dissertations, and books related to artificial intelligence, as well as relevant websites that address the same research variables. The implementation process of the Huang et al (2008) review method includes determining the research topic, searching for literature sources, selecting relevant literature, analyzing the articles, and compiling the literature review report.

Model Equation of Entrepreneurial of Ai in Vocational System

Creating an equation to represent Entrepreneurial Artificial Intelligence (AI) for Self-Reliance in Vocational Development involves integrating various factors that contribute to vocational growth, self-reliance, and entrepreneurial success with AI support. Here's an abstract form of such an equation:

Let:

- **E** = Entrepreneurial Success (output)
- **A** = Artificial Intelligence's contribution (AI tools, decision-making, automation)
- **V** = Vocational skills and knowledge (training, education)
- **S** = Self-reliance (personal initiative, problem-solving)
- **R** = Resources available (funding, tools, networks)
- **T** = Time spent in skill development and training
- **M** = Mentorship or support systems
- **I** = Innovation (creative problem-solving, new solutions)
- **F** = External factors (market conditions, competition, regulations)

The equation could look like:

$$E = (A \times (V + S) \times (R + M)) \times \frac{I}{F + T}$$

Where:

- **A × (V + S)** captures how AI boosts vocational skills and self-reliance.
- **(R + M)** reflects how available resources and mentorship enhance entrepreneurial growth.
- **I/(F + T)** shows how innovation drives success but is influenced by external factors and the time invested.

This equation models the interplay between AI-driven entrepreneurship, vocational development, and self-reliance.

Learning Mechanism

Expert systems incorporate a learning mechanism to improve performance over time or adapt to changes in the domain. Types of learning mechanisms include:

1. **Supervised Learning**: The system learns from labeled examples provided by a supervisor or expert, using these examples to generalize patterns and make predictions or decisions on new data.
2. **Unsupervised Learning**: The system learns from unlabeled data, discovering patterns, associations, or structures to improve understanding of the domain or identify relevant features. It can be used for clustering, pattern recognition, or anomaly detection.
3. **Reinforcement Learning**: The system learns by interacting with its environment and receiving feedback in the form of rewards or penalties, optimizing behavior based on this feedback.

Expert systems are a crucial subset of artificial intelligence (AI) **figure 1** explain the simulates the decision-making ability of a human expert figure 1 tells the systems use a knowledge base filled with domain-specific information and rules to interpret and solve complex problems. Expert systems are widely used in fields such as medical diagnosis, accounting, coding, and even in games.

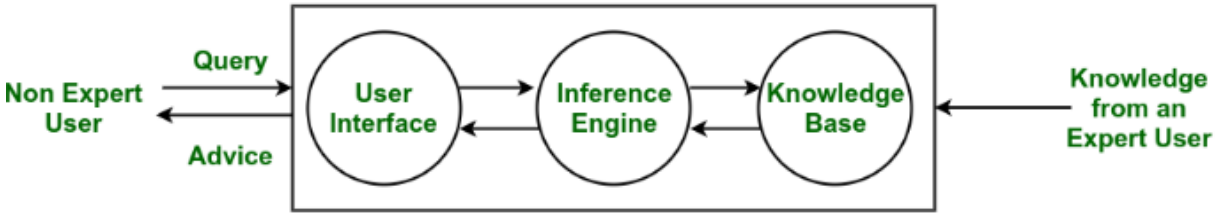

Figure 1 Block diagram of Expert Systems Bolloju et al (2012)

Expert systems operate by following a structured approach:

1. **Input Data**: Users provide data or queries related to a specific problem or scenario.
2. **Processing**: The inference engine processes the input data using the rules in the knowledge base to generate conclusions or recommendations.
3. **Output**: The system presents the results or solutions to the user through the user interface.
4. **Explanation**: If applicable, the system explains how the conclusions were reached, providing insights into the reasoning process.

Architecture of an Expert System

Expert system consists of four major components which are: knowledge base, working memory, an inference engine and a user interface. Figure 3 below represents the structure of an expert system.

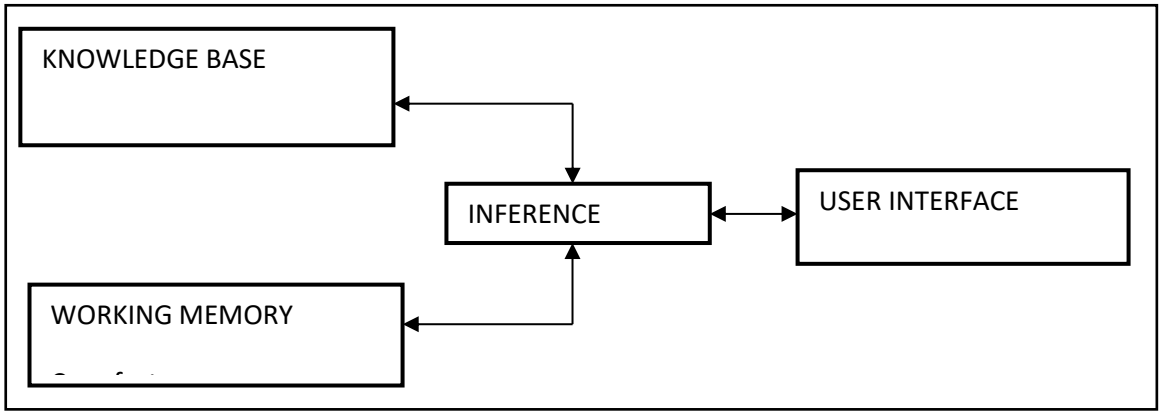

Figure. 2 The structure of a knowledge-based expert system (Khan, 2008)

(i) Knowledge base: A knowledge base is the heart of an expert system; it contains a collection of facts and rules that describe all the knowledge about the problem domain. Therefore, it stores all relevant information, data, rules, cases, and relationships used by the expert system. A knowledge base is not a database system.
(ii) Working memory: Working memory is comparable to a relational database system. It contains information that is supplied by the end user. This information is used to evaluate antecedents in the knowledge base. A change in the knowledge base results in the creation of new values; thus, the working memory will update its old values.
(iii) Inference engine: An inference engine implements the reasoning process of artificial intelligence; it is an analogy to human reasoning. Its role is to work with the available data from the system and the user to derive a solution to the problem. The purpose of an inference engine is to seek information and relationships from the knowledge base and to provide answers, predictions, and suggestions in the way a human expert would. There are two kinds of inference engines: the backward chaining and forward chaining (Khan, 2008).
(iv) User Interface: The user interface controls the dialog between the user and the system. Thus, it is an intermediary that allows communication between the user and the system. The purpose of the user interface is to ease the usage of expert systems by developers, users, and administrators.

Intelligent tutoring systems and cognitive tutors
Intelligent tutoring systems have their foundation in the artificial intelligence and computer-assisted instruction disciplines. Burns (1988) describes the "intelligence" of this software as the collection of the five subsystems shown in Figure 3. The first is an expert model that represents the domain knowledge. This knowledge constitutes the understanding of the subject matter that an expert has in the tutored area. The second is the student diagnosis model, this model represents the knowledge and behavior of a student learning the domain. The third is the instruction module, which is responsible for recognizing student input and responding to student actions. The fourth is the instructional environment that provides support to the learner. It can consist of the activity, the situation, and tools provided by the system to facilitate learning. The fifth component is the interface, an essential component that provides the means by which the user can communicate with the system. With respect to intelligent tutoring systems, it is the integration of the models that separates ITS technology from other forms of compute-raised instruction (Heffernan, 2003).
Intelligent tutoring systems assist students in mathematics, science, and language learning domains and skill for learners in high school and higher education courses (Heilman, 2006).

When integrated into school curricula, students use the tutors during school hours in computer labs and classrooms. Students using tutors have been proven to have learning gains greater than peers not utilizing the tutor and receiving more typical instruction (Koedinger, 2003).

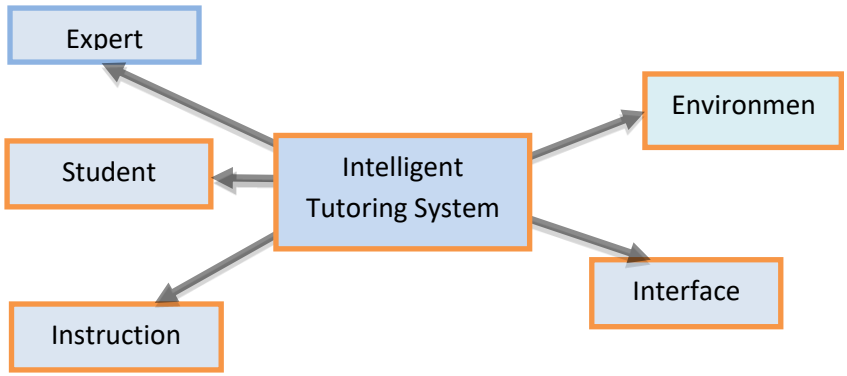

Fig. 3 Intelligent Tutoring System (Model 2013).

In this work, intelligent tutoring systems are a vehicle for delivering a mobile learning application. Specifically, Cognitive Tutors are the basis for the development of the mobile intelligent tutoring system.

RESULT AND DATA ANALYSIS

In the realm of career development, the convergence of artificial intelligence with vocational training and entrepreneurial endeavors represents a dynamic synergy that fosters both economic growth and personal advancement. This fusion empowers individuals with the practical skills and knowledge necessary to not only excel in their chosen trades but also to innovate and drive forward their own business ventures. The significance of this blend lies in its capacity to create a workforce that is not just job-ready but also equipped to identify and seize opportunities for self-reliance.

Research Question One:

To what extent do business educators teach skills, generate relationships, initiate models, practice reflection and respond to contexts in self reliance

Responses to this research questions are presented in tables 1, 2, 3, 4, 5 and 6 Using standard deviation

$$S^2 = \sum_{k=1}^{1} \mathrm{F}(\mathrm{M}^2) - \mu^2 \qquad 2$$

Table 1: Respondents frequency and percentage responses on skills taught (N = 228).

S/N	Business education skills taught by business educationteachers	Yes		No	
		F	%	F	%
1	How to teach skills	172	75	56	25
2	How to lead others	123	54	105	46
3	Ability to identify new trends/roles of accounting in the business world	98	43	103	57
4	Familiarity with various new skills in sales and Salesmanship	102	45	126	55
5	Ability to use different office machines/equipment, and ICT facilities	100	44	128	56
6	Ability to determine and interpret factors which indicate extent and strength of competitors around and in future Ability to manage time effectively	84	37	144	63
7	Learning to know e.g. critical thinking	115	50	113	49
8	Learning to be e.g. managing inadequate feelings	109	48	119	52
9	Learning to live with others e.g. teamwork	89	39	139	61
10	Learning to do e.g. working with fingers as in offices	110	48	118	52
11		92	40	136	60

Source: Field Survey (2024)

Table 1 shows that apart from teaching skills, leadership skills and ability to manage time effectively which the respondents agreed they have been taught, respondents do not think that they have been taught the other skills.

Table 2: Respondents frequency and percentage responses on level of satisfaction with skills learned from business education.

Responses	Frequency (F)	Percentage (%)
Satisfied	112	49
Dissatisfied	116	51
Total	228	100

Source: Field Survey 2024

Table 2 shows the responses of the respondents on the level of satisfaction with skills learned from business education. While 49 percent of the respondents feel satisfied with the skills learned, 51 percent are dissatisfied with it.

Table 3: Respondents frequency and percentage responses on extent to which business educators generate relationships (N= 228)

S/N	Extent of relationships generated by businesseducators	Yes F	%	No F	%
12	The relationship existing between students and vocationaleducation lecturers in your department is encouraging There is need for more closeness,	82	36	146	64
13	warmth and interaction between students and lecturers so as to improve students' learning, achieve more.	156	68	72	32
14	There should be more communications about vocational education lecturers whereabouts during office hours.	156	68	72	32

Source: Field Survey 2024

Table 3. 64 percent do not think the relationship existing between teachers and students is encouraging. In fact 68 percent of the respondents think there is need for more closeness, warmth and interaction between teachers and students, while 68 percent believe that communication of lecturers' where about is needed.

Table 4: Respondents frequency and percentage responses on extent to which business educators initiate models (N= 228)

S/N	Extent of models initiated by business educators	Yes F	%	No F	%
15	vocational education lecturers offer you sufficient illustrations of real life events while teaching in your discipline	89	39	139	61
16	Giving of real life examples to illustrate points	140	61	88	39
17	You get exposed to sufficient real life problem to practicalize your studies or in connection to your studies	81	36	147	65

Source: Field Survey 2025

Table 4 shows that 61 percent of the respondents do not agree that lecturers offer sufficient illustrations of real life events. 61 percent agree that teachers give real life examples to illustrate points, but 65 percent of the respondents do not agree that they are being exposed to sufficient real life problems.

Table 5: Respondents frequency and percentage responses on extent to which business educators practicalize reflection (N= 228)

S/N	Extent of reflection practicalized by businesseducators	Yes F	%	No F	%
18	Reflecting on each day and weeks activities so as tohandle them better	88	39	140	61
19	Watching videotape to show what was learnt or not and often be corrected	38	17	190	83
20	Repeating initial difficult lecture sessions so as to achieve objectives expected through demonstrations, questions and answers.	99	43	129	57

Source: Field Survey 2025

As shown in table 5, 61 percent do not think that business educators provide opportunity for students to reflect on each week's activities. 83 percent of the respondents said teachers do not show videotapes. In fact 57 percent also stated that teachers do not repeat initialy difficult lecture sessions through demonstrations, questionsand answers.

Research question two

What are the constraints to effective entrepreneurship of business education in skill development?

Table 6: Respondents frequency and percentage responses on exposure to interactions

S/N	Exposure to interactions	Often F	%	Rarely F	%
21	Creating revision opportunities to consolidate what was taught	108	37	120	53
22	Encouraging students to engage in tutorials to further their learning	79	35	149	65
23	Helping students to solve individual and group Problems	89	39	139	61
24	Encouraging students to engage in project based discussion groups	94	41	134	59

Source: Field Survey 2015

Table 6 shows that majority of the respondents indicated they are rarely exposed to teacher guided interactions by teachers.

Research Question Three

To provide people who apply scientific knowledge to the improvement and solution of environmental problems for the use and convenience of man.

Table 7: Respondents frequency and percentage responses on constraints to effective Vocationalization (N= 228)

S/N	Constraints	Yes		No	
		F	%	F	%
25	Epileptic power supply	152	67	76	33
26	Insufficient time for teaching skills	147	65	81	36
27	Insufficient hardware and software	154	68	74	32
28	Apparently outdated curriculum	130	57	198	43
29	Use of lecture method by lecturers	145	64	83	36
30	Administrators misconception of vocational education	123	54	105	41

Source: Field Survey 2025

A table 7 show that 67 percent of respondents agreed that epileptic power supply is one of the greatest constraints to effective teaching and learning. 65 percent said insufficient time for teaching skills, while 68 percent of the respondents think that insufficient hardware and software is the most challenging factor hindering effective vocationalization. Other constraints are outdated curriculum (57 percent), use of lecture method (64 percent) and administrators' misconception (54 percent).

In conclusion,

Entrepreneurial Artificial Intelligence (AI) for Self-Reliance in Vocational Development represents a transformative approach to empowering individuals by enhancing their vocational skills and entrepreneurial capabilities. By integrating AI technologies into vocational training, learners can benefit from personalized learning paths, real-time feedback, and adaptive resources that tailor to individual strengths and needs. This enables more effective skill acquisition, fostering self-reliance and the development of entrepreneurial qualities such as creativity, innovation, and problem-solving. AI serves as a catalyst, reducing barriers to learning and entrepreneurship, creating opportunities for individuals to achieve economic independence, and contributing to the growth of a more resilient and skilled workforce. Ultimately, AI-driven vocational development promotes self-sufficiency, equipping individuals with the tools and knowledge to thrive in dynamic and competitive markets.

RECOMMENDATIONS

- The government, agency should provide adequate infrastructural facilities like power. Electricity supply should be given priority to solve the problems of epileptic power supply in Nigeria.
- Technology education must be given due attention by the government, NGO and the teachers in secondary and tertiary institutions. Practical aspects of a practical-oriented course should be taught with relevant tools and equipment in well-equipped workshops.

- The government should encourage local entrepreneurs to establish manufacturing industries to produce local materials for cars, computers, electronics equipment, and televisions to reduce the importation of manufactured goods in the country.
- The government should set up an entrepreneurial technical and vocational training center to produce the required skilled personnel to cater for the local demands of skilled personnel in Nigeria.
- Entrepreneurial centers in our institutions in Nigeria must be equipped and utilized to assist the university and other institutions to bridge the gap created by the theoretical nature of our entrepreneurial technical and vocational education program in our institution.
- The government should set up a joint curriculum of entrepreneurial, technical, and vocational education to x-ray the possibilities of mismatching skills knowledge and initiatives or the acquisition of skills for self-reliance and job creation.

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