Innovations

Exploring the Nexus between Entrepreneurial Orientation, Technology and Performance of Manufacturing Firms in Nigeria

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Abstract: *This study focused on the nexus between entrepreneurial orientation, technology and performance of manufacturing firms. The study determined the extent to which entrepreneurial proactiveness influences sales volume, and ascertained the extent to which entrepreneurial risk-taking affects market shares. The study used a survey research design. This study covered manufacturing firms in South-East region of Nigeria.The object of interest (respondents) were from 13 selected manufacturing firms in South East Nigeria. The sample size was 369 respondents. We choose the samples in stages via multi-stage sampling technique. The study employed construct validity. Internal consistency of instrument was measured by calculating a statistic known as Cronbach's coefficient alpha. Descriptive statistics was employed to analyze data. The study employed a Structural Equation Model (SEM) path modeling approach. The study also employed regression analysis for the test of hypotheses through the use of E-view software.Findings revealed that innovativeness has a significant positive effect on profitability, and that proactiveness has a significant positive effect on sales volume of manufacturing firms.The study concluded that innovativeness, proactivity, risk-taking, autonomy, and competitive aggressiveness are all characteristics of entrepreneurial manufacturing enterprises, and they are all connected to performance results. The study recommended that firms should prioritise and actively foster a culture of innovation within their organizations, and incorporate proactiveness into their strategic planning and operational culture.*

Keywords: Entrepreneurial Innovativeness, Entrepreneurial Proactiveness, Entrepreneurial Risk-Taking, Entrepreneurial Autonomy, Competitive Aggressiveness

Introduction

Globally, technological advancements, and changing market dynamics influence the volatile business environment that organisations face. This has led to increased competition and challenges for firms, prompting the need for entrepreneurial orientation to identify internal strengths and leverage them effectively (Isichei et al., 2020; Joshi et al., 2019; Rigtering & Behrens, 2021). Despite these challenges, opportunities exist for firms that innovate and adapt to market changes. Entrepreneurial orientation helps organisations navigate market shifts, optimise performance, and seize opportunities in their environment (Wales et al., 2019; Masa'deh et al., 2018). Firms can improve performance and gain a competitive edge through entrepreneurial orientation by evaluating strategies (Martins & Perez, 2020; Wales et al., 2020).

Entrepreneurial orientation involves decision-making activities that enhance product or service value to meet customer needs and drive firm performance. It is crucial for firms to continually assess their entrepreneurial orientation as it influences decisions, resources, investments, and innovation capabilities (Masa'deh et al., 2018). A strong entrepreneurial orientation can enhance problem-solving, create new opportunities, and improve organisational performance through resource gathering, innovation, and customer engagement (Martins & Perez, 2020; Wales et al., 2020).

Entrepreneurial orientation is a strategic focus on maximising a firm's entrepreneurial aspects, driving productivity and growth, and benefiting the economy (Ambad & Wahab, 2016; Wales et al., 2019). This orientation helps firms adapt to market challenges, innovate, take risks, and outperform competitors by enhancing performance (Lumpkin, 1996; Ambad & Wahab, 2016). The multidimensional approach to entrepreneurial orientation, focusing on innovativeness, proactiveness, risk-taking, autonomy, and competitive aggressiveness, is essential for assessing firm performance in complex industries like Nigerian manufacturing (Umrani & Mahmood, 2015; Bakar & Mahmood, 2014). Performance is measured subjectively through a composite index of manufacturing firms' performance, considering financial and non-financial dimensions (Darwish & Singh, 2013; Rezaei & Urtt, 2018).

Entrepreneurial orientation plays a significant role in improving firm performance, although external factors and market conditions can also effect performance outcomes (Schrage et al., 2017; Ambad & Wahab, 2016). By innovating, adapting, and responding to market demands, firms can enhance their competitive position and achieve sustainable growth (Sambo, 2016; Rezaei & Urtt, 2018). In the Nigerian manufacturing sector, the adoption of entrepreneurial orientation can drive performance improvements in the Nigerian manufacturing

sector, but factors like advanced manufacturing technology (AMT) also play a crucial role in enhancing value and fostering successful implementation of entrepreneurial strategies (Roberto et al., 2022). AMT, characterised by highly automated and computerised production systems, offers modern approaches to manufacturing that can give firms a competitive edge in the global market (Altuntas et al., 2018; Chan et al., 2015).

Objectives of the Study

The study's broad objective is to ascertain the moderating influence of advanced manufacturing technology on entrepreneurial orientation and manufacturing firms' performance. However, the specific objectives are to:

i. Ascertain the extent to which entrepreneurial innovativeness affects profitability.
ii. Determine the extent to which entrepreneurial proactiveness influences sales volume.
iii. Ascertain the extent to which entrepreneurial risk-taking affects market shares.
iv. Evaluate the effect of entrepreneurial autonomy on resource utilisation.
v. Determine the effect of entrepreneurial competitive aggressiveness on the operating cash flow.
vi. Determine how technology modifies the effect of entrepreneurial orientation on performance.

Review of Related Literature

Conceptual Review

Entrepreneurial orientation (EO) is one of the most frequently discussed topics in entrepreneurship. Entrepreneurship serves as the foundation for entrepreneurial orientation (Schrage, 2017). It is the organization's only method for implementing the fundamentals of entrepreneurship activities across all organizational divisions. According to Moige, Mukulu, and Orwa (2016), entrepreneurial orientation is the process by which a corporation generates, develops, and employs innovative ideas and behaviors. It is also referred to as organizational entrepreneurship or entrepreneurship activity.

Entrepreneurial orientation (Covin et al., 2020) refers to the degree to which a company's managers and employees are inclined toward entrepreneurial practices. As stated by Lumpkin and Dess (1996), EO encompasses "the methods, practices, and decision-making styles managers use to act entrepreneurially." EO

emanated from the studies of Covin and Slevin (1989), who distinguished between EO at the individual and organisational levels and indicated that when managers take tangible steps to define and formulate policies, goals, objectives, competitive plans, and organisational strategies that are in line with entrepreneurial approaches and strategies, then there is individual-level EO. Covin et al (2020) unveils that individual-level EO involves employees of an organization actively engaging in entrepreneurial activities by demonstrating innovation, proactivity, and a consistent willingness to take risks.This definition implies that managers and employees who exhibit these behaviours are more likely to become successful entrepreneurial employees than those who do not.

Schrage (2017) viewed entrepreneurial orientation as the culmination of a company's efforts in innovation, rejuvenation, and venturing. Covin and Slevin (1989) identified innovation, risk-taking, and proactiveness as the three main traits of entrepreneurial organizations. Entrepreneurial orientation was described by Martins and Perez (2020) as "the advancement of new thoughts and openings or built-up organisations, directly prompting the enhancement of authoritative productivity and an upgrade of a focused position or the vital recharging of a current business."

Similarly, Sumo (2010) defined entrepreneurial orientation as the means through which organised individuals in the form of groups or teams within an organisation develop and implement new ideas for the management of another business that is different from the main firm to gain leverage from its assets, position, and other available capabilities. Lumpkin and Dess (1996), on the other hand, highlighted five characteristics of entrepreneurial orientation: initiative, ingenuity, risk-taking, competitive aggression, and managerial support.

Various approaches have dimensionalized or operationalized the idea of entrepreneurial orientation. However, research to date has indicated that the most frequently cited elements of entrepreneurial orientation are innovation, risk-taking, proactiveness, autonomy, and competitive aggressiveness (Lunipkin & Dess, 1996; Covin & Miller, 2013). Kozubilcová et al. (2017) opined that your company's capacity to create and market goods and services from concept to completion affects innovation. Most studies now describe the core and results of entrepreneurial behavior in terms of innovativeness (Lumpkin & Dess, 1996; Covin & Miller, 2013). One of the main drivers of productivity increases is innovation. It is a way of doing and method that derives from an organization's essential principles and values (Zemplinerová & Hromádková, 2012). As a result, businesses need to learn how to place greater emphasis on innovative processes rather than just creative individuals (Koulopoulos, 2009). Organisations must develop the ability to continuously innovate to meet changing client wants and

preferences, take advantage of technical advancements, and adapt to shifting market structures.

Performance of Manufacturing Firms

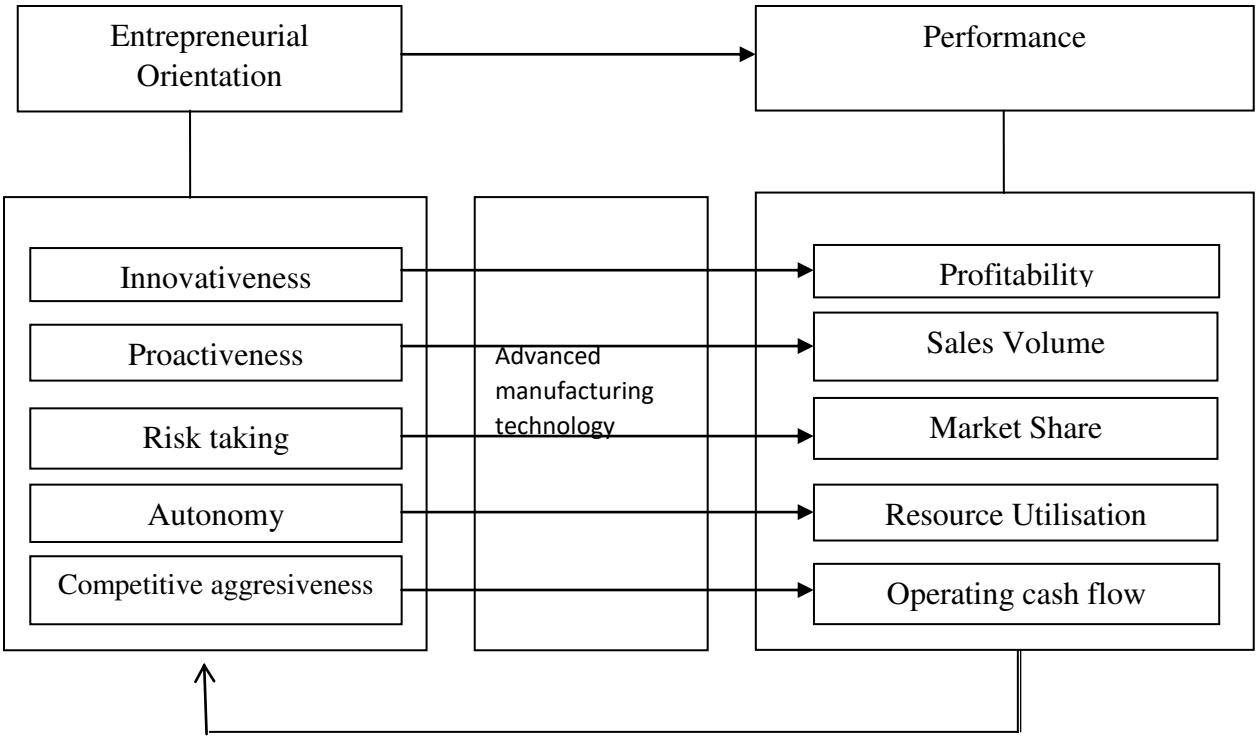
Performance as a concept has engrossed diverse research and arguments (Darwish & Singh, 2013; Guest, 2011). According to Cascio (2015), performance is defined as the achievement of the expected goals and objectives over a period of time. Al-Tit (2017) asserted that performance refers to the comprehensive expected result that gauges the organization's achievement of the anticipated goal over a given period. Several factors influence performance in the manufacturing sector. According to Al-Tit (2017), some of the factors include enterprise risk management, organizational structure, type of leader, innovation, and management practices. This explains the definition. This increasing factor makes it almost impossible to agree on the best way to measure performance, and this has been a course of research for a while in the behavioural and social sciences literature.

However, it is stated that measuring industry-based performance is quite different from firm-based performance. They stated that industry performance measurement incorporates the entirety of both internal and external factors from a collective or collaborative perspective of the entire industry. Overall industry performance has been linked to most economic development and has contributed to the growth of nations (Tseng et al., 2016). This makes it critical that, in measuring performance, there be a systemic approach to understanding the underlying criteria that control the industry. Enterprises often measure their performance using specific measurements, focusing on both financial and non-financial dimensions. Novak (2017) notes that the fields of business and finance are exploring new dimensions of performance. These ideas include the market value added both for the individual company and the industry, the balanced scorecard that includes the financial perspective, the perception conveyed by customers, and internal processes. For this purpose, profitability, sales volume, market shares, resource utilisation, and cash flow were considered.

There are varying perspectives on what is profitable to an organisation, most especially when the sector differs considerably. However, scholars have agreed that profit can be defined as an increase in an organization's initial investment in a financial year (Akinlo & Asaolu, 2012). In measuring profit, some studies have adopted an objective approach and some have adopted a subjective approach (Abata & Migiro, 2016). The objective approach uses metrics like return on assets, return on investment, return on equity, and Tobin's Q to quantify profit (Agiomirgianakis et al., 2013). The subjective measure of profit details the managers' perception of the overall index of the organisation over a period. This

measure is adopted in the absence of data from the organisation to measure the organisation's profit. There has been debate over which measure is most suitable; however, scholars have opined that whichever measure a researcher can find would advance scholarship on the study (Akinlo & Asaolu, 2012).

Figure 1: Conceptual model of moderating effect of AMT on EO and Performance Model



Source: Author's Design 2024.

Innovation and profitability

Both practice and theory widely recognise innovation as a critical driver of business performance. Researchers analyse various financial metrics to assess the effect of innovation on firms's performance (Wen et al., 2022). Tuan et al. (2016) examined the effects of innovation on financial performance and found that organisational, marketing, and process improvements have a favourable effect on financial performance. Directors and CEOs of firms strategically employ innovation as a means of ensuring a steady inflow of financial performance. Using innovation improves the relationship between a firm's performance and a newly released product.

Scholars also investigate the relationship between inputs to innovation, such as R&D spending, investment in technology, and human capital, and the resulting outputs in terms of financial performance (Chen & Wu, 2020; Hai et al., 2022; Wen et al., 2022). They investigate whether higher levels of investment in innovation lead to better financial results and whether certain types of innovation yield greater financial benefits than others. While some studies focus on immediate financial gains from innovation, others examine its enduring effect on firm value and sustainability over extended periods. This study explored specific aspects of financial performance (profitability) as they relate to the innovations of manufacturing firms.

Proactiveness and sales volume

Proactiveness, as defined by Kozubilcová et al. (2017), refers to a company's ability to outperform rivals while introducing new goods, services, or innovations to the market. Researchers have extensively studied proactive behaviour in the workplace across various industries and regions, consistently finding positive correlations between proactive behaviour and organisational performance metrics. Parker et al. (2006) conducted a study within the U.K. wire-making industry, validating self-reported proactive work behaviours against graded assessments, and their findings indicate that employees who exhibit proactive tendencies tend to contribute more effectively to their organizations. Jaman (2016) further supports this notion by discovering that proactive employee behaviour enhances organisational effectiveness. This indicates that employees who take initiative and demonstrate proactive behaviours are more likely to positively affect their organisation's overall performance, including sales volume. In a similar vein, Sylvia and Kalsom (2013) demonstrated the substantial effect of proactive behaviour on a firm's performance. Their study underscores the importance of proactive behaviours in driving organisational success, indicateing that firms with proactive employees may experience higher levels of performance.

Bromiley (2017) constructed a causal model indicating that proactive behaviour tends to enhance improved performance. This implies that even in situations where performance may be lacking, proactive individuals have the potential to drive improvement and foster positive outcomes. Moreover, Gibb and Haar (2010) found that a stronger proactive profile correlates with improved financial performance. This indicates that firms with a proactive workforce may experience higher levels of profitability and success. Similarly, Wang and Yen (2012) highlighted the significant positive effect of proactiveness on SME business performance. Their findings emphasise the importance of proactive behaviours in driving success. Additionally, Bruno (2015) revealed proactiveness as a crucial determinant of corporations' performance. This highlights the

significance of proactive behaviour not only in private enterprises but also in government-owned rganizations. However, the literature consistently indicates that proactiveness positively influences various aspects of organisational performance, including sales volume. Employees who demonstrate proactive behaviours are more likely to contribute to increased sales volume, thereby driving organisational success.

Risk-taking and Market Share

In the literature on entrepreneurship, many academics have sought to define risk-taking (Danso et al., 2016). According to Kozubilcová et al. (2017), taking risks entails making decisions and acting on them without considering the resources that are now under one's control or being aware of potential outcomes. Scholars believe that a key personal trait that fosters entrepreneurial orientation is the ability to take modest and calculated risks (Turro, 2016; Kuratko et al., 2014). Risk propensity is defined as an entrepreneur's overall inclination to behave somewhat riskily, as well as how they assess the risk-return tradeoff (Jagotra, 2018).

Taking risks plays a crucial role in shaping market shares and influencing the trajectory of firms in a highly competitive environment. Numerous studies have explored this relationship, providing insights into how firms navigate uncertainties and seize opportunities (Coenen et al., 2018; Haarhaus & Liening, 2020). McDowell (2017) examined entrepreneurship as a form of cultural innovation for long-term competitive advantage, shedding light on risk propensity. While risk-taking is intrinsic to entrepreneurial ventures, McDowell's qualitative research indicated that its effects on performance may not always be significant. This implies that although risk-taking is a fundamental aspect of entrepreneurship, its effects can vary, potentially influencing market shares in unpredictable ways.

Sylvia and Kalsom (2013) focused on the influence of entrepreneurial orientation, including risk-taking, on large firms. The study demonstrated a notable effect of risk-taking on a firm's performance. This implies that firms willing to take calculated risks may gain a competitive advantage, potentially leading to an increase in market shares. Similarly, Bromiley (2017) developed a causal model to investigate the effects of risk-taking, among other factors, on past and future performance. Despite controlling for various variables, Bromiley's study indicated that risk-taking could worsen underperformance, emphasising the complex dynamics of risk management and performance outcomes. This implies that while risk-taking can result in growth and expansion, it also carries the risk of negative consequences that may adversely affect market shares. As a result,

manufacturing firms must carefully evaluate and manage risks to optimise their market shares in dynamic and competitive environments.

Autonomy and Resource Utilisation

Entrepreneurship in an organisation requires an autonomous spirit. Masadeh et al. (2018) define autonomy as the concept of free and independent action, as well as decisions made to bring forth and carry out an idea or vision. Entrepreneurs can combine and organise resources with a greater degree of freedom (Covin & Wales, 2011). Autonomy in the workplace reflects the level of independence and freedom given to employees to make decisions and take actions related to their work. Autonomy has a significant effect on firms' resource management and allocation. The study by Langfred and Moye (2004) emphasised the importance of autonomy in firm performance, revealing a positive correlation between autonomy and resource utilization. This indicates that granting individual employees' autonomy enables them to fully express themselves, leading to enhanced overall performance within firms. Autonomy can lead to improved resource utilisation by empowering employees to make decisions that are in the best interest of the organization. When employees have autonomy in their roles, they are more likely to take ownership of their tasks and responsibilities (Cai et al., 2018). This sense of ownership can result in employees being more proactive in identifying ways to optimise resource utilization. For example, an employee with autonomy may indicate more efficient ways to use existing resources or propose innovative solutions to reduce waste and improve productivity (Rosin et al., 2019).

Autonomy can enhance employee engagement and motivation, which may positively affect resource utilization. Employees are more likely to perform at their best when they feel trusted and empowered to make decisions (Mohapatra & Sundaray, 2018). This increased motivation has the tendency to translate into higher levels of productivity and efficiency in utilising resources. Sarinah et al. (2018) found that work autonomy increases commitment and engagement among employees, leading to efficient resource utilization. Engaged employees are also more likely to collaborate effectively, share ideas, and work together to optimise resource allocation within the manufacturing firm. Additionally, autonomy can foster a culture of innovation within the manufacturing firm, leading to more creative approaches to resource management. Giving employees the freedom to experiment and try new ideas increases their likelihood of coming up with innovative solutions to resource utilisation challenges. This culture of innovation may lead to the development of efficient processes, the implementation of cost-effective strategies, and the maximisation of resource utilisation across different departments and functions.

Competitive Aggressiveness and Operating Cash Flow

Competitive aggressiveness (CA) plays a crucial role in businesses' ability to compete effectively in dynamic markets, aiming to outperform rivals and gain market share (Bolton & Lane, 2012). CA is defined as engaging in sustained, diverse actions to challenge competitors and enhance market position (Hughes-Morgan et al., 2018). According to Majeed's (2011) research on Malaysian SMEs, competitive aggressiveness has a positive effect on performance, emphasizing the importance of establishing a competitive advantage for overall success. Aigboje (2018) examined how competitive aggressiveness influences hotel profitability in Port Harcourt, finding a significant effect on financial performance. Lechner and Gudmundsson (2014) studied the relationship between small business performance, firm strategy, and entrepreneurial orientation in Icelandic businesses, revealing that competitive aggressiveness mediates performance through strategic choices.

DeepaBabu and Manalel (2016) explored competitive aggression within entrepreneurial orientation and its association with performance in manufacturing companies, advocating for market leadership efforts. Al-Swidi and Al-Hosam (2012) investigated competitive aggressiveness in Yemeni banks, highlighting its significant effect on organisational performance and the need for employee-driven performance improvements. Kozubiková et al. (2017) studied competitiveness and aggression in the Czech Republic, revealing a strong influence on small businesses' entrepreneurial motivations. Musa et al. (2014) focused on the relationship between entrepreneurial orientation, business success, and competitive aggressiveness in Malaysian cooperative enterprises, emphasising the substantial effect of competitive aggression on business outcomes.

Relationship between Advanced Manufacturing Technology, Entrepreneurial Orientation and Performance

The adoption of advanced manufacturing technologies (AMT) is becoming increasingly prevalent among firms worldwide to address market fragmentation, shorter product life cycles, and growing consumer demand for customisation (Zammuto & O'Connor, 2018). In Nigeria, the evolution of manufacturing technology is evident as automation, additive manufacturing, and sustainable practices gain traction (Ordoobadi & Mulvaney, 2019). AMT encompasses computer-based systems that enhance manufacturing operations and competitiveness, utilising computer-aided technologies to optimise production processes (Small & Yasin, 2016; Sun, 2000).

In terms of innovation, Shamsudee et al. (2022) investigated the impact of technical orientation on the relationship between entrepreneurial orientations and SME performance. The study proposed a conceptual model emphasising the role of technological orientation in mediating the linkages among entrepreneurial orientation, learning orientation, and SME innovation performance. Findings indicate that technological orientation may moderate the effects of entrepreneurial and learning orientations on SME innovation performance, offering insights for future research directions. While the study focuses on AMT in manufacturing enterprises, it qualitatively examines SME performance. Onwe et al. (2020) investigated the connection between entrepreneurial orientation and small business performance in Nigeria, specifically examining the moderating effect of environmental hostility on this relationship. The study, conducted in southeast Nigeria, revealed that while there was no direct correlation between entrepreneurial orientation and firm performance, environmental hostility positively moderated this association, indicating that challenging environments prompt businesses to adopt entrepreneurial strategies for improved performance. Krisada and Kittisak (2019) assessed the impact of entrepreneurial orientation and total quality management on organisational performance in pharmaceutical SMEs in Thailand, with organisational learning serving as a moderator. Using a quantitative approach, the study found that organisational learning significantly influenced the relationship between total quality management and performance, although it did not moderate the link between entrepreneurial orientation and performance. Mohd et al. (2017) developed a model illustrating the moderating effect of financial availability on the relationships between entrepreneurial orientation, market orientation, learning orientation, and SME performance. Their research highlighted the importance of financial access in influencing the impact of entrepreneurial, market, and learning orientations on company performance, shedding light on strategic management and entrepreneurship dynamics.

Methodology

Research Design

The research design that underpins the study is a survey research design. This will include the use of a standardized research instrument for gathering information and collecting data. The researcher will be able to analyze ‘‘cause and effect’’ sequel to the data that will be collected and analysed. Using this design, respondents will be given opportunity to air their views on the variables under examination.

Area of the Study

This study covers manufacturing firms in South-East region of Nigeria, specifically in parts of Enugu State, Abia State, Imo State, Anambra State and Ebonyi state.

Population of the Study

The object of interest(respondents)are from 13 selected manufacturing firms in South East Nigeria. The accessible populations were 4,723 employees of the selected manufacturing firms.

The study selected firms that have operated up to 10 years. The basis for this is to be able to gather data from manufacturing firms that are operational. The period of operations will be justified on the need to select firms that have stabilized, as most firms take the first 1-10 years to stabilize and gain economies of scale that will help determine the direction of the firms.

Sample Size and Sampling Technique

The sample is 369 respondentsfrom the selected manufacturing firms.Using Taro Yamene's formula, we calculated the sample size. The samples were chosen in stages via multi-stage sampling technique.The researcher divided the respondents into groups based on their activities in the first stage. The researcher classified the respondents in the second stage based on common features at the time of the study. The survey was carried out in the third stage, which comprised choosing samples based on cadre, specialization, department and understanding of the subject matter among others.

Description of Research Instruments

The research instrument for the study was questionnaire. The five dimensions of entrepreneurial orientation were measured using a construct adapted from prior studies (Hughes & Morgan 2007; Hornsby et al., 2002). The instrument is designed using a five-point Likert scale ranging from strongly agree (1), agree (2), undecided (3), disagree (4) and strongly disagree (5). The choice of the instruments is because of their high-reliability index of 0.812.

Performance was measured subjectively using the instrument designed by Gupta and Govindarajan, (1984). The questionnaire is a 5 - point Likert-type scale ranging from strongly agree (1), agree (2), undecided (3), disagree (4) and strongly disagree (5). The respondents were required to provide their perception on the extent the manufacturing firms are satisfied with their average performance for the last 3 years. This is to reduce the decision variation as indicated by (Al-tit, 2017; Gupta and Govindarajan, 1984). The choice of these instruments is because of the high-reliability index of 0.94 and the application of the instrument in other sectors and country.

Validity of the Research Instrument

The study employed construct validity. Factor analysis was used for the analysis. The choice of Factor analysis is because it addresses the issue of analyzing the interrelationships among a large number of items and then explaining these items in terms of their common underlying dimensions (factors). Factor loadings were used to present these relations. Factor loadings greater than 0.30 was considered significant; loadings of 0.40 are considered more important; if the loadings are 0.70 or greater, they are considered significant (Creswell, 2003). Table 1 shows the results of the factor loadings of the items for each construct.

Table 1 Validation of Instrument

S/N	Question Items	CR	Factor Loading	S.E
	Risk Taking	.704		
1	RSK1		.972	.126
2	RSK2		.962	.127
3	RSK3		1.05	.135
4	RSK4		1.000	
	Innovativeness	.712		
1	INS1		.898	.124
2	INS2		1.075	.140
3	INS3		1.335	.170
4	INS4		1.000	
	Pro-activeness	.893		
1	PTS1		1.100	
2	PTS2		1.057	.067
3	PTS3		1.209	.073
4	PTS4		1.202	.070
5	PTS5		1.000	
	Competitive aggressiveness	.799		
1	CAS1		.904	.055
2	CAS2		.429	.072
3	CAS3		.748	.058
4	CAS4		.977	.057
5	CAS5		1.000	
	Autonomy	.938		
1	AUT1		.963	.026
2	AUT2		.748	.037
3	AUT3		.868	.036
4	AUT4		.983	.023

5	AUT5		.692	.041
6	AUT6		1.000	
	Advanced Manufacturing Technology	.948		
1	AMT1		1.000	
2	AMT2		1.027	.057
3	AMT3		1.091	.051
4	AMT4		1.216	.048
5	AMT5		1.047	.064
6	AMT6		1.252	.048
	Profitability	.848		
1	PRF1		.981	.063
2	PRF2		.970	.067
3	PRF3		1.000	
	Sales Volume	.818		
1	SVE1		.851	.064
2	SVE2		.943	.067
3	SVE3			
	Market Shares	.819		
1	MKS1		.814	.057
2	MKS2		.597	.054
3	MKS3		1.000	
	Resource Utilization	.890		
1	RSU1		1.234	.073
2	RSU2		1.341	.079
3	RSU3		1.000	
	Operating Cash Flow	.920		
1	OCF1		.936	.042
2	OCF2		.988	.035
3	OCF3		1.000	

Source: AMOS SPSS Version 25

Reliability of the Research Instrument

The study adopted internal consistency reliability in assessing the reliability of the questionnaire. The choice of internal consistency is because it helps to provide an indicator of how well the different items measure the same variable. Internal consistency is measured by calculating a statistic known as Cronbach's coefficient alpha. Coefficient alpha was used to assess the internal consistency due to the aggregation of items into a unified scale.Generally, reliability coefficients of 0.70 or more are considered high (Creswell, 2003), therefore, in this study items with Cronbach alpha coefficients of 0.70 and above were considered suitable for the scale.

Table 2 Reliability Statistics of Entrepreneurial Orientation

S/N	Constructs	Cronbach's Alpha	N of Items
1	Risk Taking	.704	4
2	Innovativeness	.712	4
3	Pro-activeness	.893	5
4	Competitive aggressiveness	.799	5
5	Autonomy	.938	6
6	Advanced Manufacturing	.948	6

Source: SPSS Version 25

The table 2 shows the Cronbach's Alpha of constructs. The Cronbach's Alpha of 0.704 for the risk- taking construct indicates a moderate level of internal consistency reliability. The four items measuring risk-taking behaviors within this construct are reasonably correlated with each other, indicateing that they are tapping into a similar aspect of risk-related behaviors. The Cronbach's Alpha of 0.712 for innovativeness also indicates a moderate level of internal consistency reliability. The four items used to measure innovativeness seem to be coherent and consistent with each other in capturing innovative tendencies. With a Cronbach's Alpha of 0.893, the pro-activeness construct demonstrates a relatively high level of internal consistency reliability. The construct's five items, which assess proactive behaviors and attitudes, show strong inter-item correlations. The Cronbach's Alpha of 0.799 for competitive aggressiveness indicates a good level of internal consistency reliability. The five items that make up this construct, measuring competitive and assertive behaviors, appear to be closely related to each other. The Autonomy construct stands out with a high Cronbach's Alpha of 0.938. This indicates a strong level of internal consistency among the six items assessing autonomy-related behaviors, indicating that these items are effectively capturing the concept of autonomy. Finally, the technology implementation construct demonstrates the highest Cronbach's Alpha of the set, at 0.948. This indicates excellent internal consistency reliability among the six items assessing attitudes or practices related to advance manufacturing technology.

Table 3 Reliability Statistics of Performance of Manufacturing Firms

S/N	Constructs	Cronbach's Alpha	N of Items
1	Profitability	.848	3
2	Sales Volume	.818	3
3	Market Shares	.819	3
4	Resource Utilization	.890	3
5	Operating Cash Flow	.920	3

Source: SPSS Version 25

Table 3 shows the Cronbach's Alpha of 0.848 for profitability. This indicates a good level of internal consistency among the three items that assess profitability-related metrics. This indicates that the items are coherent and reliable in capturing different aspects of profitability. The Cronbach's Alpha value of 0.818 for sales volume indicates a reasonably strong level of internal consistency. The three items measuring sales volume-related information seem to be consistent with each other in capturing sales performance. Similarly, a Cronbach's Alpha of 0.819 for market shares indicates good internal consistency reliability. The three items assessing market share-related data appear to be consistently measuring the concept of market share. The Cronbach's Alpha value of 0.890 for resource utilization indicates a high level of internal consistency. The three items evaluating the utilization of resources are coherent and reliable in capturing how effectively resources are being used. Finally, the operating cash flow construct stands out with a Cronbach's Alpha of 0.920. This indicates excellent internal consistency reliability among the three items assessing cash flow-related information. These items appear to be highly reliable in capturing cash flow dynamics.

Data Analyses Techniques

In the quantitative analysis of the study, both descriptive and inferential statistics were utilized. Descriptive statistics such as mean and standard deviation was employed to analyze the responses obtained from the survey instrument. These measures provided an overview of the central tendency and variability of the data. Furthermore, the study employed a Structural Equation Model (SEM) path modeling approach to test the formulated hypotheses. The choice of this method is motivated by the nature of the research problem, which requires gathering data from a specific population to draw inferences and provide recommendations. SEM is suitable for this purpose as it aims to generate reliable and unbiased information, resulting in reliable and factual outcomes.

The selection of the structural equation model is driven by the need to confirm the hypothesized relationships between the constructs in the model. SEM allows for prediction and exploration, even with a limited study sample. This approach facilitates theory verification and is particularly adept at explaining complex models or relationships. By utilizing descriptive and inferential statistics, along with the SEM path modeling approach, the study aims to provide a comprehensive analysis that not only describes the data but also tests the relationships among variables and verifies theoretical constructs. This analytical procedure ensures both predictive and exploratory purposes, contributing to a better understanding of the research problem and facilitating evidence-based recommendations. The study also employed regression analysis for the test of hypotheses through the use of E-view software.

Data Analyses and Results

Out of the 369 copies of questionnaire administered, we observed that the percentage return rate is 99.19% (366) and this value is quite high. Thus, scientific investigation was based on the returned copies of questionnaire.

Table 4: Gender Distribution of Respondents

Category	Response	Frequency	Percent
Gender	Male	228	62.3
	Female	138	37.7
Age Distribution	20—30	112	30.6
	3l—40	148	40.4
	4l—50	57	15.6
	51 years and above	49	13.4
Marital Status	Single	126	34.4
	Married	212	57.9
	Divorced	17	4.6
	Separated	11	3.0
Managerial	Top	100	27.3
	Middle	192	52.5
	Lower	74	20.2

Source: Survey Data, 2024.

The table 4 shows that 228 respondents (62.3%) identified themselves as male; while 138 respondents (37.7%) identified as female. The result gives detailed perspective on how gender dynamics intersect with entrepreneurial orientation.

The results provided in table 4 shed light on the age distribution of the respondents who participated in the study. The table shows that 112 respondents, representing approximately 30.6%, fall within the age range of 20 to 30; the age range of 31 to 40 includes 148 respondents, making up around 40.4% of the total; about 57 respondents, accounting for approximately 15.6% of the total respondents, fall within the age range of 41 to 50; the respondents aged 51 years and above amount to 49 respondents, making up roughly 13.4% of the total participants. The age group (31 to 40) constitutes the largest proportion of the respondents and covers a critical period where respondents are likely to be in the early stages of their careers.

Table 4 shows that there were 100 respondents in the top managerial level, which represents approximately 27.3%; there were 192 respondents in the middle managerial level, making up about 52.5%; and there were 74 respondents in the lower managerial level, accounting for approximately 20.2%.

Figure 5
The Correlation between the Latent Variables (Structural Equation Model)

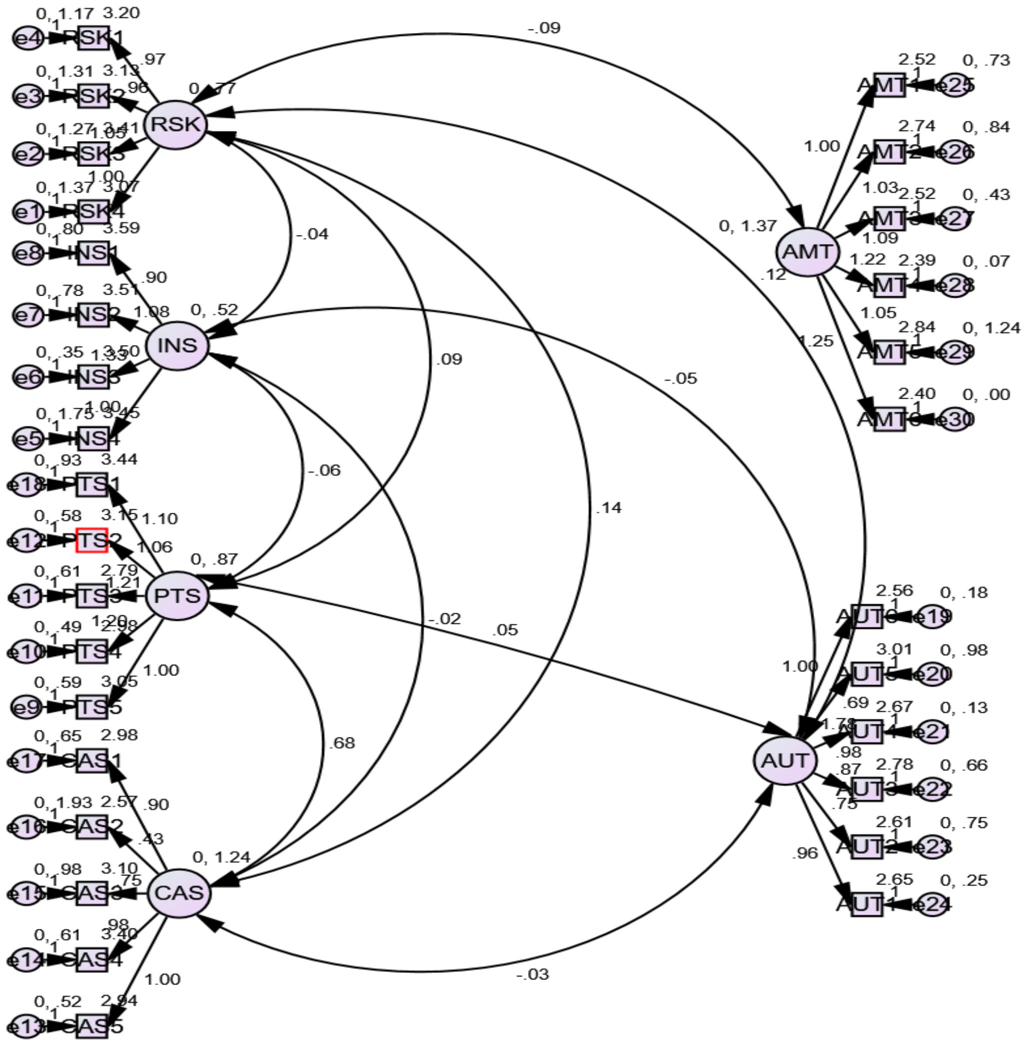


Figure 5 shows the correlations between the latent variables. This is clearly presented in table 5.

Table 5 Covariances of between the Latent Variables

Variables			Estimate	S.E.	C.R.	P
Risk Taking	<-->	Innovativeness	-.040	.044	-.910	.363
Risk Taking	<-->	Pro-Activeness	.090	.054	1.646	.100
Risk Taking	<-->	Competitive Aggressiveness	.139	.067	2.085	.037
Innovativeness	<-->	Pro-Activeness	-.056	.042	-1.337	.181
Innovativeness	<-->	Competitive Aggressiveness	-.022	.050	-.450	.653
Risk Taking	<-->	Autonomy	.122	.075	1.632	.103
Innovativeness	<-->	Autonomy	-.053	.057	-.938	.348

Pro-Activeness	<-->	Competitive Aggressiveness	.675	.079	8.510	***
Pro-Activeness	<-->	Autonomy	.046	.070	.660	.510
Competitive Aggressiveness	<-->	Autonomy	-.029	.085	-.339	.735
Advanced Manufacturing Technology	<-->	Risk Taking	-.092	.064	-1.437	.151

Source: Survey Data, 2024.

The table 5 shows the covariances between different latent variables. It is seen that there is no issue of autocorrelation given that the estimate values are less than 50%.The estimated covariance between "Risk Taking" and "Innovativeness" is -0.040, indicating a negative relationship between these two variables. The standard error for this estimate is 0.044, which reflects the precision of the estimate. This covariance is not statistically significant (p = 0.363), as the C.R. (Critical Ratio) of -0.910 is less than the threshold of 1.96. This indicates that the negative relationship is not strong enough to be considered meaningful. The estimated covariance between "Risk Taking" and "Pro-Activeness" is 0.090, indicating a positive relationship between these two variables. The standard error for this estimate is 0.054. Meanwhile, this covariance is not statistically significant (p = 0.100), as the C.R. of 1.646 is less than 1.96. This indicates that the positive relationship is not strong enough to be considered meaningful.

The estimated covariance between "Risk Taking" and "Competitive Aggressiveness" is 0.139, indicating a positive relationship between these two variables. The standard error for this estimate is 0.067. Importantly, this covariance is statistically significant (p = 0.037), as the C.R. of 2.085 exceeds the threshold of 1.96. This indicates a meaningful and positive relationship between these variables. The estimated covariance between "Innovativeness" and "Pro-Activeness" is -0.056, indicating a negative relationship between these two variables. The standard error for this estimate is 0.042. However, this covariance is not statistically significant (p = 0.181), as the C.R. of -1.337 is less than 1.96. This indicates that the negative relationship is not strong enough to be considered meaningful.

The estimated covariance between "Innovativeness" and "Competitive Aggressiveness" is -0.022, indicating a negative relationship between these two variables. The standard error for this estimate is 0.050. This covariance is not statistically significant (p = 0.653), as the C.R. of -0.450 is less than 1.96. This indicates that the negative relationship is not statistically meaningful. The estimated covariance between "Risk Taking" and "Autonomy" is 0.122, indicating a positive relationship between these two variables. The standard error for this

estimate is 0.075. This covariance is not statistically significant (p = 0.103), as the C.R. of 1.632 is less than 1.96. This indicates that the positive relationship is not strong enough to be considered meaningful.

The estimated covariance between "Innovativeness" and "Autonomy" is -0.053, indicating a negative relationship between these two variables. The standard error for this estimate is 0.057. This covariance is not statistically significant (p = 0.348), as the C.R. of -0.938 is less than 1.96. This indicates that the negative relationship is not statistically meaningful. The estimated covariance between "Pro-Activeness" and "Competitive Aggressiveness" is 0.675, indicating a strong positive relationship between these two variables. The standard error for this estimate is 0.079. Importantly, this covariance is highly statistically significant (p < 0.001), denoted by three asterisks (***). This indicates a meaningful and strong positive relationship between these variables.

The estimated covariance between "Pro-Activeness" and "Autonomy" is 0.046, indicating a positive relationship between these two variables. The standard error for this estimate is 0.070. However, this covariance is not statistically significant (p = 0.510), as the C.R. of 0.660 is less than 1.96. This indicates that the positive relationship is not strong enough to be considered meaningful. The estimated covariance between "Competitive Aggressiveness" and "Autonomy" is -0.029, indicating a negative relationship between these two variables. The standard error for this estimate is 0.085. This covariance is not statistically significant (p = 0.735), as the C.R. of -0.339 is less than 1.96. This indicates that the negative relationship is not statistically meaningful. The estimated covariance between "Advanced Manufacturing Technology" and "Risk Taking" is -0.092, indicating a negative relationship between these two variables. The standard error for this estimate is 0.064. This covariance is not statistically significant (p = 0.151), as the C.R. of -1.437 is less than 1.96. This indicates that the negative relationship is not strong enough to be considered meaningful.

Table 6: Covariances of between the Performances Constructs

Variables			**Estimate**	**S.E.**	**C.R.**	**P**
Profitability	<-->	Sales Volume	.011	.065	.174	.862
Profitability	<-->	Market Shares	-.059	.063	-.941	.347
Profitability	<-->	Resource Utilization	-.024	.055	-.445	.656
Profitability	<-->	Operating Cash Flow	-.022	.066	-.326	.745
Sales Volume	<-->	Market Shares	.107	.076	1.408	.159
Sales Volume	<-->	Resource Utilization	.102	.066	1.539	.124
Sales Volume	<-->	Operating Cash Flow	.758	.094	8.102	***
Market Shares	<-->	Resource Utilization	.114	.064	1.781	.075

Market Shares	<-->	Operating Cash Flow	.016	.077	.209	.834
Resource Utilization	<-->	Operating Cash Flow	.032	.067	.486	.627

Source: Survey Data, 2024.

The table 6 shows the covariances between constructs of performance. The results show that there is no issue of auto correlation. The estimated covariance between "profitability" and "sales volume" is 0.011, indicateing a small positive relationship between these two variables. The standard error for this estimate is 0.065, reflecting the precision of the estimate. This covariance is not statistically significant (p = 0.862). The C.R. (Critical Ratio) of 0.174 falls below the threshold of 1.96, indicating that the positive relationship is not strong enough to be considered meaningful in this context. The estimated covariance between "profitability" and "market shares" is -0.059, indicating a negative relationship between these two variables. The standard error for this estimate is 0.063, reflecting the precision of the estimate. This covariance is not statistically significant (p = 0.347). The C.R. of -0.941 is less than the threshold of 1.96, indicateing that the negative relationship is not strong enough to be considered meaningful.

The calculated covariance between "profitability" and "resource utilization" is -0.024, signifying an inverse connection between these two variables. The associated standard error, measuring the accuracy of this estimate, is 0.055. However, it is worth noting that this covariance is not statistically significant (p = 0.656). Additionally, the critical ratio (C.R.) of -0.445 falls below the threshold of 1.96, indicating that the negative relationship observed is not substantial enough to be deemed significant. The computed covariance between "profitability" and "operating cash flow" is -0.022, indicating an adverse association between these two variables. The standard error for this estimation, at 0.066, reveals the level of precision in this calculation. However, it is essential to note that this covariance lacks statistical significance (p = 0.745). Furthermore, the critical ratio (C.R.) of -0.326 falls short of the threshold of 1.96, indicating that the observed negative relationship is not substantial enough to be considered significant.

The estimated covariance between "sales volume" and "market shares" stands at 0.107, implying a potential positive connection between these two variables. The standard error associated with this estimation, at 0.076, provides insight into the precision of this calculation. Nevertheless, it's important to note that this covariance lacks statistical significance (p = 0.159). Furthermore, the critical ratio (C.R.) of 1.408 falls below the threshold of 1.96, indicateing that the observed positive relationship may not be substantial enough to be deemed meaningful within this particular context.The estimated covariance between "sales volume"

and "resource utilization" is 0.102, indicateing a positive relationship between these two variables. The standard error for this estimate is 0.066, reflecting the precision of the estimate. This covariance is not statistically significant (p = 0.124). The C.R. of 1.539 is less than the threshold of 1.96, indicating that the positive relationship is not strong enough to be considered meaningful in this context. The calculated covariance between "sales volume" and "operating cash flow" is 0.758, signifying a robust and positive association between these two variables. The standard error, which is 0.094, provides an indication of the accuracy of this estimation. Importantly, this covariance is highly statistically significant (p < 0.001), marked with three asterisks (***), underscoring a meaningful and substantial positive relationship between these variables.

The estimated covariance between "market shares" and "resource utilization" is 0.114, indicateing a positive relationship between these two variables. The standard error for this estimate is 0.064, reflecting the precision of the estimate. This covariance is marginally statistically significant (p = 0.075). The C.R. of 1.781 is slightly above the threshold of 1.96, indicating a potential relationship between these variables, although it should be interpreted cautiously. The computed covariance between "market shares" and "operating cash flow" is 0.016, indicateing a modest positive connection between these two variables. The standard error for this estimation, at 0.077, offers insights into the precision of this calculation. Nevertheless, it is important to highlight that this covariance lacks statistical significance (p = 0.834). Furthermore, the critical ratio (C.R.) of 0.209 falls short of the threshold of 1.96, indicating that the observed positive relationship might not carry enough weight to be considered significant in this specific context. The calculated covariance between "resource utilization" and "operating cash flow" is 0.032, implying a potential positive link between these two variables. The standard error associated with this estimate, at 0.067, indicates the level of precision in this calculation. However, it is important to note that this covariance lacks statistical significance (p = 0.627). Furthermore, the critical ratio (C.R.) of 0.486 falls below the threshold of 1.96, indicateing that the observed positive relationship might not have enough strength to be deemed significant in this specific context.

Table 7 Effect of entrepreneurial innovativeness on profitability

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	1.302045	0.187206	6.955146	0.0000
INS	0.657138	0.050874	12.91702	0.0000
R-squared	0.314306	Mean dependent var		3.603825
Adjusted R-squared	0.312423	S.D. dependent var		1.323709
S.E. of regression	1.097623	Akaike info criterion		3.029620
Sum squared resid	438.5385	Schwarz criterion		3.050946

Log likelihood	-552.4205	Hannan-Quinn criter.	3.038095
F-statistic	166.8494	Durbin-Watson stat	2.120077
Prob(F-statistic)	0.000000		

Model Line: $PRF = \beta_0 + \beta_1 INS + \varepsilon$

Regression Line: $PRF = 1.302045 + 0.657138\boldsymbol{INS}$

Where; *PRF* = Profitability, INS = Innovativeness and ε= Stochastic error term.

Table 7 shows regression analysis results indicating the relationship between entrepreneurial innovativeness and profitability of manufacturing firms. The coefficient for the constant term (C) is 1.302045, and for innovativeness, it is 0.657138. These coefficients represent the estimated effect of the variables on profitability. The standard errors for both coefficients are relatively small (0.187206 for C and 0.050874 for innovativeness), indicateing precise estimates. The t-statistics for both C and innovativeness are significantly greater than 2, with values of 6.955146 and 12.91702, respectively. The p-values for both coefficients are very low (both are 0.0000), indicating high statistical significance. This indicates that both the constant term (C) and innovativeness have a significant effect on profitability.

The R-squared value is 0.314306, indicating that approximately 31.43% of the variability in profitability can be explained by the combination of the constant term (C) and innovativeness in the model. The adjusted R-squared value is 0.312423, which takes into account model complexity. It is slightly lower than the R-squared value but still indicates a relatively good fit for the model. The mean value of the dependent variable (profitability) is 3.603825, providing an understanding of the average profitability. The standard deviation of the dependent variable is 1.323709, indicating the degree of variability in profitability. The standard error of the regression is 1.097623, measuring the average distance between the actual profitability values and the predicted values from the regression model.

Table 8 Influence of entrepreneurial proactiveness on sales volume

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.429764	0.124228	11.50916	0.0000
PTS	0.545791	0.040001	13.64433	0.0000
R-squared	0.338384	Mean dependent var		2.950820
Adjusted R-squared	0.336566	S.D. dependent var		1.287575
S.E. of regression	1.048748	Akaike info criterion		2.938521
Sum squared resid	400.3538	Schwarz criterion		2.959847
Log likelihood	-535.7494	Hannan-Quinn criter.		2.946996
F-statistic	186.1678	Durbin-Watson stat		1.804940
Prob(F-statistic)	0.000000			

Model Line: $SVE = \beta 0 + \beta_1 PTS + \varepsilon$

Regression Line: $SVE = 1.429764 + 0.545791 PTS$

Where; *SVE* = Sales Volume, PTS = Entrepreneurial Proactiveness and ε= Stochastic error term.

Table 8 shows regression analysis results describing the relationship between entrepreneurial proactiveness and the sales volume of manufacturing firms. The coefficient for the constant term (C) is 1.429764, and for entrepreneurial proactiveness, it is 0.545791. These coefficients represent the estimated effect of the variables on the sales volume of manufacturing firms. The standard errors for both coefficients are relatively small (0.124228 for C and 0.040001 for entrepreneurial proactiveness), indicating precise estimates. The t-statistics for both C and entrepreneurial proactiveness are significantly greater than 2, with values of 11.50916 and 13.64433, respectively. The p-values for both coefficients are very low (both are 0.0000), indicating high statistical significance. This indicates that both the constant term (C) and entrepreneurial proactiveness have a significant effect on sales volume.

The R-squared value is 0.338384, indicating that approximately 33.84% of the variability in sales volume can be explained by the combination of the constant term (C) and entrepreneurial proactiveness in the model. The adjusted R-squared value is 0.336566, which takes into account model complexity. It is slightly lower than the R-squared value but still indicates a relatively good fit for the model. The mean value of the dependent variable (sales volume) is 2.950820, providing an understanding of the average sales volume. The standard deviation of the dependent variable is 1.287575, indicating the degree of variability in sales volume. The standard error of the regression is 1.048748, measuring the average distance between the actual sales volume values and the predicted values from the regression model.

Table 9 Effect of entrepreneurial risk taking on market shares

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	1.402983	0.120283	11.66398	0.0000
RSK	0.661484	0.035356	18.70904	0.0000
R-squared	0.490216	Mean dependent var		3.434426
Adjusted R-squared	0.488816	S.D. dependent var		1.384777
S.E. of regression	0.990076	Akaike info criterion		2.823379
Sum squared resid	356.8111	Schwarz criterion		2.844705
Log likelihood	-514.6784	Hannan-Quinn criter.		2.831853
F-statistic	350.0282	Durbin-Watson stat		1.633034
Prob(F-statistic)	0.000000			

Model Line: $MKS = \beta 0 + \beta_1 RSK + \varepsilon$

Regression Line: $MKS = 1.402983 + 0.661484 RSK$

Where; *MKS* = Market Share, RSK = Entrepreneurial Risk-Taking and ε= Stochastic error term.

Table 9 shows the statistical output representing the results of a regression analysis where the dependent variable is "market shares," and the independent variable of interest is "entrepreneurial risk-taking." The coefficient for the intercept (C) is 1.402983. This represents the estimated effect on market shares when entrepreneurial risk-taking is zero. In this context, it indicates that even when entrepreneurial risk-taking is absent, there is still some positive market share. The coefficient for "entrepreneurial risk-taking" is 0.661484. This indicates that for every one-unit increase in entrepreneurial risk-taking, the market shares of manufacturing firms are expected to increase by approximately 0.661 units. The "t-Statistic" for both the intercept and "entrepreneurial risk-taking" is very high, indicating that both coefficients are statistically significant. The associated p-values are 0.0000, indicating that these results are highly unlikely to occur by chance.

The R-squared value (0.4902) represents the proportion of the variance in market shares explained by the model. In this case, approximately 49.02% of the variance in market shares is explained by the variables in the model. The adjusted R-squared (0.4888) is similar to R-squared but penalizes for the inclusion of additional variables. It indicates that the model is still a good fit even after considering model complexity. The F-statistic (350.0282) is a measure of overall model fit. A high F-statistic with a low associated p-value (0.0000) indicates that the model as a whole is a good fit for the data. The standard error of regression (S.E. of regression) is 0.9901, representing the average error in predicting market shares using the model.

Table 10 Effect of entrepreneurial autonomy on resource utilization

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.625499	0.098865	6.326776	0.0000
AUT	0.816564	0.033106	24.66500	0.0000
R-squared	0.625654	Mean dependent var		2.789617
Adjusted R-squared	0.624626	S.D. dependent var		1.422713
S.E. of regression	0.871665	Akaike info criterion		2.568626
Sum squared resid	276.5671	Schwarz criterion		2.589952
Log likelihood	-468.0586	Hannan-Quinn criter.		2.577100
F-statistic	608.3624	Durbin-Watson stat		1.971610
Prob(F-statistic)	0.000000			

Model Line: $RSU = \beta 0 + \beta_1 AUT + \varepsilon$
Regression Line: $RSU = 0.625499 + 0.816564 AUT$
Where; RSU = Resource Utilization, AUT = Autonomy and ε= Stochastic error term.

Table 10 shows the statistical output representing the results of the regression analysis where the dependent variable is "resource utilization of manufacturing firms," and the independent variable of interest is "entrepreneurial autonomy." The coefficient for the intercept (C) is 0.625499. This represents the estimated effect on resource utilization when entrepreneurial autonomy is zero. In this context, it indicates that even in the absence of entrepreneurial autonomy, there is still some baseline level of resource utilization. The coefficient for "entrepreneurial autonomy" is 0.816564. This indicates that for every one-unit increase in entrepreneurial autonomy, the resource utilization of manufacturing firms is expected to increase by 0.816564 units. The "t-Statistic" for both the intercept and "entrepreneurial autonomy" is very high, indicating that both coefficients are statistically significant. The associated p-values are 0.0000, indicating that these results are highly unlikely to occur by chance.

The R-squared value (0.625654) represents the proportion of the variance in resource utilization explained by the model. In this case, approximately 62.57% of the variance in resource utilization is explained by the variables in the model. The adjusted R-squared (0.6246) is similar to R-squared but penalizes for the inclusion of additional variables. It indicates that the model is still a good fit even after considering model complexity. The F-statistic (608.3624) is a measure of overall model fit. A high F-statistic with a low associated p-value (0.0000) indicates that the model as a whole is an excellent fit for the data. The standard error of regression (S.E. of regression) is 0.8717, representing the average error in predicting resource utilization using the model.

Table 11 Effect of entrepreneurial competitive aggressiveness on operating cash flow

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	1.191805	0.144551	8.244889	0.0000
CAS	0.637431	0.044534	14.31333	0.0000
R-squared	0.360137	Mean dependent var		3.090164
Adjusted R-squared	0.358379	S.D. dependent var		1.372953
S.E. of regression	1.099752	Akaike info criterion		3.033497
Sum squared resid	440.2417	Schwarz criterion		3.054822
Log likelihood	-553.1299	Hannan-Quinn criter.		3.041971
F-statistic	204.8715	Durbin-Watson stat		2.080483
Prob(F-statistic)	0.000000			

Model Line: $OCF = \beta 0 + \beta_1 CAS + \varepsilon$
Regression Line: $OCF = 1.191805 + 0.637431 CAS$

Where; OCF = Operating Cash Flow, CAS = Competitive Aggressiveness and ε= Stochastic error term.

Table 11 presents the statistical results derived from a regression analysis. In this analysis, the focus is on the relationship between the dependent variable, which is the "operating cash flow of manufacturing firms," and the independent variable of interest, which is "competitive aggressiveness."The coefficient for the intercept, denoted as (C), is 1.191805. This coefficient signifies the estimated effect on operating cash flow when competitive aggressiveness is at zero. In essence, it implies that even in the absence of competitive aggressiveness, there remains a fundamental baseline level of operating cash flow. Conversely, the coefficient for "competitive aggressiveness" is 0.637431. This coefficient indicates that with every one-unit increase in competitive aggressiveness, we can anticipate an approximate increase of 0.6374 units in the operating cash flow of manufacturing firms. It is important to note that both the intercept and the "competitive aggressiveness" coefficient yield notably high "t-Statistics." This high value indicates that both of these coefficients hold statistical significance. Furthermore, the associated "p-values" are reported as 0.0000, emphasizing that these results are highly improbable to have occurred by random chance.

The R-squared value (0.3601) signifies the proportion of the variability in operating cash flow that is accounted for by the model. In this instance, it means that roughly 36.01% of the variations in operating cash flow can be explained by the variables included in the model. The adjusted R-squared (0.3584) serves a similar purpose to R-squared but adjusts for the inclusion of additional variables. This adjustment takes into consideration model complexity. The adjusted R-squared value indicates that even when we account for model complexity, the model remains a suitable fit for the data. The F-statistic (204.8715) is a metric that assesses the overall goodness of fit of the model. A high F-statistic, accompanied by a low associated p-value (0.0000), implies that the model, as a whole, is well-suited to the data. The standard error of regression (S.E. of regression), at 1.0998, signifies the average error in predicting operating cash flow using the model.

Table 12 The interaction effect between advanced manufacturing technology, entrepreneurial orientation and performance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.574627	0.233905	2.456668	0.0145
EO	0.585496	0.068934	8.493575	0.0000
AMT	0.011923	0.081484	-0.146318	0.8838
AMT*EO	0.067974	0.023466	2.896720	0.0040
R-squared	0.605187	Mean dependent var		2.863388
Adjusted R-squared	0.601915	S.D. dependent var		1.345891

S.E. of regression	0.849176	Akaike info criterion	2.521768
Sum squared resid	261.0382	Schwarz criterion	2.564420
Log likelihood	-457.4836	Hannan-Quinn criter.	2.538717
F-statistic	184.9633	Durbin-Watson stat	1.998837
Prob (F-statistic)	0.000000		

Model Line: $PF = \beta 0 + \beta_1 EO + \beta_2 AMT + \beta_3 AMT*EO + \varepsilon$

Regression Line: $PF = 0.574627 + 0.585496 EO + 0.011923 AMT + 0.067974 AMT*EO$

Where; AMT= Implementation of advanced technology, EO= entrepreneurial orientation, PF= performance of manufacturing firms and ε= Stochastic error term.

Table 10 shows the statistical output represents the results of a regression analysis where the dependent variable is "performance of manufacturing firms," and the analysis assesses the moderating effect of "implementation of advanced technology" on the relationship between "entrepreneurial orientation" and firm performance. The coefficient for the intercept (C) is 0.574627. This represents the estimated effect on firm performance when all other variables are zero. The coefficient for "entrepreneurial orientation" is 0.585496. This indicates that for every one-unit increase in entrepreneurial orientation, firm performance is expected to increase by 0.585496 units. The coefficient for "implementation of advanced technology" is 0.011923. However, this coefficient is not statistically significant (p-value = 0.8838), indicating that the implementation of advanced technology alone does not significantly affect firm performance. The coefficient for the interaction term is 0.067974. This is the key coefficient for assessing the moderating effect. It indicates that the effect of entrepreneurial orientation on firm performance is moderated by the implementation of advanced technology. Specifically, for every one-unit increase in both entrepreneurial orientation and advanced technology implementation, firm performance is expected to increase by 0.067974 units more than what would be expected from the individual effects alone. The p-values for the intercept, entrepreneurial orientation, and the interaction term are all statistically significant ($p < 0.05$), except for the "implementation of advanced technology" variable, which is not significant ($p = 0.8838$).

The R-squared value (0.605187) represents the proportion of the variance in firm performance explained by the model. In this case, approximately 60.52% of the variance in firm performance is explained by the variables in the model. The adjusted R-squared (0.601915) is similar to R-squared but penalizes for the inclusion of additional variables. It indicates that the model is still a good fit even after considering model complexity. The F-statistic (184.9633) is a measure of overall model fit. A high F-statistic with a low associated p-value (0.0000)

indicates that the model as a whole is a good fit for the data. The standard error of regression (S.E. of regression) is 0.849176, representing the average error in predicting firm performance using the model.

Discussion of Findings

The moderating role of advanced manufacturing technology on entrepreneurial orientation and performance of manufacturing firms in South-East, Nigeria was the focus of the study. The six hypotheses, which emanated from the research questions and objective, were quantitatively tested. The quantitative analysis was done with a data sample of 366 respondents that took part in the survey. The results from the analyses are discussed in line with the general objective and research question.

The quantitative result provides an empirical answer to research question one, as it confirms that innovativeness affects profitability of manufacturing firms in South-East, Nigeria. The decision was reached based on the p-value less than (0.05) (β = 0.657138, p-value = 0.000). This finding is supported with the outcome from the study of Moige et al. (2016), Lwamba et al. (2014) and Turro (2016) that also found that innovativeness affects profitability. Further, the result proved that the link between innovativeness and profitability in the manufacturing sector in South-East, Nigeria are strengthened by the extent of the firm's reaction to research and development, human and organisational capacity resources building and managing regulative pressure. This result is consistent with the study of Tuan et al. (2016) and Chigamba (2014) that found research and development as a major factor that accounts for improvement in the manufacturing sector.

The research question two was also answered and the outcome from the quantitative result indicates that proactiveness affects the sales volume of manufacturing firms in South-East, Nigeria. The decision was reached based on the p-value less than 0.05, β = 0.545791 and p-value = 0.000). This result is consistent with the findings of Sylvia and Kalsom (2013), Gibb and Haar (2010) that also found that proactiveness affects firm's sales volume. The finding refutes that of Meekaewkunchorn et al. (2021) that proactiveness has a significant negative effect on firm performance. This finding provides empirical evidence supporting the notion that proactive measures play a critical role in influencing the sales performance of manufacturing firms. The significance of this finding underscores the importance of a forward-thinking approach for manufacturing firms operating in the South-East Nigeria region. Firms that actively engage in proactive strategies are more likely to seize opportunities as they arise, adapt swiftly to market shifts, and effectively meet the evolving demands of their customer base.

The research question three was also answered and the outcome from the quantitative results indicates that risk taking influences market share. The decision was reached based on the p-value less than 0.05, β = 0.661484 and p-value 0.000. This implies that calculated risk-taking is a pivotal factor in determining the market presence and growth prospects of manufacturing firms. This study is supported with the outcome from the study of McDowell, (2017); Sylvia & Kalsom, (2013). The result confirms that risk taking affects the market shares of manufacturing firms in South-East, Nigeria. This result though differs from the findings of Isichei et al. (2020), the difference could be because their study was more concerned with small businesses, while the current study is on manufacturing firms. The study also refutes the finding of Broniiley (2017) that taking risks can worsen performance. It is evident that in the manufacturing firms in South-East Nigeria often demonstrate the willingness to embrace calculated risks as part of their strategic decision-making process. These risks may involve entering new markets, introducing innovative products, investing in research and development. The significance of this finding underscores the importance of adopting a strategic approach to risk-taking for manufacturing firms in South-East Nigeria.

Also, the research question four was examined from a quantitative perspective and the outcome from the analysis indicates that autonomy would account for effective resource utilisation among manufacturing firms in South-East, Nigeria. The decision was reached based on the p-value less than 0.05, β = 0.816564 and p-value 0.000. This result aligns with the findings of Burcharth et al. (2017), and Raza et al. (2013) that also confirmed that autonomy affects resource utilisation of firms. This finding serves as a critical contribution to the understanding of how organizational dynamics effect the economic landscape of this region. It is evident that manufacturing firms that fostered a culture of autonomy exhibited more efficient resource utilization. Firms that empowered their management teams with the autonomy to adapt to changing market conditions and formulate agile resource allocation strategies were better equipped to thrive in a dynamic business environment. Firms that value and encourage autonomy are likely to report higher levels of employee engagement, which, in turn, positively influenced resource utilization.

Further, the research question five was answered quantitatively and the outcome confirmed that competitive aggressiveness has a significant effect on the operating cash flow of manufacturing firms in South-East, Nigeria. The decision was reached based on the p-value less than 0.05, β = 0.637431 and p-value 0.000. The finding is supported by the study of Aigboje (2018) and DeepaBabu and Manalel (2016) that also found that competitive aggressiveness has a significant effect on organisations operating cash flow. The study's findings revealed a compelling connection between competitive aggressiveness and its substantial

effect on the operational cash flow of manufacturing firms located in the South-Eastern region of Nigeria. This profound relationship underscores the pivotal role that competitive aggressiveness plays in shaping the financial dynamics and sustainability of businesses operating within this specific geographical context.

Finally, the research question six was answered quantitatively and the result indicates that there is a significant positive total interaction effect between advanced manufacturing technology, entrepreneurial orientation (innovativeness, proactiveness, risk-taking, autonomy & competitive aggressiveness) and performance of manufacturing firms in South-East, Nigeria. The decision was reached based on the p-value less than 0.05, $\beta = 0.067974$ and p-value 0.0040. Entrepreneurial orientation, advanced manufacturing technology and performance were measured as a first-order level construct and the repeated measure was used, thus, allowing for indicators used for the second-order level construct to be cumulatively used to measure the second-order level construct. The result thus is a cumulative perspective on the entire variables. Hence, validating the result that advanced manufacturing technology would strengthen the relationship between entrepreneurial orientation and performance of manufacturing firms in South-East, Nigeria. This aligns with the findings of Lwamba et al. (2014) and Kocak et al. (2017) that entrepreneurial orientation had a favorable effect on the performance of the firms. The finding underscores the interconnectedness of advanced technology implementation, entrepreneurial orientation, and the performance of manufacturing firms in the region. The implementation of advanced technology alone does not significantly affects firm performance. The positive interaction effect implies that when manufacturing firms in South-East Nigeria simultaneously invest in advanced technology and nurture an entrepreneurial mindset within their organizations, they experience more substantial improvements in their performance than if they were to pursue these strategies individually. The finding of Shamsudee et al. (2022) also unveiled that technological orientation functions as a moderator between entrepreneurial orientation and SMEs performance. This advances the finding of Moige et al. (2016) that technology innovation has a major effect on organization's performance. In essence, these two variables act as catalysts for each other, synergizing to elevate the overall success of these firms. The finding navigates that the adoption of modern technology emerges as a driving force behind improved business outcomes in this region.

Conclusion

Innovativeness, proactivity, risk-taking, autonomy, and competitive aggressiveness are all characteristics of entrepreneurial manufacturing enterprises, and they are all connected to performance results. Developing an innovative culture is essential to increasing profitability. Empowering employees

to approach problems creatively and pro-actively sets up firms for long-term success. Being proactive is crucial for successfully navigating the ever-changing business environment, which creates competitive advantages and long-term growth.

By taking advantage of opportunities for growth and gaining market share, strategic planning that incorporates calculated risk-taking improves competitiveness. Giving individuals or teams autonomy promotes resource optimisation and well-informed decision-making, which boosts operational effectiveness. By resolutely pursuing market possibilities, competitive aggressiveness ensures financial stability and success in a constantly shifting company environment, which in turn promotes operational cash flow. The study emphasises the need for a comprehensive strategy and highlights the benefits of implementing cutting-edge technologies, having an entrepreneurial mindset, and improving corporate performance. South-east Nigerian manufacturing firms can prosper in the region's economic environment by adopting an entrepreneurial mindset along with current technologies.

Recommendations

Based on the findings of the study, the study makes the following recommendations:

1. Given the significant relationship between innovativeness and the profitability of manufacturing firms in south-east Nigeria, these firms should prioritise and actively foster a culture of innovation within their organizations. This can involve investing in innovation training programmes, creating platforms for idea generation, and incentivizing employees to propose and implement innovative solutions. By doing so, the firms will harness their creative potential to drive financial success.
2. Considering the significant effect of proactiveness on sales volume, manufacturing firms in southeast Nigeria should incorporate proactiveness into their strategic planning and operational culture. This may involve actively monitoring market trends, seeking out emerging opportunities, and promptly responding to changing customer needs. By embracing a proactive approach, these firms can enhance their competitive position and consistently increase their sales.
3. Recognising the pivotal role of risk-taking in influencing market shares, manufacturing firms in south-east Nigeria should carefully evaluate and strategically embrace calculated risks as part of their market expansion strategies. This may include conducting thorough risk assessments and implementing risk management measures while pursuing growth opportunities. By doing so, the firms can positively affect their market shares.

4. To optimise resource utilisation, manufacturing firms in southeast Nigeria should recognise the significance of autonomy. Empowering individuals or teams within manufacturing firms to make informed decisions and take ownership of responsibilities can lead to more efficient and agile resource allocation. Manufacturing firms should actively promote autonomy within a structured framework, enabling them to maximise their operational efficiency and streamline resource allocation.
5. Considering the significant relationship between competitive aggressiveness and operating cash flow, firms should develop strategies that balance assertiveness with prudent financial management. While pursuing market opportunities and challenging competitors, firms should maintain a strong focus on cost management, cash flow optimisation, and financial sustainability. Achieving this equilibrium is essential for maximising the beneficial effect of competitive aggression on cash flow without jeopardising financial stability.
6. Recognising the significant and positive total interaction effect among advanced technology implementation, entrepreneurial orientation, and firm performance, manufacturing firms in south-east Nigeria should embrace a holistic approach to their business strategies. They should focus on synergizing technology adoption with a culture of entrepreneurship. Not only should they invest in advanced technologies, but also foster an environment that encourages and supports innovative thinking and proactive entrepreneurship. By doing so, firms can unlock the full potential of these interrelated variables, ultimately driving improved performance.

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