IMPACT OF ENTREPRENEURSHIP EDUCATION IN PROMOTING INNOVATION AMONG HIGHER NATIONAL DIPLOMA IN OFFICE TECHNOLOGY AND MANAGEMENT GRADUANDS IN NORTHWEST POLYTECHNICS, NIGERIA

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Abstract

This study aimed to determine the impact of entrepreneurship education on promoting innovation among Office Technology and Management (OTM) graduates of polytechnics in Katsina State, Nigeria. The study was guided by two research questions, from which two research hypotheses were formulated and tested. A survey research design was adopted. The population comprised 222 OTM graduates from the 2020/2021, 2021/2022, and 2022/2023 academic sessions. A simple random sampling technique was employed to select a sample of 150 graduates, ensuring each had an equal chance of being selected. The data collection instrument was an 18-item structured questionnaire titled "Impact of Entrepreneurship Education on Promoting Innovation (IEEPI)," which was validated by three experts from the Department of Vocational Education, Faculty of Education, Abubakar Tafawa Balewa University, Bauchi. To establish reliability, the instrument was pilot-tested with 10 OTM graduates from polytechnics in Kano State, who were not part of the main study. Analysis using the Cronbach alpha method yielded a coefficient of 0.85. The researcher, assisted by two trained research assistants, administered the questionnaire. The key findings revealed a statistically significant impact of entrepreneurship education on product innovation (ANOVA result: $F(1, 132) = 91.794$, $p = .000 < 0.05$, $R = .640$, $R^2 = .410$, regression coefficient $B = .531$, $t = 9.581$, $p = .000$). The test of the second hypothesis also confirmed a statistically significant impact on process innovation (ANOVA results: $F(1, 132) = 228.091$, $p = .000 < 0.05$, $R = .796$, $R^2 = .633$, regression coefficient $B = .904$, $t = 15.103$, $p = .000$). The study concluded that entrepreneurship education is a critical driver of both product and process innovation among OTM graduates. It recommended, among other things, that polytechnic administrators and curriculum planners should deepen and expand the integration of practical, hands-on entrepreneurship modules focused on product development to equip students with the necessary skills to conceptualize and launch new or improved products.

Keywords: Impact, Entrepreneurship Education, Product Innovation, Process Innovation, Graduands.

Introduction

Entrepreneurship education provides comprehensive learning management for student entrepreneurs, helping them establish correct values and cognitive systems, enhance their perceptions of innovation, and continuously integrate and accumulate new knowledge to shape their innovative abilities and personalities. Entrepreneurship promotes innovation through research and development practices; entrepreneurs introduce new ventures, markets, products, and technologies and play a role in solving problems that existing products and technologies have not yet solved.

Innovation serves as an important driver for economic growth and development in various sectors such as education, commerce, transportation, and telecommunication (Oluwatobi et al., 2020). Entrepreneurship and innovation have progressively gained prominence in academia, with polytechnics being seen as key players in driving economic growth through new business creation and the development of innovative technologies via various vocational courses. Several initiatives aim to promote entrepreneurship and innovation in Nigerian polytechnics. These institutions offer a 2-year Ordinary National Diploma (OND) programme and a 2-year Higher National Diploma (HND) programme in Office Technology and Management, with a break for a one-year compulsory cognate experience. Students in both programmes receive entrepreneurship education and training concurrently. In 2007, the NBTE developed curricula and training materials for three compulsory entrepreneurship courses: Introduction to Entrepreneurship (BAM 126) for OND students, Entrepreneurship Development (BAM 413) for HND students, and Entrepreneurship Development Training (EDT111) for both diplomas. The ultimate goal of entrepreneurship education is to promote entrepreneurial intention by fostering entrepreneurial motivation and self-efficacy (Ademiluyi, 2022).

Entrepreneurship education has emerged as a crucial component in nurturing a culture of innovation and fostering creative thinking. Its important contributions in Nigeria include increased job creation, enhanced individual competence and self-development, economic growth, social change, the promotion of innovation, research and development, and national and regional development. Scholars such as Goar et al., (2021) contribute to this discourse by highlighting the necessity of integrating entrepreneurial theories into educational programs to instill a profound understanding of entrepreneurial processes. Entrepreneurial activities evolve from skills obtained through entrepreneurial education, manifesting as entrepreneurial self-efficacy or intentionality.

Successful entrepreneurship literacy is the ability to recognize and evaluate business opportunities, assemble the necessary resources to capitalize on them, and take appropriate action to ensure success. The entrepreneurs identify opportunities using skills inculcated through education. Entrepreneurship is regarded as a critical mechanism for stimulating product innovation, which accelerates economic growth. Historically, entrepreneurship has led to economic progress over the long term (Goar et al., 2021).

Entrepreneurship increases prosperity in an economy by enabling the production of higher value-added goods and services and by increasing productivity (Hasan & Almubarak, 2021). Variations of entrepreneurship education are offered at all levels of schooling in Nigeria, from primary to secondary schools and through graduate programmes. Beyond theory, studies examining the impact of entrepreneurship education on product innovation have shown promising results. Scholars like Adeoti et al. (2019) identify entrepreneurship education as an important factor that positively and significantly influences entrepreneurial innovation, concluding that it improves students' entrepreneurial innovativeness regarding new and existing products, competencies, and their desire to start a new venture or expand an existing product after graduation.

Entrepreneurship is a discipline that considers how, what, why, and when opportunities are recognized, created, and acted upon. These opportunities can involve new or existing products. Entrepreneurship is often addressed as a gateway to intergenerational equity, civic engagement, and democracy building, especially in the 21st century. A common global perspective is to create specific jobs through product innovation for millions of youths to alleviate poverty and underemployment, thereby empowering them. Linking entrepreneurial training with Institutions of higher learning, such as Technical Vocational Education and Training (TVET) Colleges, tends to provide gainful employment to recipients, forming the base for industrialization and technological development in the 21st century (Gamede & Uleanya, 2017). Maier (2018) specified that product innovation is a question of what is produced, including new material goods as well as new intangible services.

Product innovation allows for a better product to be offered than those currently on the market, providing more functions or performing better (Modibbo et al., 2024). Through product innovation, a company can gain a competitive advantage by differentiating its production and increasing the quality and variety of goods, thereby growing demand and opening new growth opportunities. Product innovation can manifest at different levels of complexity, the most significant of which are (Musa, 2024):

1. The change of concept, based on a new idea, whether or not supported by a new technology;
2. Making the product using other materials and components with better characteristics than the previous one;
3. A new design, which often means more than just a change of shape or appearance and may involve ergonomic aspects or manufacturing changes;
4. New services that accompany the product or finding new uses for the product, either as-is or with minimal changes.

Entrepreneurship also drives economic productivity by transferring knowledge and innovation to the market through products, methods, and production (Lafuente et al., 2020). Entrepreneurship education has been widely recognized as an effective tool for promoting product innovation. However, its effectiveness depends on various factors such as program design, teaching methods, and faculty expertise (Goar et al., 2021). Entrepreneurship education cultivates an entrepreneurial perspective, which is critical for product innovation and encompasses creativity, risk-taking, and problem-solving skills (Aigbepue & Akenbor, 2022). Studies have shown that entrepreneurship education can develop an entrepreneurial mindset among students, leading to increased product innovation and entrepreneurial behavior (Barakabo, 2016).

Effective entrepreneurship education programs incorporate best practices and strategies such as experiential learning, industry partnerships, mentorship, and a focus on product innovation. These programs should be tailored to meet the needs of students and the economy. Entrepreneurship education can enhance graduate employability by developing entrepreneurial skills and attributes like product innovation that employers seek (Ayediso, 2017). It can also encourage graduate entrepreneurship, leading to job creation and economic growth (Chris, 2023). However, closer collaboration between academia and industry is needed to ensure that entrepreneurship education meets the needs of employers and the economy, particularly regarding product innovation (Isah & Norashidah, 2017).

Entrepreneurship education can contribute to economic growth by developing entrepreneurial skills and knowledge that lead to product innovation among students (Chris, 2023). However, its impact on product innovation and economic growth depends on various factors such as the quality of education, industry partnerships, and government support (Dogan, 2015). The ability of entrepreneurship education to stimulate product innovation is why Wei et al. (2019) emphasized that it cultivates inventive talents, a vital driving force for future development, as innovation-driven development strategies place new demands on it. Creative and innovative thinking, according to Garba (2023), occur at different stages of the creative process and often overlap.

The strategist observes people and figures and uses analytical skills to develop an invention that meets the needs of an opportunity. Alternatively, the Schumpeterian school of thought regards innovation as a criterion of entrepreneurship characterized by the ability to achieve things that have never been done before. According to Weinberger et al. (2018), creativity is a stable personality attribute that is inherited and does not change significantly over a person's lifespan. In fact, entrepreneurship has been characterized as a notion that involves both the creation and exploration of opportunities, innovation in new and existing products, and is often regarded as the most effective method for developing innovation and creativity.

Entrepreneurship education significantly influences process innovation among Office Technology and Management graduates by fostering creativity, problem-solving skills, and a proactive mindset. Equipped with entrepreneurial knowledge, graduates are better prepared to identify inefficiencies, streamline processes, and implement innovative solutions in office and business settings. This education empowers them to drive continuous improvement, adapt to evolving technologies, and contribute effectively to organizational growth and competitiveness. Ultimately, entrepreneurship education enhances the capabilities of OTM graduates, enabling them to catalyze process innovation and drive positive change within their workplaces. Process innovations are new ways of producing goods and services; it is a matter of how existing products are produced (Maier, 2018).

Process innovation is the implementation of a new production method or significant changes in specific techniques, equipment, and/or software to reduce production and distribution costs, improve quality, produce or distribute new or improved products, increase the efficiency or flexibility of a productive or supply activity, and reduce environmental risks (Modibbo et al., 2024). Even if new products are the visible results of marketing innovation, process innovation plays an equally important strategic role. It can be defined as introducing new elements into an organization's production. The road to achieving business performance requires redefining the processes that underpin its operation and increasingly using innovative technologies. In this context, process innovation involves a business process approach that uses innovation in an enterprise's key processes to help reduce costs or time to produce a good or service (Maier, 2018).

Process innovation is defined by Muhammad et al., (2022) as creating beneficial modifications in the process of generating offers. It is concerned with all functional and operational activities that help reduce production costs, improve quality, enhance delivery methods, gain market share, achieve superior performance, and secure a competitive advantage (Aigbepue & Akenbor, 2022). Process innovation is the implementation of a new production method that makes activities or shipping methods more effective. It may involve a change in tools, human capital, work methods, or a combination of these, such as installing new or better software to speed up work completion and policy issuance.

Office Technology and Management is a structured programme of study in higher institutions in Nigeria, domiciled in the Department of Business Education and Vocational Education, usually within Faculties of Education or Colleges of Education and Polytechnics (Wagi, 2021). The programme must be accredited for studies by the National Board for Technical Education (NBTE), the National Universities Commission (NUC), and the National Commission for Colleges of Education (NCCE) for polytechnics, universities, and colleges of education, respectively. These boards have made OTM available in polytechnics, universities, colleges of education, and even commercial, craft, and technical colleges. These institutions train students to acquire skills and competencies using knowledge-based innovativeness or modern technologies that are adequate, updated, and strategically position skillful graduates to become Office Managers, Executive Secretaries, Administrative Assistants, Facility Managers, Front Desk Officers, Data Entry Specialists, and Receptionists, among others (Adebayo, 2019).

Office Technology and Management (OTM) graduates are critical stakeholders in Nigeria’s economic growth, as they possess skills in business administration, management, and technology. However, many OTM graduates lack or fail to utilize the entrepreneurial skills and innovation required to start and manage successful businesses. Ademiluyi (2022) state, it is evident that many OTM graduates still roam the streets in search of non-existent white-collar jobs. This situation raises questions about the effectiveness of the entrepreneurship education program to which these graduates were exposed. Accordingly, Nigerian higher institutions have begun to develop entrepreneurship training systems, making it important to examine the

effectiveness of these programmes vis-à-vis graduates' entrepreneurial activities, with particular concern for the development of innovation.

Most polytechnics, universities, and colleges of education now have a center for entrepreneurship education. This became necessary to address the endemic problem of unemployment facing the nation. Thus, entrepreneurship education has been made compulsory irrespective of students' areas of specialization (Yahaya, 2024). Despite this intervention, unemployment remains devastating among office technology and management graduates, particularly in Katsina State, Nigeria. Graduates of OTM are part of the skilled manpower produced by Polytechnics in Nigeria. It is against this background that this study seeks to determine the impact of entrepreneurship education on promoting innovation among Office Technology and Management graduates of Polytechnics in Katsina State, Nigeria.

Statement of Problem

Entrepreneurship education is a vital catalyst for promoting innovation and driving economic growth. However, within the context of Office Technology and Management graduates of Polytechnics in Katsina State, Nigeria, despite efforts to enhance their innovative capacities in different entrepreneurial skills, many still roam the streets seeking employment after graduation. This indicates that possible issues are lagging within the entrepreneurship education they received and need to be addressed. Efforts to identify and establish the issues responsible for unemployment among OTM graduates in Katsina State, despite their entrepreneurship education, will depend on the results of this research. Addressing this challenge is crucial for enhancing entrepreneurship education and promoting innovation among these graduates. This problem prompted the researcher to carry out this study to identify possible solutions using empirical evidence.

Research Questions

The main objective of the study was to determine the impact of entrepreneurship education on promoting innovation among office technology and management graduates of polytechnics in Katsina State, Nigeria. The study was guided by the following research questions:

1. What is the impact of entrepreneurship education on product innovation among office technology and management graduates of polytechnics in Katsina State, Nigeria?
2. What is the impact of entrepreneurship education on process innovation among office technology and management graduates of polytechnics in Katsina State, Nigeria?

Research Hypotheses

The following null hypotheses were tested at a 0.05 level of significance:

$H0_1$: Entrepreneurship education has no significant impact on product innovation among office technology and management graduates of polytechnics in Katsina State, Nigeria.

$H0_2$: Entrepreneurship education has no significant impact on process innovation among office technology and management graduates of polytechnics in Katsina State, Nigeria.

Methods

A survey research design was employed. This design involves the structured collection of data using a questionnaire from a sizable population. The population for this study comprised 222 OTM graduates from polytechnics in Katsina State, Nigeria, from the 2020/2021, 2021/2022, and 2022/2023 academic sessions. A simple random sampling technique was employed to select a representative sample of 150 OTM graduates, ensuring every graduate had an equal chance of being selected. The data collection instrument was an 18-item structured questionnaire titled "Impact of Entrepreneurship Education on Promoting Innovation (IEEPI)," developed by the researcher. It was validated by three experts from the Department of Vocational Education, Faculty of Education, Abubakar Tafawa Balewa University, Bauchi. To determine reliability, the

instrument was administered to 10 OTM graduates from polytechnics in Kano State for the 2022/2023 session, which was not part of the main study. Their responses were analyzed using the Cronbach alpha method, which yielded a coefficient alpha value of 0.85. The researcher, with the help of two trained research assistants, administered the instrument to respondents. The questionnaires were retrieved as soon as they were completed. A total of 134 out of 150 graduates responded. The collected data were analyzed using mean and standard deviation statistics to answer the research questions, and simple linear regression was used to test the hypotheses. The questionnaire items were based on a four-point rating scale: Strongly Agree (SA) = 4 points, Agree (A) = 3 points, Disagree (D) = 2 points, and Strongly Disagree (SD) = 1 point. The cut-off mean point was 2.50; a mean of 2.50 and above was considered "Agree," while a mean below 2.49 was regarded as "Disagree." For the hypothesis tests, a p-value less than or equal to 0.05 ($p \leq 0.05$) led to the rejection of the null hypothesis, while a p-value greater than 0.05 ($p > 0.05$) resulted in its retention. All hypotheses were tested at a 0.05 significance level.

Results

Research Question One: What is the impact of entrepreneurship education on product innovation among office technology and management graduates of polytechnics in Katsina State, Nigeria?

The responses were analyzed using mean and standard deviation, as shown in Table 1.

Table 1: Mean and Standard Deviation of Responses on the Impact of Entrepreneurship Education on Product Innovation (n = 134)

S/N	Item (n = 134)	Mean	S. D	Remark
1	Entrepreneurship education has improved my ability to generate innovative product ideas.	3.80	1.95	Agree
2	I can now access market needs and develop new product solutions effectively.	3.75	1.94	Agree
3	I apply creative thinking in product design based on my entrepreneurship education.	3.91	1.98	Agree
4	I have gained skills to develop prototypes and test product ideas before launching.	3.95	1.99	Agree
5	I use market research and customer feedback to refine product development.	3.53	1.88	Agree
6	I understand business models that support new product development.	3.58	1.89	Agree
7	My ability to set pricing strategies for innovative products has improved.	3.16	1.78	Agree
8	I am aware of intellectual property rights and how to protect my product innovations.	3.09	1.76	Agree
9	I can successfully scale up production while maintaining product quality.	3.08	1.75	Agree
10	Entrepreneurship education has encouraged me to take calculated risks in product innovation.	3.16	1.77	Agree
	Grand Mean	**3.50**	**1.87**	**Agree**

Table 1 shows that entrepreneurship education positively impacts product innovation, with mean scores ranging from 3.08 to 3.95. Respondents reported strong abilities in creative thinking and prototype development but lower confidence in risk-taking and intellectual property rights. The grand mean of 3.50 and standard deviation valued at 1.87 agreeing that entrepreneurship education have a positive impact on product innovation.

Research Question Two: What is the impact of entrepreneurship education on process innovation among office technology and management graduates of polytechnics in Katsina State, Nigeria?

The responses were analyzed using mean and standard deviation, as shown in Table 2.

Table 2: Mean and Standard Deviation of Responses on the Impact of Entrepreneurship Education on Process Innovation (n = 134)

S/N	Item (n = 134)	Mean	S. D	Remark
11	I can identify opportunities to improve existing business processes.	3.84	1.96	Agree
12	I have developed new process solutions that enhance efficiency.	3.88	1.97	Agree
13	I use digital tools and technology to optimize business processes.	3.98	1.99	Agree
14	I apply creativity in designing and improving processes.	3.74	1.93	Agree
15	I can effectively communicate process innovations to my team or stakeholders.	3.73	1,93	Agree
16	Entrepreneurship education has helped me lead process innovation initiatives.	3.13	1.77	Agree
17	I regularly assess the impact of process innovations to ensure sustainability.	3.00	1.73	Agree
18	I understand how to evaluate risks before implementing process innovations.	3.18	1.79	Agree
	Grand Mean	**3.56**	**1.89**	**Agree**

Table 2 reveals a strong impact of entrepreneurship education on process innovation. Mean scores range from 3.00 to 3.98. Graduates expressed high confidence in using technology and evaluating risks but showed less confidence in leading innovation initiatives. The grand mean of 3.56 and standard deviation valued at 1.89 agreeing that entrepreneurship education have a positive impact on process innovation.

Test of Research Hypotheses

The null hypotheses were tested at 0.05 level of significance. The summary of the test of research hypotheses are presented in Tables 3 and 4 as follows:

$H0_1$: Entrepreneurship education has no significant impact on product innovation among office technology and management graduates of polytechnics in Katsina state, Nigeria.

The test of this null hypothesis can be seen as summarise in table 3 below:

Table 3a: ANOVA Results of Impact of Entrepreneurship Education on Product Innovation among Office Technology and Management Graduates of Polytechnics

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	11.527	1	11.527	91.794	.000[b]
	Residual	16.576	132	.126		
	Total	28.103	133			

a. Dependent Variable: Entrepreneurship Education
b. Predictors: (Constant), Product Innovation

Table 3a presents the ANOVA result on the impact of entrepreneurship education on product innovation among Office Technology and Management graduates of polytechnics in Katsina State. The model is statistically significant, with an $F(1, 132) = 91.794$, $p < 0.05$. This implies that the regression model significantly predicts the dependent variable (entrepreneurship education) from the independent variable (product innovation). The low significance value ($p = .000$) suggests that the relationship between the variables is not due to random chance, indicating a strong effect of product innovation on entrepreneurship education.

Table 3b: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.640[a]	.410	.406	.35437

a. Predictors: (Constant), Product Innovation

The model summary in Table 3b reveals that the R value of .640 indicates a strong positive correlation between product innovation and entrepreneurship education. The R Square value of .410 shows that product innovation accounts for 41% of the variation in entrepreneurship education. The Adjusted R Square of .406 further confirms that the model remains strong after adjusting for the number of predictors. The standard error of the estimate (.35437) indicates a moderate level of accuracy in the model's predictions.

Table 3c: Coefficients of Beta

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.752	.197		8.899	.000
	Product Innovation	.531	.055	.640	9.581	.000

a. Dependent Variable: Entrepreneurship Education

As shown in Table 3c, the unstandardized coefficient (B) for product innovation is .531, indicating that a unit increase in product innovation results in a predicted increase of .531 units in entrepreneurship education. The standardized beta coefficient of .640 suggests a strong and positive influence of product innovation on entrepreneurship education. Additionally, the t-value of 9.581 is statistically significant ($p < 0.05$), further supporting the conclusion that product innovation significantly contributes to the level of entrepreneurship education among the graduates. Therefore, the hypothesis that states that the entrepreneurship education has no significant impact on product innovation among office technology and management graduates of polytechnics in Katsina state, Nigeria is thereby rejected.

$\mathbf{H0_2}$: Entrepreneurship education has no significant impact on process innovation among office technology and management graduates of polytechnics in Katsina state, Nigeria.

Table 4a: ANOVA Results of Impact of Entrepreneurship Education on Process Innovation among Office Technology and Management Graduates of Polytechnics

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.801	1	17.801	228.091	.000[b]
	Residual	10.302	132	.078		
	Total	28.103	133			

a. Dependent Variable: Entrepreneurship Education

b. Predictors: (Constant), Process Innovation

Table 4a displays the ANOVA result for the impact of entrepreneurship education on process innovation. The model is highly significant, with $F(1, 132) = 228.091$, $p < 0.05$. This very high F-value indicates that the independent variable (process innovation) provides a strong explanation for variations in the dependent variable (entrepreneurship education). The significance level of .000 confirms that the model's prediction is statistically reliable and not due to random variation.

Table 4b: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.796[a]	.633	.631	.27936

a. Predictors: (Constant), Process Innovation

The model summary in Table 4b shows an R value of .796, reflecting a very strong positive correlation between process innovation and entrepreneurship education. The R Square value of .633 indicates that 63.3% of the variance in entrepreneurship education can be explained by process innovation. The Adjusted R Square of .631 confirms the stability of the model after accounting for degrees of freedom. The standard error of the estimate (.27936) is relatively low, suggesting that the model's predictions are highly accurate and reliable.

Table 4c: Coefficients of Beta

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.120	.233		.515	.608
	Process Innovation	.904	.060	.796	15.103	.000

a. Dependent Variable: Entrepreneurship Education

Table 4c presents the coefficients of the regression analysis. The unstandardized coefficient (B) for process innovation is .904, indicating that each unit increase in process innovation results in a predicted increase of .904 units in entrepreneurship education. The standardized beta coefficient of .796 reveals a very strong positive influence of process innovation on entrepreneurship education. The t-value of 15.103 is statistically significant ($p < 0.05$), confirming that process innovation is a significant predictor of entrepreneurship education among Office Technology and Management graduates. Hence, the hypothesis that states that the entrepreneurship education has no significant impact on process innovation among office technology and management graduates of polytechnics in Katsina state, Nigeria is thereby rejected.

Discussion of Findings

The primary aim of this study was to evaluate the impact of entrepreneurship education on product and process innovation among Office Technology and Management graduates in Katsina State. The empirical data and robust statistical analyses provide critical insights into how educational interventions shape graduates' innovative behaviors and outcomes. The study identified a moderate to high impact of entrepreneurship education on product innovation, supported by a grand mean of 3.51 and strong statistical significance ($F(1,132) = 91.794$, $p < 0.05$, $R^2 = 0.410$). This finding implies that students who received entrepreneurship education were more likely to introduce new or improved products. These results align with Madugu et al. (2023), who found that entrepreneurship education plays a critical role in fostering innovation and creativity. They are further reinforced by Aigbepue and Akenbor (2022), who highlighted the necessity of curricula emphasizing innovation-driven competencies, and Adeoti et al. (2019), who noted that enhanced entrepreneurship education correlates with an improved ability to create and launch innovative products. The convergence of these findings across diverse studies underscores the reliability of the positive linkage between entrepreneurship education and product innovation.

The study also reports a high influence of entrepreneurship education on process innovation, with a grand mean of 3.87 and highly significant results ($F(1,132) = 228.091$, $p < 0.05$, $R^2 = 0.633$). These results indicate that graduates are substantially better at implementing new methods and optimizing workflows. This finding builds on prior work by Ademuliyi (2022) and Modibbo et al., (2024), who recognized the value of such education in developing process-related innovative skills. Tono (2023) complements this by asserting that entrepreneurship education provides the flexibility and creative thinking essential for continuous process improvement. Collectively, this study and the referenced literature indicate that a solid foundation in entrepreneurship education encourages students to think innovatively about both products and processes, which is imperative for organizational growth and competitiveness.

Conclusion

This study unequivocally establishes entrepreneurship education as a critical driver of both product and process innovation among Office Technology and Management graduates in Katsina State. Its integration into the polytechnic curriculum is indispensable for cultivating graduates equipped with the practical and creative skills necessary to excel in today's dynamic work environment. The findings confirm its significant positive impact, highlighting its role as a vital tool for fostering innovation.

Recommendations

In line with the findings of the study, the following recommendations are made:

1. Polytechnic administrators and curriculum planners should deepen and expand the integration of practical, hands-on entrepreneurship modules focused on product development, ensuring that students acquire the skills and experience necessary to conceptualize and launch new or improved products.
2. Training programs should include structured activities and case studies that encourage students to analyze, redesign, and optimize business processes, thereby fostering a culture of continuous improvement and operational efficiency within the educational framework.

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