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Profitability Analysis of Conventional and Islamic Banks in Bangladesh: A Comparative Study

G. M. Anwar Hossain¹, Dr. Md. Ruhul Amin², Md. Shahbub Alam^{3*}

^{1,2}Department of Finance and Banking, Islamic University, Kushtia, Bangladesh

³Department of Business Administration, Sonargaon University, Dhaka, Bangladesh

***Corresponding author:** shahbubiu@gmail.com*, ORCID ID: 0009-0002-0880-9173

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Abstract

This comparative study on profitability analysis of conventional and Islamic banks in Bangladesh from 2018 to 2022 gives an insightful financial performance of the two modes of banking stream. For the analysis, five conventional banks and five Islamic banks were chosen randomly. Financial ratios are calculated from the respective bank's annual financial reports and the Central bank's data to measure profitability. Ten profitability indicators are used to analyze data, comparing the results of two types of banks, and finally, the ANOVA test shows the differences in profitability measures at a 5% level of significance. Conventional banks are performing better in terms of NNII, Spread, Burden, OP, NP, ROA & ROE, but Islamic banks are performing better regarding profit earned, profit paid, and OOE. The differences in profit earned ratio, profit paid ratio, and Spread ratio are significant, which indicate that trends are not identical in conventional and Islamic banks, but the differences in NNII ratio, OOE ratio, Burden ratio, OP ratio, NP ratio, ROA, ROE are not significant which indicate that trends are identical. Deposit and investment trends of Islamic banks are better than conventional banks, and it shows Islamic banks have good prospects in the near future. Overall findings show that conventional banks are doing comparatively better than Islamic banks in terms of profitability measures.

Keywords: Conventional Banks, Islamic Banks, Profitability, ANOVA Test.

1. Introduction

In Bangladesh 61 scheduled banks are running as per Bangladesh Bank Order, 1972 and Bank Company Act, 1991. Commercial banks of three categories (i) full-fledged conventional commercial banks, (ii) full-fledged Islamic commercial banks and (iii) Commercial banks with dual operations are running here. As on 31st December 2022, 10 full-fledged Islamic commercial banks with 1659 branches, 11 conventional banks with 23 Islamic Shariah banking branches and 13 conventional banks with 535 Islamic banking windows are giving Islamic financial services (IFS) in the country's economy. Islamic banking is getting more popularity as a perfect option of conventional banking day after day in Bangladesh. At present, Islamic banking is being successfully operated in the world economy (Rashid et al., 2018). Profit is the primary objective

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of a commercial bank and profitability is the tool used for measuring comparative performance with its counterparts. 'Profit' and 'profitability' in business are treated as 'blood' and 'pulse' in human body (Rahman et al., 2014). Profitability of a commercial bank mainly depends on operational efficiency and asset utilization. Profitability of a commercial bank also depends on advance deposit ratio (Das et al., 2015).

Conventional banking is predetermined interest based where Islamic banking is based on profit – loss sharing, moral values, ethical business transactions and all procedures must be permitted by Islamic Shariah. Islamic banks (IB) and conventional banks (CB) have different features, IB performance must be measured considering Islamic values and principles (Al Arif et al., 2021). Nowadays IB is the fastest rising banking systems and most competitive against existing CB (Suppia et al., 2019).

Profitability is an indicator of growth trend and financial success of a commercial bank (Yuan et al., 2022). Financial performance of a commercial bank can be measured by traditional accounting-based methods: Return on Assets (ROA), Return on Investment (ROI), Return on Equity (ROE), Net Interest Margin (NIM), Earnings per Share (EPS), Price Earnings Ratio (P/E), Net Profit, Dividend Yield and modern value-based methods: Value Added Statement - Economic Value Added (EVA), Market Value Added (MVA) (Rahman, 2016).

Conventional bank is more profitable which differs significantly from Islamic bank with respect to Return on Asset, Return on Equity, Profit Expenses Ratio, Earnings per Share, Net Profit Margin, Profit per Employee and Profit per Branch (Paul et al., 2013). Debt to equity ratio is a measure of leverage which has negative control on profitability of a commercial bank (Uddin, 2022). Deposit and bank size have significant negative impact on profitability of Islamic banks (Rahaman et al., 2016).

In this context, this study intends to compare the profitability of the conventional and Islamic banks in Bangladesh for the period of 2018 to 2022. Thus, through the analysis of their financial performance and the assessment of factors that impact on the level of profitability, this study aims at establishing which of the banking systems in consideration is more efficient in terms of financial performance indicators and operations, and, consequently, what roles they play in the nation's economy.

2. Literature Review

Hasan (2016) studied conversion of conventional banks into Islamic banks in Bangladesh and found higher profitability after conversion. Ahmmed et al. (2015) analyzed four conventional banks and four Islamic banks in Bangladesh from 2009-2013 and found mixed results. Ara (2016) studied 19 CB and 5 IB and found IB's better position in profit efficiency and CB's better position in cost efficiency. Karim et al. (2020) studied and found highest non-compliance in Musharakah and moderate non-compliance in Mudarabah, Ijarah and Quard Hasanah due to internal and external reasons. Rafiq (2016) compared five Islamic banks with five conventional banks during 2008-2014 and found conventional banks perform better than Islamic banks as per ROA, ROE & Cost to Income ratio. Ibrahim et al. (2018) studied and found conventional banks are significantly more profitable than Islamic banks in ROA, ROE and Profit Expense ratio. Akber et al. (2020) studied and found no significance differences according to CAMEL test, traditional commercial

bank performs better as per asset quality and management efficiency and Islamic bank performs better as per liquidity and capital adequacy. Muhiuddin et al. (2020) studied and found Islamic banks have more profitability performance than conventional banks. Shafee et al. (2021) described bankers and customers' relationship is based on confidence and increases of customer confidence in bank lead to expansion of e-banking services which ultimately lead to increase of profit and reduction of costs. Nuhiu et al. (2017) concluded that banks profitability influenced by internal factors –asset quality, management efficiency and capital adequacy but macroeconomic factors influence insignificantly. Sukmana et al. (2016) studied and found conventional banks have higher ROA, CAR than Islamic banks. Haslem (1968) showed the variables- management, time, location and size significantly affect relative profitability of a commercial bank. Paltrinieri et al. (2021) showed increase of non-financing income contributes positively to increase stability and profitability in both banking model. Abduh et al. (2013) studied and showed Islamic bank has progress on efficiency level. Fatema et al. (2013) showed investment to total assets ratio significantly affects Return on Assets.

Bhuiya et al. (2023) studied ten commercial banks of Bangladesh and found NPL ratio, L/D ratio have significant impact in ROA and also showed that NPL has negative impact in ROE. Uddin et al. (2017) studied performance of five conventional and five Islamic banks in Bangladesh using CAMEL analysis and found no significant differences but management quality and asset quality are better in conventional banks where capital adequacy and liquidity position are better in Islamic banks. Khan (2018) studied deposit performance of all private commercial banks and Islamic banks in Bangladesh during 2007-2016 and found average growth of IBs is better. Hoque et al. (2019) studied comparative performance of 5 conventional and 5 Islamic banks in Bangladesh over five years from 2012-2016 and found conventional banks performance is better than Islamic banks. Alam (2019) studied randomly selected four conventional and four Islamic banks in Bangladesh from 2017-2018 and found Islamic banks overall performance is better than conventional banks but conventional banks standard deviation is greater than Islamic ones. Islam (2012) studied and found generally IBs overall performance is better than CBs. Ibrahim et al. (2014) studied 6 Islamic banks in Bangladesh during 2004-2013 and found all IBs perform well which will stimulate CBs to convert banking business as per Islamic Shariah principles. Abdullah et al. (2020) studied 7 Islamic banks and 23 conventional banks of Bangladesh from 2010 to 2018 and found conventional bank is more profitable than Islamic ones and conventional banks have higher Return on Assets and Profit Expenses Ratio than Islamic counterparts but significant difference has no existence in Return on Equity.

2.1. Research Gap

Although a number of papers have attempted to evaluate the performance of conventional and Islamic banks, some research gaps have emerged. Several papers investigated the profitability issue based on the financial data for previous years with less attention paid to current changes and tendencies in the banking sector. To fill these gaps, this study intends to use data from the period 2018-2022 to capture the current dynamics of the banking sector, especially the effects of the COVID-19 pandemic in 2020-2021.

Moreover, unlike most previous studies that have concentrated on a limited number of profitability parameters, ten profitability indicators are adopted in this study: Profit Earned Ratio (PER), Profit

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Paid Ratio (PPR), Net Non-interest (Non-investment) Income [NNII] ratio, Other Operating Expenses (OOE) ratio, Spread ratio or Net Interest (Investment) Margin [NIM], Burden ratio, Operating Profit (OP) ratio, Net Profit (NP) ratio, Return on Asset (ROA), and Return on Equity (ROE).

This approach offers a wider and much more elaborate view of the determinants of profitability in both banking systems. Based on these gaps, this paper aims to present a current picture on the profitability of conventional and Islamic banks in Bangladesh besides adopting a wider range of financial ratios.

2.2. Research Questions

The study aims to answer the following research questions:

What has been the trend of profitability of both conventional and Islamic banks in Bangladesh in the period 2018-2022?

Which banking system between the conventional and the Islamic banking system has the highest performance of the ten profitability measurements in the study period?

To what extent does it explain the variation in profitability between the conventional and the Islamic banks in Bangladesh?

2.3. Hypothesis of the Study

The following hypothesis is developed and tested using one-way ANOVA:

H₀: There is no difference in profitability measures of conventional and Islamic banks in Bangladesh from 2018-2022.

H₁: There is a significant difference in profitability measures of conventional and Islamic banks in Bangladesh from 2018-2022.

In hypothesis testing 5% level of significance is considered. If P value more than 0.05 we will accept the null hypothesis and reject the alternative hypothesis, if P value is less than 0.05 we will reject the null hypothesis and accept the alternative hypothesis (Hassan, 2021).

3. Methodology

3.1. Sample of the Study and Data Sources

The study employs a comparative analysis of the profitability of conventional and Islamic banks in Bangladesh. The population for the study includes the entire banking sector of Bangladesh. A random sampling method was used to select five conventional banks and five Islamic banks for the analysis. The selected banks and their years of establishment are listed in **Table 1**.

Secondary data for the analysis was obtained from the annual reports of the selected banks, their official websites, and the website of the Bangladesh Bank. The study covers a five-year period from 2018 to 2022.

Table 1: Sample Banks and Year of Establishment

Five sample of conventional banks	Establishment	Five sample of Islamic banks	Establishment
1. Pubali Bank Ltd. (PBL)	26 March 1972	Islami Bank Bangladesh Ltd. (IBBL)	30 March 1983
2. Prime Bank Ltd. (Prime BL)	17 April 1995	First Security Islami Bank Limited (FSIBL)	25 October 1999
3. Brac Bank Ltd. (BBL)	July 2001	Social Islami Bank Ltd. (SIBL)	22 November 1995
4. Eastern Bank Ltd. (EBL)	16 August 1992	EXIM Bank Ltd. (EXIM BL)	3 August 1999
5. Dutch Bangla Bank Ltd. (DBBL)	30 June 1996	Shahjalal Islami Bank Ltd. (SJIBL)	10 May 2001

Source: Authors' own explanations.

3.2. Measurement of Profitability

Profitability (profit + ability) means ability or power to make profit with respect to total business, total investment, total equity, total assets, and operating expenses etc. Profitability analysis is instrumental in comprehending the financial position of an organization that is both solvent and solid (Gazi et al. 2021). The following tools and techniques were employed for profitability analysis:

1. **Profitability Model:** Profitability (P) is calculated as:

$$P = \frac{I}{A} \text{ [where I represents income and A represents assets]}$$
2. **Statistical Tools:** The following statistical techniques are applied to analyze the data: Mean (Average), Standard Deviation (SD), and Coefficient of Variation (CV).
3. **Growth Rate Analysis:** The Compound Growth Rate (CGR) is employed to measure the growth trend in profitability performance.
4. **ANOVA Test:** The ANOVA test was applied to assess the accuracy and significance of results, facilitating comparisons between the profitability of conventional and Islamic banks.
5. **Profitability Indicators:** Profitability indicators provide critical insights into the performance and efficiency of banks. The main ten profitability indicators (highlighting their significance) presented in **Table 2** were used to analyze the profitability of conventional and Islamic bank.

Table 2: Profitability Indicators with Significance

SN	Profitability Indicators	Significance
01	Profit Earned Ratio (PER)	Indicates income or profit generated on loans & advances (investments). A bank having higher PER means it has better performance in disbursement of quality loans (investment) than the other one.

02	Profit Paid Ratio (PPR)	Indicates profit paid on deposits of the depositors. A bank having lower PPR means it is more efficient in collecting deposits at lower profit than the other one.
03	Net Non-interest (Non-investment) Income [NNII] ratio	Includes commission, services charges, fees, guarantee fees, net profits from sales of investment securities and foreign exchange profits which indicate diversification of banking activities. A bank having higher NNII means it has better performance in diversification of banking activities than the other one.
04	Other operating expenses (OOE) ratio	Indicates management efficiency to handle daily operating activities at lower cost. A bank having lower OOE means it is more efficient in managing costs than the other one.
05	Spread ratio or Net Interest (Investment) Margin [NIM]	Indicates PER over PPR. A bank having higher spread means it is more efficient in investing the collected deposits than the other one.
06	Burden ratio	Indicates OOE over NNII. A bank having lower burden means it is more efficient in cost control than the other one.
07	Operating Profit (OP) ratio	Indicates total income over total expenses. A bank having higher OP means it is more profitable than the other one.
08	Net profit (NP) ratio	Indicates net profit after tax. A bank having higher NP means it is more profitable (considering NPAT) than the other one.
09	Return on Asset (ROA)	Indicates how banks are utilizing their available assets. A bank having higher ROA means it is efficiently utilizing assets than the other one.
10	Return on Equity (ROE)	Indicates how banks are utilizing shareholders' equity capital. A bank having higher ROE means it is efficiently utilizing equity than its counterpart.

Source: Authors' own explanations.

4. Data Analysis

4.1. Comparative Profitability Ratios

The profitability ratios presented in **Table 3** provide insights into the financial performance of conventional and Islamic banks over the period 2018–2022.

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Table 3: Comparative Profitability Ratios

Sample Banks		Profit Earned	Profit Paid	NNII	OOE	Spread	Burden	OP	NP	ROA	ROE
Conventional Banks	PBL	3.40	2.60	1.85	1.37	0.80	-0.48	1.28	0.49	0.69	10.37
	Prime BL	3.75	2.13	1.40	1.53	1.62	0.13	1.49	0.53	0.73	8.82
	BBL	4.46	2.09	1.38	2.06	2.37	0.68	1.68	0.93	1.43	13.35
	EBL	4.02	2.55	1.60	1.33	1.47	-0.27	1.74	0.83	1.23	15.27
	DBBL	3.71	1.18	1.76	2.58	2.53	0.82	1.72	0.79	1.20	17.16
Islamic Banks	IBBL	3.40	2.02	0.58	1.09	1.37	0.51	0.87	0.24	0.43	8.68
	FSIBL	4.82	3.44	0.27	0.87	1.38	0.61	0.78	0.30	0.54	14.18
	SIBL	4.26	2.91	0.57	1.04	1.36	0.46	0.89	0.29	0.48	9.82
	EXIM BL	3.96	2.89	0.68	0.86	1.06	0.18	0.88	0.35	0.59	8.96
	SJIBL	4.10	2.52	0.96	1.16	1.57	0.19	1.38	0.53	0.79	12.63

Source: Authors' calculation from the respective banks' annual reports (2018-2022).

Profit earned ratio of BBL is 4.46% where average is 3.87% which represents better position for investing the loanable fund at higher interest rate compared to other conventional banks and profit earned ratio of FSIBL is 4.82% where average is 4.11% which represents better position for investing the investable fund at higher profit rate compared to other Islamic banks.

Profit paid ratio of DBBL is 1.18% where average is 2.11% which represents better position to collect deposit at lower interest rate compared to other conventional banks and profit paid ratio of IBBL is 2.02% where average is 2.76% which represents better position to collect deposit at lower profit rate compared to other Islamic banks.

NNII ratio of PBL is 1.85% where average is 1.60% which represents better position to earn other fees based income compared to other conventional banks and NNII ratio of SJIBL is 0.96% where average is 0.61% which represents better position to earn other fees based income compared to other Islamic banks.

OOE ratio of EBL is 1.33% where average is 1.78% which represents better position to manage other operating costs compared to other conventional banks and OOE ratio of EXIM is 0.86% where average is 1.00% which represents better position to manage other operating costs compared to other Islamic banks.

Spread ratio of DBBL is 2.53% where average is 1.76% which represents better position to earn more interest on loans & advances over interest payment on deposit compared to other conventional banks and spread ratio of SJIBL is 1.57% where average is 1.35% which represents better position to earn more profit on investment over profit payment on deposit compared to other Islamic banks.

Burden ratio of PBL is -0.48% where average is 0.18% which represents better position to control other operating costs over earning on non-interest fees based income compared to other conventional banks and burden ratio of EXIM is 0.18% where average is 0.39% which represents better position to control other operating costs over earning on non-investment fees based income compared to other Islamic banks.

OP ratio of EBL is 1.74% where average is 1.58% which represents better position to earn total income over total expenses compared to other conventional banks and OP ratio of SJIBL is 1.38% where average is 0.96% which represents better position to earn total income over total expenses compared to other Islamic banks.

NP ratio of BBL is 0.93% where average is 0.71% which represents better position to earn more profit after deduction of all taxes compared to other conventional banks and NP ratio of SJIBL is 0.53% where average is 0.34% which represents better position to earn more profit after deduction of all taxes compared to other Islamic banks.

ROA of BBL is 1.43% where average is 1.06% which represents better position to earn more return through utilization of available assets compared to other conventional banks and ROA of SJIBL is 0.79% where average is 0.57% which represents better position to earn more return through utilization of available assets compared to other Islamic banks.

ROE of DBBL is 17.16% where average is 12.99% which represents better position to earn more return through utilization of shareholder's equity compared to other conventional banks and ROA of FSIBL is 14.18% where average is 10.85% which represents better position to earn more return through utilization of shareholder's equity compared to other Islamic banks.

4.2. Statistical Analysis of the Profitability Indicators

The statistical analysis of profitability indicators provides a deeper understanding of the performance dynamics between conventional and Islamic banks, as summarized in **Table 4**.

Table 4: Statistical Analysis

	Profit Earned	Profit Paid	NNII	OOE	Spread	Burden	OP	NP	ROA	ROE
Conventional Banks										
Mean	3.87	2.11	1.60	1.78	1.76	0.18	1.58	0.71	1.06	12.99
S.D.	0.79	0.44	0.19	0.13	0.42	0.31	0.13	0.04	0.07	1.04
C.V.	20.51	20.71	11.82	7.43	23.82	175.04	8.43	5.82	7.05	8.04
Max.	4.75	2.55	1.78	1.94	2.24	0.57	1.74	0.78	1.18	14.72
Min.	3.03	1.53	1.37	1.62	1.41	-0.11	1.44	0.68	0.99	11.98
CGR	-7.90	-5.36	5.97	-3.44	-8.70	44.52	-2.80	-2.47	-2.86	-2.52
Islamic Banks										
Mean	4.11	2.76	0.61	1.00	1.35	0.39	0.96	0.34	0.57	10.85
S.D.	0.67	0.50	0.11	0.04	0.19	0.09	0.16	0.04	0.05	1.02
C.V.	16.27	18.26	17.56	4.32	13.96	23.33	16.94	10.61	8.52	9.39
Max.	4.78	3.27	0.79	1.04	1.59	0.48	1.14	0.41	0.64	12.66
Min.	3.40	2.21	0.50	0.94	1.18	0.25	0.77	0.32	0.53	10.21
CGR	-7.73	-7.98	9.58	0.18	-6.98	-11.77	-3.07	4.71	2.80	5.42
Conventional and Islamic banks (ANOVA test)										
F-ratio	21.85	5.06	0.33	0.21	2.83	1.53	1.14	1.48	0.19	0.42
P-value	0.01	0.01	0.86	0.93	0.04	0.21	0.35	0.23	0.94	0.79

Source: Authors' calculation from the respective banks' annual reports (2018-2022).

For conventional banks profit earned ratio ranging between 3.03 to 4.75 with an average of 3.87 and in Islamic banks profit earned ratio ranging between 3.40 to 4.78 with an average of 4.11 and

average profit earned in Islamic banks is more consistent which is 1.06 times higher than conventional banks implies that Islamic banks investing efficiently to procure more profit.

In conventional banks profit paid ratio ranging between 1.53 to 2.55 with an average of 2.11 and in Islamic banks profit paid ratio ranging between 2.21 to 3.27 with an average of 2.76 and average profit paid in Islamic banks is more consistent which is 1.31 times higher than conventional banks implies that Islamic banks procuring more deposit through offering competitive rate. It also implies that conventional banks have more scope to procure low cost and no cost deposit than Islamic banks.

In conventional banks NNII ratio ranging between 1.37 to 1.78 with an average of 1.60 and in Islamic banks NNII ratio ranging between 0.50 to 0.79 with an average of 0.61 and average NNII in conventional banks is more consistent which is 2.62 times higher than Islamic banks implies that conventional banks generating fee based income serving in diverse group of customers.

In conventional banks OOE ratio ranging between 1.62 to 1.94 with an average of 1.78 and in Islamic banks OOE ratio ranging between 0.94 to 1.04 with an average of 1.00 and average OOE in Islamic banks is more consistent which is 1.78 times lower than conventional banks implies that Islamic banks have more control over their other operating expenses.

In conventional banks Spread ratio ranging between 1.41 to 2.24 with an average of 1.76 and in Islamic banks Spread ratio ranging between 1.18 to 1.59 with an average of 1.35 and average Spread in Islamic banks is more consistent but it is 1.30 times higher in conventional banks than Islamic banks implies that conventional banks generating higher net interest margin.

In conventional banks Burden ratio ranging between -0.11 to 0.57 with an average of 0.18 and in Islamic banks Burden ratio ranging between 0.25 to 0.48 with an average of 0.39 and average Burden in Islamic banks is more consistent but it is 2.17 times lower in conventional banks than Islamic banks implies that conventional banks can profitably manage non-interest expenses.

In conventional banks OP ratio ranging between 1.44 to 1.74 with an average of 1.58 and in Islamic banks OP ratio ranging between 0.77 to 1.14 with an average of 0.96 and average OP in conventional banks is more consistent which is 1.65 times higher than Islamic banks implies that conventional banks can profitably manage interest income, non-interest income, interest expenses & non-interest expenses.

In conventional banks NP ratio ranging between 0.68 to 0.78 with an average of 0.71 and in Islamic banks NP ratio ranging between 0.32 to 0.41 with an average of 0.34 and average NP in conventional banks is more consistent which is 2.09 times higher than Islamic banks implies that conventional banks can profitably handle all income & expenditure elements.

In conventional banks ROA ranging between 0.99 to 1.18 with an average of 1.06 and in Islamic banks ROA ranging between 0.53 to 0.64 with an average of 0.57 and average ROA in conventional banks is more consistent which is 1.86 times higher than Islamic banks implies that conventional banks can properly utilize assets to generate more return.

In conventional banks ROE ranging between 11.98 to 14.72 with an average of 12.99 and in Islamic banks ROE ranging between 10.21 to 12.66 with an average of 10.85 and average ROE in

conventional banks is more consistent which is 1.20 times higher than Islamic banks implies that conventional banks can properly utilize equities to generate more return.

Thus Islamic banks are in better position than conventional banks in respect of profit earned ratio, profit paid ratio, OOE ratio and conventional banks are in better position than Islamic banks in respect of NNII ratio, Spread ratio, Burden ratio, OP ratio, NP ratio, ROA, ROE. ANOVA shows that this difference in profit earned ratio, profit paid ratio and Spread ratio are significant at 5% significance level resulting null hypothesis is rejected and shows trends are not identical in these three parameters, but the difference in NNII ratio, OOE ratio, Burden ratio, OP ratio, NP ratio, ROA, ROE are not significant at 5% significance level resulting null hypothesis is not rejected and banks trends are identical in these seven parameters.

4.3. Growth Rate Analysis

4.3.1. Total Income Growth Rate

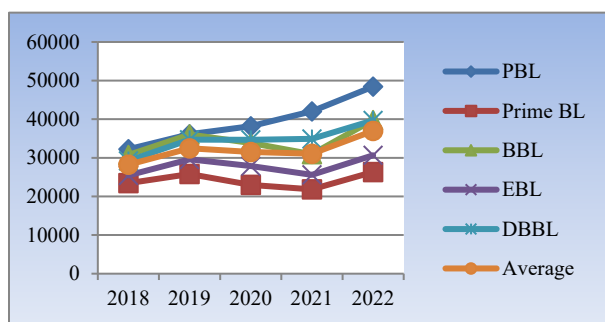
Table 5 as well as **Figure 1** and **Figure 2** reveal that total income growth rate of conventional banks ranging in between 1.12 to 1.50 with an average of 1.30 and total income growth rate of Islamic banks ranging in between 1.00 to 1.37 with an average of 1.17. Thus average total income growth rate in conventional banks is 1.11 times higher than Islamic banks. It is a better indication in favor of conventional banks than Islamic ones.

Table 5: Total Income Growth Rate

Conventional banks	PBL	Prime BL	BBL	EBL	DBBL	Average
	1.50	1.12	1.29	1.20	1.36	1.30
Islamic banks	IBBL	FSIBL	SIBL	EXIM	SJIBL	Average
	1.37	1.21	1.00	1.14	1.13	1.17

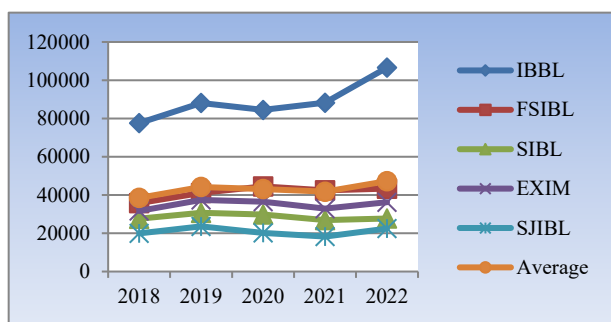
Source: Authors' calculation from the respective banks' annual reports (2018-2022).

Figure 1: Income (Conventional Banks)



Source: Authors' own development.

Figure 2: Income (Islamic Banks)



Source: Authors' own development.

4.3.2. Total Expenditure Growth Rate

From **Table 6**, **Figure 3**, and **Figure 4**, it can be seen that the total expenditure growth rate of conventional banks ranging in between 0.99 to 1.59 with an average of 1.27, and the total expenditure growth rate of Islamic banks ranges between 0.92 to 1.49 with an average of 1.17. Thus, the average total expenditure growth rate in conventional banks is 1.09 times higher than

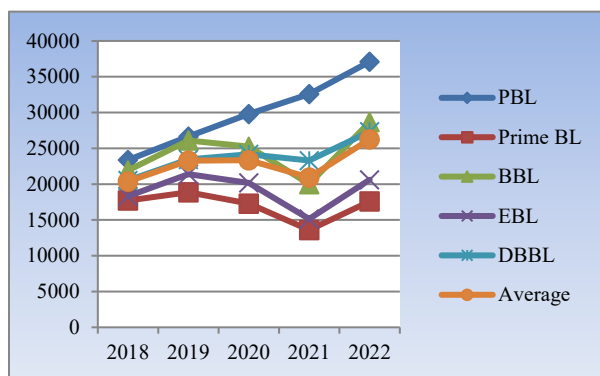
that of Islamic banks. It also indicates that more total income associated with more total expenditure in conventional banking groups.

Table 6: Total Expenditure Growth Rate

Conventional banks	PBL 1.59	Prime BL 0.99	BBL 1.31	EBL 1.13	DBBL 1.33	Average 1.27
Islamic banks	IBBL 1.49	FSIBL 1.19	SIBL 1.07	EXIM 1.18	SJIBL 0.92	Average 1.17

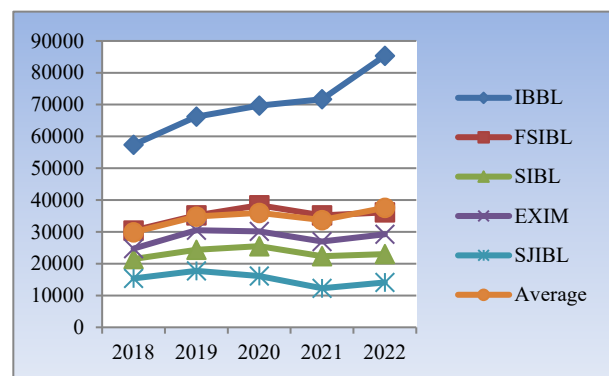
Source: Authors' calculation from the respective banks' annual reports (2018-2022).

Figure 3: Expenditure (Conventional Banks)



Source: Authors' own development.

Figure 4: Expenditure (Islamic Banks)



Source: Authors' own development.

4.3.3. Total Income to Total Expenditure (TI-TE) Growth Rate

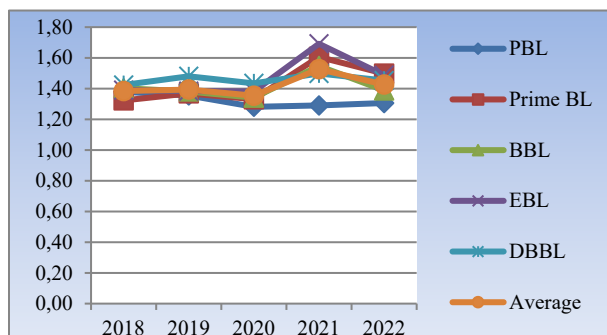
From **Table 7** as well as **Figure 5** and **Figure 6** it is also evident that total income to total expenditure (TI-TE) growth rate of conventional banks ranges in between 0.95 to 1.13 with an average of 1.03 and total income to total expenditure (TI-TE) growth rate of Islamic banks ranges in between 0.92 to 1.23 with an average of 1.01. Thus average TI to TE growth rate of conventional banks is 1.02 times higher than Islamic banks and it indicates that conventional banks are generating more operating income through efficiently managing their operating costs.

Table 7: Total Income to Total Expenditure (TI-TE) Growth Rate

Conventional banks	PBL 0.95	Prime BL 1.13	BBL 0.99	EBL 1.07	DBBL 1.02	Average 1.03
Islamic banks	IBBL 0.92	FSIBL 1.02	SIBL 0.94	EXIM 0.97	SJIBL 1.23	Average 1.01

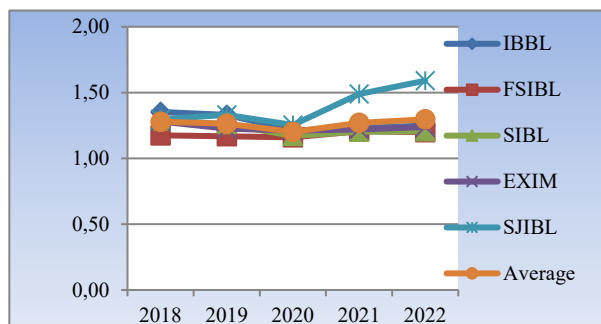
Source: Authors' calculation from the respective banks' annual reports (2018-2022).

Figure 5: TI-TE (Conventional Banks)



Source: Authors' own development.

Figure 6: TI-TE (Islamic Banks)



Source: Authors' own development.

4.3.4. Profit growth Rate

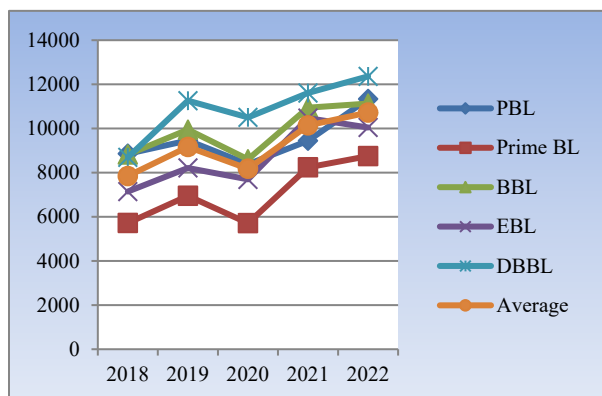
From the **Table 8** also from the **Figure 7** and **Figure 8** it is identified that profit growth rate of conventional banks ranges in between 1.26 to 1.53 with an average of 1.37 and profit growth rate of Islamic banks ranges in between 0.77 to 1.82 with an average of 1.12. Thus average profit growth rate of conventional banks is 1.22 times higher than Islamic banks and it indicates that conventional banks growth trends are better than Islamic counterparts.

Table 8: Profit growth Rate

Conventional banks	PBL	Prime BL	BBL	EBL	DBBL	Average
	1.28	1.53	1.26	1.41	1.42	1.37
Islamic banks	IBBL	FSIBL	SIBL	EXIM	SJIBL	Average
	1.05	1.35	0.77	1.01	1.82	1.12

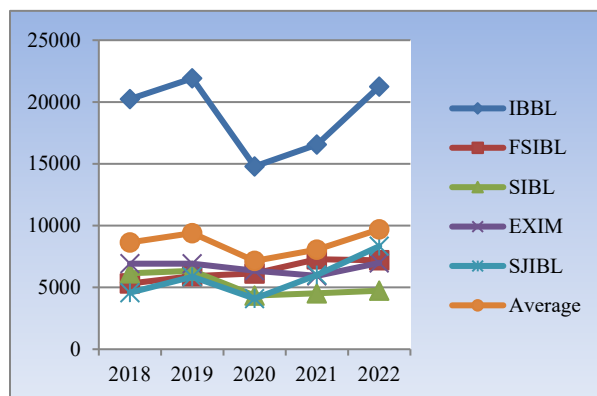
Source: Authors' calculation from the respective banks' annual reports (2018-2022).

Figure 7: Profit (Conventional Banks)



Source: Authors' own development.

Figure 8: Profit (Islamic Banks)



Source: Authors' own development.

4.4. Key Profitability Indicators of CB & IB

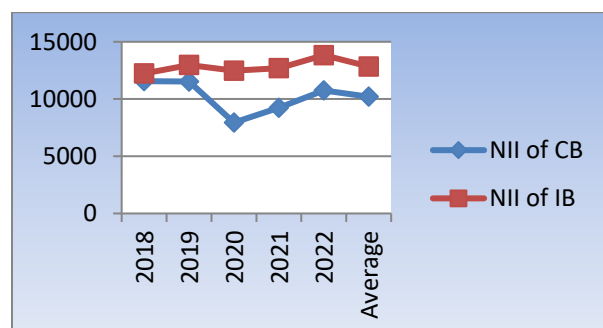
The key profitability indicators are Net Interest Income (Investment Income) [NII], Net Non Interest Income (Non Investment Income) [NNII], Return on Asset [ROA] & Return on Equity [ROE]. The key profitability indicators analyzed in **Table 9** and visualized in **Figures 9 to 12** offer a comparative understanding of the financial performance of conventional banks (CB) and Islamic banks (IB) in Bangladesh during 2018-2022.

Table 9: Profitability Indicators of CB & IB during 2018-2022

	Indicators	2018	2019	2020	2021	2022	Average
Conventional banks	NII	11559.36	11524.60	7941.15	9236.42	10753.58	10203.02
	NNII	(3712.02)	(2359.23)	235.82	904.12	(28.92)	(992.05)
	ROA	1.18	1.03	0.99	1.04	1.04	1.06
	ROE	14.72	12.55	11.98	12.61	13.11	12.99
	Indicators	2018	2019	2020	2021	2022	Average
Islamic banks	NII	12231.30	12973.48	12477.68	12690.98	13832.02	12841.09
	NNII	(3591.87)	(3585.09)	(5334.72)	(4630.92)	(4132.51)	(4255.02)
	ROA	0.59	0.55	0.53	0.53	0.64	0.57
	ROE	10.37	10.21	10.44	10.57	12.66	10.85

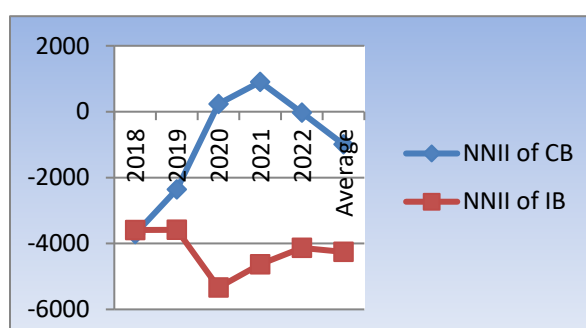
Source: Authors' calculation from the respective banks' annual reports (2018-2022).

Figure 9: NII Comparison of CB and IB



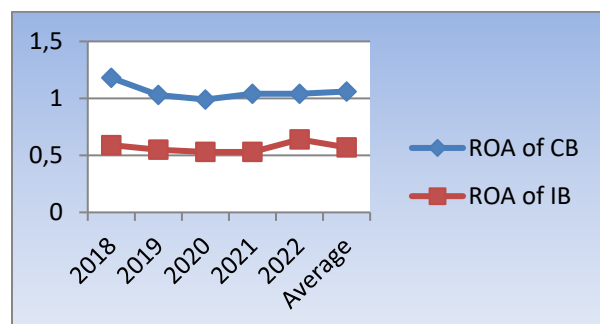
Source: Authors' own development.

Figure 10: NNII Comparison of CB and IB



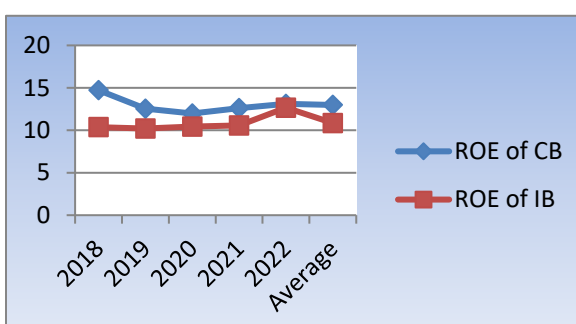
Source: Authors' own development.

Figure 11: ROA Comparison of CB and IB



Source: Authors' own development.

Figure 12: ROE Comparison of CB and IB



Source: Authors' own development.

Islamic banks growth trend with respect to NII are in better position than conventional banks and conventional banks growth trend with respect to NNII, ROA & ROE are in better position than Islamic banks. For measuring profitability of a commercial bank ROA & ROE are the two important weapons. Thus overall profitability of conventional banks is better than Islamic counterparts in Bangladesh during 2018-2022.

4.5. Comparative Deposit and Loans & Advances (Investments) of CB & IB

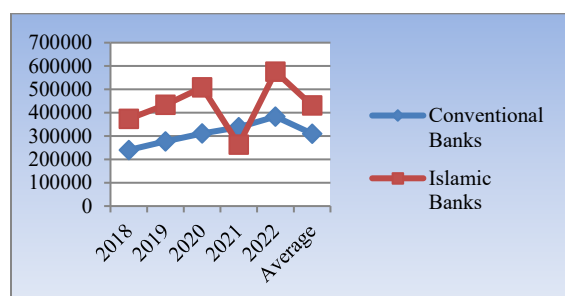
Deposit is the cheap & main source of funding and banking loan (investment) is the main sources of income for a commercial bank. The comparison of deposits and loans & advances (investments) for conventional banks (CB) and Islamic banks (IB), presented in **Table 10** and visualized in **Figures 13 and 14**, highlights the funding and income dynamics of these two banking systems during 2018–2022.

Table 10: Deposit and Loans & Advances of CB & IB during 2018-2022

	Index	2018	2019	2020	2021	2022	Average
Conventional banks	Deposit	240404.69	277299.02	311278.80	337916.10	383274.56	310034.64
	Loans & Advances	231117.48	250674.27	264673.76	309945.11	368391.59	284960.44
	Index	2018	2019	2020	2021	2022	Average
Islamic banks	Deposit	373631.88	433962.40	508693.48	263257.55	575687.86	431046.64
	Investment	377889.84	424607.76	483031.07	257105.73	621347.25	432796.33

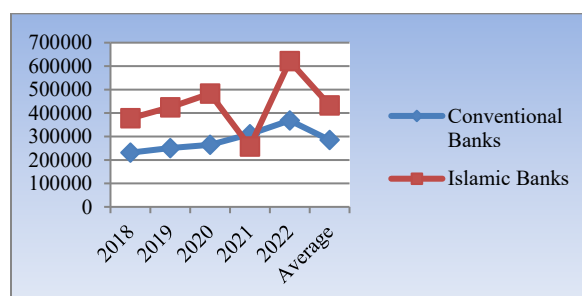
Source: Authors' calculation from the respective banks' annual reports (2018-2022).

Figure 13: Deposit Comparison



Source: Authors' own development.

Figure 14: Loans & Advances (Investments) Comparison



Source: Authors' own development.

Islamic banks are in better position than conventional banks with respect to deposits and loans & advances (investments). Deposits may be procured at no cost, low cost or high cost. Procurement of more deposits leads to disbursement of more loans (investments) which ultimately leads to more profitability. More deposits significantly support profitability (Alharthi, 2016). Higher deposits and investments show a good indication in coming future for Islamic banks in Bangladesh.

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4.6. Findings

5.1. Findings

Islamic banks (IB) perform better in respect of profit earned ratio, profit paid ratio, OOE ratio than conventional banks (CB). These differences in profit earned ratio, profit paid ratio are significant at 5% significance level resulting null hypothesis is rejected and shows trends are not alike in profit earnings and profit payment of two groups of banks, but the difference in OOE ratio is not significant at 5% significance level resulting null hypothesis is accepted and shows trend is alike in other operating expenses (OOE) of CB and IB.

Conventional banks (CB) perform better in respect of NNII ratio, Spread/NIM ratio, Burden ratio, OP ratio, NP ratio, ROA, ROE than Islamic banks (IB). This difference in Spread or NIM ratio is significant at 5% significance level resulting null hypothesis is rejected and shows trend is not alike in spread or NIM of CB and IB, but the differences in NNII ratio, Burden ratio, OP ratio, NP ratio, ROA, ROE are not significant at 5% significance level resulting null hypothesis is accepted and shows trends are alike in NNII, Burden, OP, NP, ROA & ROE of two groups of banks.

Conventional banks have higher Income-to-Expenditure growth rate, profit growth rate, ROA & ROE than Islamic banks. Thus conventional banks are more profitable than Islamic ones.

5.2. Recommendations

To enhance profitability, the following measures are recommended:

1. Conventional banks should increase interest income through disbursement of more quality loans & advances.
2. Conventional banks should procure more deposits bases.
3. Conventional banks should control or minimize other operating expenses.
4. Islamic banks should concentrate to introduce more fees based services for generating more NNII income.

5. Conclusion

This paper aims to conduct a profitability analysis of five conventional and five Islamic banks in Bangladesh for the period of 2018-2022. The analysis shows that conventional banks outperform Islamic banks on key profitability measures, including Return on Assets (ROA) and Return on Equity (ROE), while Islamic banks exhibit stronger performance in Profit Earned Ratio (PER) and Profit Paid Ratio (PPR). It also shows significant differences in certain metrics, such as Spread or Net Interest Margin (NIM), suggesting distinct operational and financial dynamics between the two banking models. Islamic banks are steadily increasing their market share in terms of assets, financing, and deposits, demonstrating their contribution to the economic development of the country. Conventional banks, with their longer-established systems and processes, maintain a competitive edge in profitability, but Islamic banks continue to grow and innovate, signaling promising prospects for the future.

The study provides policy implications for policymakers, bank managers, and stakeholders; it explains that conventional banks should enhance their efficiency by managing costs and diversifying income sources. In the same way, Islamic banks must work on introducing the new

fee-based services and increase operation efficiency in order to raise the level of profitability and competitiveness.

This paper lays down a benchmark for comparing the profitability of conventional and Islamic banks in Bangladesh. The future research work could use greater sample size and increase the period of study to cover wider perspective. The use of macroeconomic variables like inflation and GDP growth can aid in understanding the external factors that affect profitability. Furthermore, the investigation of customers' behavior and their attitude might foster understanding of the impact of consumers' confidence and satisfaction on the performance of the banking sector. Finally, the comparative assessment in terms of the banking models during the period of crises including the COVID-19 pandemic could unveil the strengths and weaknesses of the models.

There are some limitations with this study. First, it has been carried out on five selected conventional and five selected Islamic banks, which might not be sufficient to portray the overall Banking sector of Bangladesh. A larger sample size would increase the generalization of the results obtained. Second, the study period is five years, and this hampers the analysis of long run trends and structural changes in the banking industry. Third, the reliance on secondary data constrains the accuracy of the findings to the reliability of the data sources.

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Impact of Institutional Risk Management, Technological Adoption, and Climate Change Adaptation on Ghana's Crop Productivity

*Dexter Senanu Kofi Hewlett^a, Evans Tee^b,
Kojo Essel-Mensah^c, Janet Owusu Asabre^d

^aDepartment of Banking and Finance, University of Professional Studies, Accra, Ghana

^bDepartment of Economics and Actuarial Science, University of Professional Studies, Accra, Ghana,

^cDepartment of Mathematical Statistics and Actuarial Science, University of the Free State, South Africa,

^d The International Institute of Tropical Agriculture (IITA)

Corresponding author: dhewlett@upsamail.edu.gh,

evans.tee@upsamail.edu.gh, EsselMensahKA@ufs.ac.za, ^d J.Owusu-Asabre@cgiar.org

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Abstract

This study investigated the impact of Agricultural Technology Adoption (ATA), Climate Change Adaptation Measures (CCAM), and Institutional Risk Management (IRM) on crop production (CP). The purpose of this study is to assess how these variables influence agricultural productivity and identify the key drivers of successful crop production in the context of climate change and institutional challenges. A quantitative research design was employed utilising survey data collected from farmers across different agricultural regions. Structural equation modelling (SEM) was used for data analysis to examine the relationships between ATA, CCAM, IRM, and CP. The findings indicated that ATA, CCAM, and IRM had a positive and statistically significant effect on crop production. This study highlights that adopting advanced technologies, implementing effective climate change adaptation strategies, and strengthening institutional risk management can significantly enhance crop productivity. This study contributes to the literature by emphasising the importance of technological adoption and risk management strategies in agriculture. These practical implications suggest that policymakers should prioritise the integration of ATA and IRM into agricultural policies to promote sustainable and resilient agricultural practices, thereby improving overall crop production and food security.

Keywords: Agricultural Technology Adoption, Climate Change Adaptation, Institutional Risk Management, Crop Production, Policy Implications.

JEL Codes: Q12, O33, Q54.

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1. Introduction

Ghana's economy is dependent on agriculture, which is essential for export revenue, food security, and employment (Nkansah-Dwamena, 2024; Asare-Nuamah et al. 2023). Several risk factors, such as the effects of climate change, institutional inefficiencies, and the inadequate incorporation of contemporary technology, have contributed to the fact that crop productivity has not reached its potential (Agyei-Holmes et al., 2023; Ayojimi et al., 2023). The necessity for comprehensive solutions to resolve these issues is underscored by the ongoing productivity disparity. A comprehensive method for overcoming these obstacles and attaining sustainable agricultural development is provided by the amalgamation of institutional risk management, technical implementation, and climate change adaptation strategies (Afriyie et al., 2023; Grigorieva et al., 2023).

The agricultural industry's resilience, which has faced numerous challenges, is inextricably linked to crop productivity in Ghana. These consist of market volatility, financial uncertainty, inadequate infrastructure, and erratic weather conditions (Sekyi et al. 2023). Addressing these challenges necessitates effective institutional risk management, particularly through policies that provide financial protection, extension services, and regulatory frameworks (Eghan & Adjasi, 2023). However, bureaucratic inefficiencies and resource constraints have frequently impeded the effectiveness of these endeavours.

The integration of technology is a critical component of agricultural development. In numerous developing nations, mechanisation, precision agriculture, and mobile information systems are acknowledged as critical factors that increase productivity (Tham-Agyekum et al., 2024; Redclift, 2023). However, the adoption of these technologies in Ghana is restricted due to their high costs, insufficient technical expertise, and limited access to financing (Jones et al., 2023). These challenges are further complicated by the escalating effects of climate change, which include insect infestations, elevated temperatures, and irregular rainfall patterns (Campbell et al., 2023). A unified framework that integrates institutional, technological, and adaptive strategies is necessary to resolve these interconnected difficulties.

Empirical research that investigates the combined impact of institutional risk management, technological adoption, and climate change adaptation on crop output is still scarce, despite the growing recognition of the intricate nature of agricultural hazards. The majority of research conducted in Ghana has focused solely on one or two variables. Torsu et al. (2024) examined the role of extension services in reducing production hazards, while Antwi-Agyei and Amanor (2023) examined the challenges associated with technology adoption. Asante et al. (2024) assessed the effectiveness of climate-smart agriculture; however, they did not establish a direct correlation between it and technological and institutional challenges. The interplay of various variables on agricultural productivity is significantly compromised by this disparate methodology, which leads to significant deficiencies in comprehension. It is imperative to rectify this research deficiency in order to develop comprehensive policies that enhance the productivity and resilience of Ghanaian agriculture.

The objective of this investigation was to evaluate the synergistic effects of institutional risk management, technological implementation, and climate change adaptation strategies on agricultural productivity in Ghana. The objective of this investigation is to

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- i. Evaluate the influence of institutional risk management techniques on crop productivity.
- ii. To examine the impact of technological adoption on crop productivity.
- iii. Assessment of the efficacy of climate change adaptation strategies on crop productivity.

The following research questions guide this study:

- i. To what extent does institutional risk management influence Ghana's crop productivity?
- ii. How does technological adoption enhance crop productivity?
- iii. What role do climate change adaptation measures play in mitigating crop productivity loss?

For various reasons, it is imperative to investigate the correlation between institutional risk management, technological adoption, and climate change adaptation measures. This study provides empirical evidence to inform policy decisions that prioritise developing agricultural resilience. Effective risk management policies can significantly reduce farmers' vulnerability to market and environmental disruptions, as Aduhene-Chinbuah et al. (2024) emphasized. Ghana's strategic objectives for agricultural modernization under the "Planting for Food and Jobs" initiative are consistent with the role of technology in addressing the productivity gap, as emphasized in this study (Ministry of Food and Agriculture, 2022). Third, the research combines climate change adaptation into the analysis, acknowledging the existential threat that global warming poses to food security and livelihoods (Tham-Agyekum et al., 2024). Significant implications for farmers, policymakers, and researchers will result from the findings of this study, which will offer actionable insights for the promotion of sustainable agricultural development.

A fragmented approach has been primarily used in previous studies on agricultural productivity in Ghana, with a focus on individual variables rather than comprehensive frameworks. The impact of technological innovations was not taken into account by Batung et al. (2023), who demonstrated that institutional support, such as access to credit and insurance, mitigates production risks. Financial and knowledge barriers to technology adoption were identified by Osei et al. (2023); however, they neglected to consider the influence of institutional frameworks and environmental factors.

The importance of climate-smart agricultural practices was emphasised by Anang and Dagunga (2024); however, they did not investigate their interaction with technological and institutional factors. The necessity of a comprehensive approach that considers the interconnections among risk management, technology, and adaptation strategies is underscored by the identified limitations.

Addressing the increasing complexity of agricultural challenges in Ghana, this research is both timely and pertinent. By transcending fragmentary analyses, this investigation offers a comprehensive evaluation of the factors that influence crop productivity. This investigation investigates the dynamics that influence agricultural outcomes by examining the intersections of environmental, technological, and institutional dimensions. The practical solutions provided by these findings will enhance the resilience and productivity of Ghanaian farmers, as well as contribute to academic discourse.

2 Literature Review

2.1 Theoretical Framework

The interconnections between institutional risk management, technological adoption and climate change adaptation strategies are investigated in this study through the application of a variety of

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theoretical frameworks. The Resource-Based View (RBV) posits that the efficient utilisation of resources by institutions, including agricultural systems, results in a competitive advantage (Malhotra et al., 2024). Institutional frameworks, technologies, and adaptive measures are indispensable resources in agriculture that necessitate strategic management to enhance productivity. In order to achieve stability and growth,

Risk Management Theory provides a framework for understanding how producers and institutions can anticipate, assess, and mitigate risks (Jankensgard & Kapstad, 2021).

The interconnections between the institutional, technological, and adaptive dimensions are underscored by the synthesis of these theories. The financial risks associated with the adoption of advanced technologies can be mitigated through institutional support, while adaptive measures can promote technological innovation by resolving environmental uncertainties. The exhaustive examination of factors that affect crop productivity is guided by this theoretical framework.

The current literature on agricultural productivity in Ghana reveals significant deficiencies in the comprehension of the interplay between institutional risk management, technological adoption, and climate change adaptation strategies. There is a scarcity of research on the collective impact of these factors, despite the fact that they have been examined separately. Batung et al. (2023) investigate the obstacles to technology adoption; however, they fail to recognise the importance of institutional support and climate adaptation. The advantages of CSA practices are underscored by Osei et al. (2023); however, they fail to integrate these discoveries with technological and institutional factors. The identified deficiencies underscore the importance of a comprehensive framework that evaluates the synergies and trade-offs between these dimensions.

2.2 Institutional Risk Management

It is imperative to implement institutional risk management in order to mitigate uncertainties and improve the stability of agricultural systems. This encompasses credit facilities, regulatory policies, extension services, and agricultural insurance schemes. Aigbavboa et al. (2023) states that effective institutional frameworks are essential for mitigating production risks, particularly in the presence of environmental uncertainties and market volatility. The availability of credit enables producers to invest in contemporary inputs that increase productivity. Acheampong et al. (2023) argue that bureaucratic inefficiencies and insufficient transparency in their distribution methods diminish the potential benefits of institutional support. The evidence from Kenya has shown that agricultural output is considerably increased by well-structured institutional interventions, such as cooperative farming schemes (Borter and Malik 2023). The prerequisite for context-specific assessments of institutional risk management in Ghana is emphasized by these constructing results. Additionally, institutional risk management functions as a catalyst for innovation and adaptation and as a protective mechanism. Effective policies can facilitate the adoption of sophisticated agricultural practices (Aigbavboa et al. 2023). In Ghana, the effectiveness of these interventions is frequently diminished due to the disparity between policy design and implementation, which is frequently the result of fragmented institutional frameworks. This investigation aims to evaluate the optimization of institutional risk management in conjunction with technological and adaptive strategies to address existing gaps.

2.3 Technological Adoption

The adoption of technology in agriculture has become fundamental to improving productivity and resilience. Innovations, including precision farming, mechanisation, and mobile-based advisory services, have shown considerable potential in addressing productivity gaps in sub-Saharan Africa (Anang & Dagunga, 2024). Mobile platforms providing real-time weather updates and market prices have facilitated informed decision making among farmers, resulting in increased yields. Ghana's adoption rates are low, primarily because of financial constraints, limited technical expertise, and insufficient infrastructural support (Aduhene-Chinbuah et al., 2024).

Although research has demonstrated the beneficial effects of technology on agricultural productivity, it has frequently overlooked the interaction between technology and additional elements, including institutional frameworks and climate adaptation strategies. Anang and Dagunga, (2024) assert that supportive institutional policies are essential for technological interventions to realise their full potential. Borter and Malik (2023) indicated that the lack of risk-sharing mechanisms, including insurance, discourages farmers from utilising high-cost technologies. This study seeks to address this gap by analysing the role of technological adoption within a comprehensive framework that incorporates institutional and environmental factors.

2.4 Climate Change Adaptation Measures

Climate change poses a significant risk to agricultural productivity, especially in nations such as Ghana, where agricultural systems rely heavily on natural weather patterns. Measures for adaptation, including crop diversification, water conservation, and implementation of drought-resistant seeds, have been extensively advocated as effective solutions (Gyamerah et al., 2023). Erekaló and Yadda (2023) assert that climate-smart agriculture (CSA) practices mitigate the negative impacts of climate variability while simultaneously improving long-term productivity. However, the success of these measures often depends on their compatibility with local conditions and availability of institutional support.

The adoption of climate change adaptation measures in Ghana has been inconsistent despite their apparent benefits. Amankwah (2019) identified lack of awareness, restricted access to climate-resilient technologies, and insufficient funding as contributing factors. Acheampong et al. (2023) contended that the majority of adaptation strategies are reactive, prioritising short-term gains over the development of long-term resilience. This study aimed to evaluate the effectiveness of climate change adaptation measures alongside institutional and technological factors to address existing shortcomings.

The literature highlights the significance of institutional risk management, technological adoption, and climate change adaptation measures for improving crop productivity. Existing studies have frequently employed a fragmented approach, neglecting the interdependencies among these factors. This study aims to overcome this limitation by employing an integrated framework that analyzes the interactions between these dimensions and their impact on agricultural outcomes in Ghana. The efficacy of climate change adaptation strategies alongside institutional and technological influences.

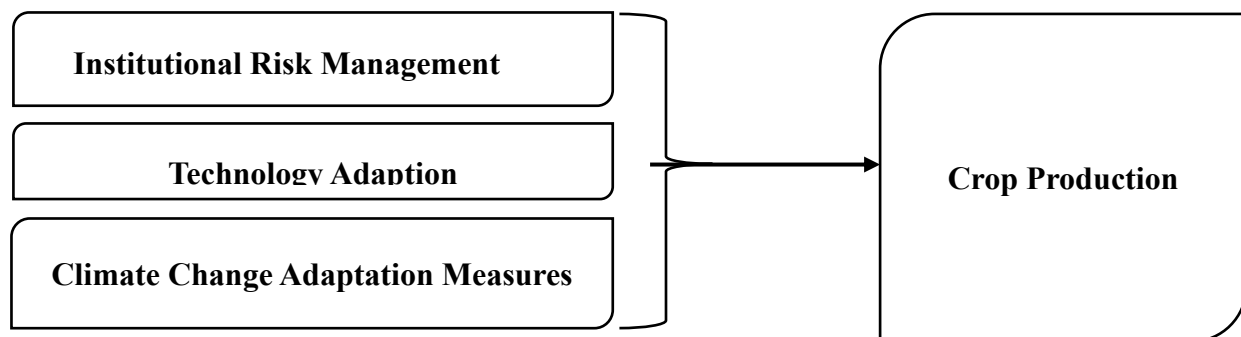


Figure 1 Conceptual Framework

3. Research Method

3.1 Research Design

This study employed a quantitative design to examine the effects of institutional risk management, technological adoption, and climate change adaptation on crop productivity in Ghana. This study employed a quantitative approach to facilitate the systematic collection, analysis, and interpretation of numerical data to examine the relationships among the variables of interest. This design enables the application of statistical tools to evaluate the magnitude and direction of relationships, yielding robust and generalizable findings (Creswell, 2017). The survey methodology was chosen for its efficiency in gathering data from a substantial sample of respondents (Bryman, 2016), especially in geographically dispersed areas, such as Ghana's agricultural zones.

3.2 Study Population and Sampling

The study's target population comprised crop farmers from key agricultural regions in Ghana. This population was chosen because farmers are the main stakeholders directly affected by institutional, technological, and environmental factors that affect crop productivity. This study examines farmers involved in crop production interacting with institutional risk management systems, technological tools, or climate adaptation measures. These characteristics ensure that respondents have the necessary knowledge and experience to offer pertinent insights for the study. A stratified random sampling technique was used to ensure representation across various farming regions and farm sizes, thus reducing selection bias and improving the generalisability of the findings (Flick, 2018). The sample size was calculated using Cochran's formula, achieving a 95% confidence level and 5% margin of error, resulting in 1,054 respondents. The sample size was adequate to detect significant relationships and maintain statistical power (Cochran, 1977).

3.3 Data Collection Methods

A structured questionnaire was used as the primary data-collection instrument for this study. The questionnaire comprised two primary sections. Section A presents demographic data on the participants, including age, gender, educational qualifications, and farming experience.

Section B includes items intended to assess the study's primary variables: institutional risk management, technological adoption, climate change adaptation measures, and crop productivity. The items were evaluated using a five-point Likert scale, with 1 indicating Strongly Disagree and

5 indicating Strongly Agree. The scale promotes clarity, consistency, and ease of response, facilitating the use of advanced statistical methods for data analysis (Likert, 1932). Each construct was represented by several indicators obtained from validated scales in previous studies, adjusted to fit the Ghanaian agricultural context.

3.4 Measurement of Variables

The research utilizes A structured questionnaire was used to assess four primary variables: institutional risk management, technological adoption, climate change adaptation measures, and crop productivity. Institutional risk management is evaluated using indicators that examine access to agricultural insurance, training, extension services, and credit facilities. Technological adoption emphasises the implementation of innovations, including mechanised equipment, enhanced seed varieties, fertilisers, irrigation systems, and digital tools. Climate change adaptation measures assess practices, such as crop diversification, soil conservation, water management, and the implementation of drought-resistant crops. Crop productivity, as the dependent variable, was evaluated based on self-reported perceptions of yield enhancements and harvest quality in recent seasons. Table 3.1 presents the constructs and the measurement items. This evaluation of the variables is consistent with earlier research on risk management and agricultural productivity (Makate et al., 2019).

Table 1: Constructs and Measurement Items

Construct	Description/Measurement
ATA1	I practice crop diversification on my farm
ATA2	I use pest-resistant crop varieties to reduce production risk
ATA3	I have invested in an irrigation system to manage water-related production risks
ATA4	I use digital tools or mobile applications to monitor and manage farm activities.
ATA5	I apply precision farming techniques to optimise resource use and improve productivity.
CCAM1	I adopt new technologies in my farming practices.
CCAM2	I use irrigation to manage water availability effectively.
CCAM3	I practice sustainable farming methods (farming practices that preserve the environment like Crop rotation, planting legumes to protect and enrich the soil) to manage environmental risks
CCAM4	I diversify my crops and livestock to reduce the risks associated with climate variability.
CCAM5	I access climate-related information from reliable sources to make informed farming decisions.
CP1	My crop yield meets or exceeds my expectations.
CP2	I am satisfied with the overall productivity of my crops per yield.
CP3	My crop yield per hectare is improving over time.
CP4	The strategies I use significantly contribute to achieving high crop yield per hectare.
CP5	The quality of my crop yield is consistent and meets market or consumption standards.
IRM1	I have hired additional or seasonal workers to help manage my farm activities.

IRM2	I offer regular training programs for my workers to improve their efficiency
IRM3	I regularly hire seasonal workers during peak periods to manage labour shortages.
IRM4	I frequently utilise agricultural extension services for advice and support.
IRM5	I have established contingency plans to manage unexpected risks in my farming operations.
IRM6	I actively participate in cooperative societies or farmer associations to enhance risk-sharing and support.

Source: Authors Own Creation

3.5 Data Analysis

Structural Equation Modelling (SEM) was utilized to analyze the interrelationships among the latent variables: Human Resource Risk Management (HRRM), financial risk management, institutional support, and crop productivity. This method is suitable for evaluating intricate models involving several mediating and moderating variables (Hair et al., 2014). The analysis examined the mediating role of financial risk management and the moderating effect of institutional support through bootstrapping and multigroup analysis, thereby enhancing the robustness and reliability of the indirect and interaction effects (Preacher et al., 2007). This analytical approach guarantees that this study yields valid and reliable insights into the dynamics of risk management in agriculture.

3.6 Ethical Considerations

Ethical considerations were prioritised in this study. All participants received comprehensive information regarding the research objectives and the voluntary aspects of their involvement. All respondents provided informed consent and confidentiality was ensured through data anonymisation. The study complied with the ethical standards established by the Institutional Review Board of the University of Ghana, which safeguarded participants' rights and privacy during data collection.

4. Result and Discussion

Table 2. Descriptive Statistical Analysis Result-Demographic

		FREQUENCY	PERCENT
GENDER	Male	556	52.8
	Female	498	47.2
AGE GROUP	under 20	81	7.7
	21-30	264	25
	31-40	125	11.9
	41-50	243	23.1
	51-60	219	20.8
	above 60	122	11.6
EDUCATIONAL LEVEL	Primary education	270	25.6
	Secondary school education	195	18.5
	Tertiary education	370	35.1

	No formal education	219	20.8
YEAR OF EXPERIENCE	less than 5 years	268	25.4
	5-10 years	245	23.2
	11-20 years	268	25.4
	over 20 years	273	25.9

Source: Authors Own Creation

4.1 Descriptive Analysis

Table 4.1 presents a comprehensive descriptive statistical analysis of the respondents' demographic characteristics, encompassing variables such as age, sex, educational level, and farming experience. This analysis provides a foundational understanding of the composition of the sample and emphasises the diversity within the respondent population. The analysis systematically examined the demographic dimensions to identify patterns that may influence respondents' perspectives and practices related to risk management and crop productivity. Demographic variables are essential for contextualising the study's findings, as differences in age, educational attainment, or experience may influence individuals' perceptions and the adoption of risk management strategies. Comprehending this heterogeneity is essential for analysing variations in the effectiveness and implementation of these strategies in different agricultural contexts.

The study sample demonstrated a gender distribution of 52.8% male and 47.2% female participants. Equal representation enhances the generalisability of the findings and facilitates the analysis of gender-specific agricultural practices and risk-management strategies. Gender diversity in the sample allows for the analysis of differences in roles, decision-making, and resource access between genders, thereby improving the understanding of social dynamics in farming communities.

Age demographics revealed a diverse distribution, with the highest percentage (25%) in the 21–30 age group. This suggests a significant presence of young farmers, indicating the potential for innovation and technological adoption in agriculture. The 41–50 age group (23.1%) and the 51–60 age group (20.8%) underscored the important contribution of middle-aged and mature farmers who possess valuable experience but may face challenges in adopting contemporary practices. The low representation of individuals under 20 years of age (7.7%) highlights the need for initiatives to engage the youth in agriculture.

The educational backgrounds of the participants were diverse; 20.8% had no formal education, 35.1% completed secondary school, and 18.5% attained tertiary education, indicating that secondary education was the most prevalent level achieved. This stratification underscores the varying capacities of farmers to implement risk-management strategies. Farmers with tertiary education are better equipped to spearhead innovation, whereas those with restricted educational backgrounds may need tailored and accessible training to rectify knowledge gaps.

The largest cohort (25.9 %) had more than 20 years of farming experience, signifying a substantial reservoir of practical knowledge in the sample. In contrast, individuals with fewer than five years of experience (25.4%) highlighted the potential to integrate modern agricultural techniques. Farmers with 5–10 and 11–20 years of experience (23.2% and 25.4%, respectively) demonstrated

a notable balance between traditional and modern practices, making them crucial for fostering innovation and enabling knowledge transfer.

4.2 Measurement Model

The reliability and validity of the measurement scales were rigorously evaluated using Confirmatory Factor Analysis (CFA), an advanced statistical method for assessing the structure of latent constructs (Kyriazos 2018). This assessment was aimed at ensuring the reliability and validity of the elements and scales used in the study. The evaluation utilised key metrics such as Cronbach's alpha (CA), Composite Reliability (CR), and construct-specific factor loadings, which serve as essential indicators of the internal consistency and coherence of the measurement model.

Cronbach's alpha was employed to assess the reliability of the individual constructs, with values surpassing the recommended threshold of 0.7, indicating high internal consistency among the items. Composite Reliability confirmed this consistency by showing values exceeding the 0.7 benchmark, indicating that the constructs effectively captured the variance of their related items in relation to measurement error. The Average Variance Extracted (AVE) was used to evaluate convergent validity, yielding results that exceeded the minimum threshold of 0.5, as recommended by Bagozzi and Yi (2012). This suggests that the latent constructs account for a significant amount of variance in their indicators.

The CFA results in Table 2 indicate that all factor loadings exceeded 0.6, signifying robust associations between individual items and their corresponding constructs. The findings demonstrate significant convergence and reliability among all constructs, highlighting the strength of the measurement framework and its appropriateness for hypothesis testing and model validation.

Table 3. Construct reliability, validity, and Multicollinearity

Construct and Items	Factor Loading	Cronbach Alpha	Composite Reliability	AVE	VIF
ATA1	0.777	0.817	0.873	0.578	1.631
ATA2	0.786				1.718
ATA3	0.722				1.453
ATA4	0.733				1.554
ATA5	0.781				1.711
CCAM1	0.730	0.775	0.848	0.527	1.489
CCAM2	0.731				1.509
CCAM3	0.665				1.290
CCAM4	0.735				1.499
CCAM5	0.765				1.568
CP1	0.726	0.811	0.869	0.57	1.433
CP2	0.772				1.622
CP3	0.751				1.603
CP4	0.771				1.728
CP5	0.754				1.600
IRM1	0.742	0.809	0.862	0.513	1.574

IRM2	0.657	1.502
IRM3	0.745	1.676
IRM4	0.752	1.670
IRM5	0.617	1.464
IRM6	0.769	1.836

Source: Authors Own Creation

Table 2 presents the reliability of all constructs, as evidenced by the Cronbach's alpha (CA) values exceeding the accepted threshold of 0.70. This indicates robust internal consistency, suggesting that the items within each construct are well-aligned and effectively assess the intended underlying concept. Furthermore, the Composite Reliability (CR) values significantly improved, highlighting the robustness of internal consistency among the constructs. The results confirm that the constructs effectively represent the shared variance of their associated indicators, thereby strengthening the reliability of the measurement model.

The Average Variance Extracted (AVE), which indicates convergent validity, met the minimum threshold of 0.50, as recommended in the literature. The results indicate that the indicators collectively explained a substantial portion of the variance within their respective constructs, underscoring the validity of these constructs in reflecting their intended dimensions.

Discriminant validity was evaluated by comparing the correlations among constructs with the square root of the Average Variance Extracted (AVE) for each construct in accordance with the Fornell-Larcker criterion (Fornell & Larcker, 1981). Discriminant validity establishes that each construct is conceptually distinct and empirically independent of the other constructs (Ramayah et al., 2018).

Table 4. Discriminant validity Fornell-Larker criteria

	ATA	CCAM	CP	IRM
ATA	0.760			
CCAM	0.748	0.726		
CP	0.650	0.625	0.755	
IRM	0.702	0.685	0.662	0.716

Source: Authors Own Creation

Table 3 indicates that the square root of the Average Variance Extracted (AVE) for each construct consistently exceeded the highest correlation observed with any other construct. This demonstrates that the constructs were separate and did not overlap significantly, which is crucial for preserving the accuracy of the structural model. The results validate the reliability of the measurement model, providing a strong foundation for subsequent hypothesis testing and structural analysis.

The discriminant validity analysis yielded satisfactory results, confirming that the constructs employed in this study were adequately distinct. This distinction is crucial for validating the utility of constructs in subsequent analyses, ensuring that each construct represents a unique and significant aspect of the data. Through this differentiation, the research framework effectively represents the theoretical concepts under investigation, thus enhancing the model's reliability and

robustness. Validation is crucial to confirm the relevance and appropriateness of the constructs in relation to the objectives of the study.

The heterotrait–monotrait (HTMT) ratio was used to evaluate discriminant validity. The HTMT metric is a recognised criterion for assessing the empirical distinctiveness of constructs (Henseler et al., 2015). This method offers a more sensitive and rigorous evaluation of discriminant validity than the traditional approaches. This study's literature indicates varying thresholds for HTMT values: Kline (2011) proposed a conservative threshold of 0.85 or lower, while Teo et al. (2008) recommended a more lenient threshold of 0.90 or below.

The results in Table 4 demonstrate that the HTMT ratios for all constructs were below 0.90, thus satisfying the criterion for adequate discriminant validity. These findings indicate that the constructs are both theoretically and empirically distinct, thereby enhancing the validity of the measurement model. This study adhered to stringent criteria and established a robust basis for the dependable hypothesis testing and interpretation of causal relationships within the structural model.

Table 5. Discriminant validity-HTMT

	ATA	CCAM	CP	IRM
ATA				
CCAM	0.884			
CP	0.794	0.785		
IRM	0.852	0.852	0.811	

Source: Authors Own Creation

The next phase evaluated the degree to which the independent variable accounted for variance in the dependent variable. This study established a measurement model to ascertain the degree to which the independent variable explained the variance of the dependent variable.

Table 6. Model Fit – R Square

	R-square	R-square adjusted
CP	0.520	0.518

Source: Authors Own Creation

The analysis demonstrated an R² value of 0.520 for Crop Production (CP), indicating that 52% of the variance in CP was explained by agricultural technology adaptation (ATA), climate change adaptation measures (CCAM), and institutional risk management (IRM).

4.3 Structure Assessment Model

Table 6 Structure Model Result

	Beta Coefficient	Standard deviation	T statistics	P values
ATA -> CP	0.265	0.046	5.714	0.000
CCAM -> CP	0.189	0.040	4.729	0.000
IRM -> CP	0.347	0.042	8.216	0.000

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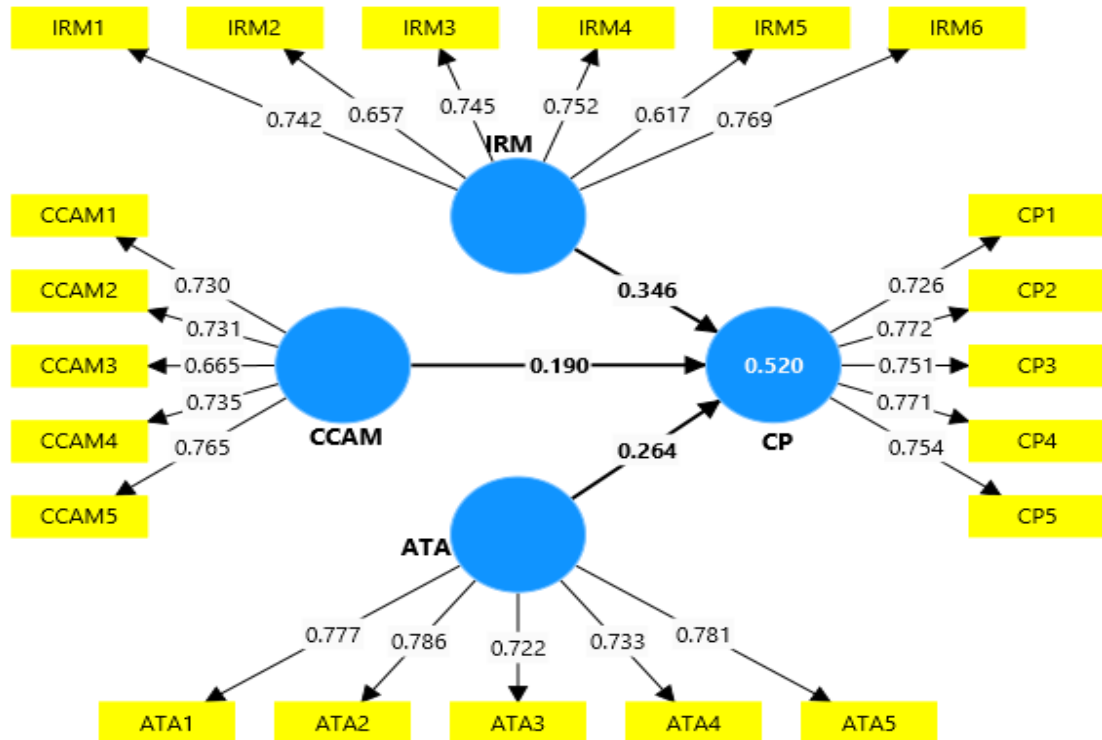


Figure 2 Measurement Assessment Model

The analysis indicates a positive and statistically significant correlation between agricultural technological adoption (ATA) and crop productivity (CP), as demonstrated by the coefficient ($\beta = 0.265$, $t = 5.714$, $p < 0.000$). A 1% increase in ATA correlated with a 26.5% increase in CP, underscoring the significant impact of technological advancements in agriculture. Innovations, including precision farming, mechanisation, and enhanced seed varieties, improve efficiency, decrease resource wastage, and reduce environmental and production risks. This finding highlights the importance of enhancing access to, and adoption of, agricultural technologies to attain sustainable productivity and food security.

The results demonstrated a statistically significant impact of climate change adaptation measures (CCAM) on crop productivity (CP), with a coefficient of ($\beta = 0.189$, $t = 4.729$, $p < 0.000$). This indicates that a 1% enhancement in CCAM may result in an 18.9% increase in CP, highlighting the significance of proactive measures in alleviating the negative impacts of climate variability. Soil conservation, crop diversification, and implementation of drought-resistant varieties improve resilience, optimise resource use, and maintain agricultural productivity. These findings underscore the necessity for focused investments and policy actions to enhance adaptive strategies for sustained agricultural productivity.

The analysis indicates a positive and statistically significant impact of institutional risk management (IRM) on crop productivity (CP), with a coefficient of ($\beta = 0.347$, $t = 8.216$, $p < 0.000$). This indicates that a 1% enhancement in IRM correlates with a 34.7% increase in CP, underscoring the essential function of IRM in stabilising agricultural systems. Effective integrated risk management strategies, including insurance programs, access to financial services, and strong institutional frameworks, reduce production risks and improve farmers' abilities to address market and environmental uncertainties. This highlights the need to enhance institutional support to foster resilience and maximise agricultural productivity.

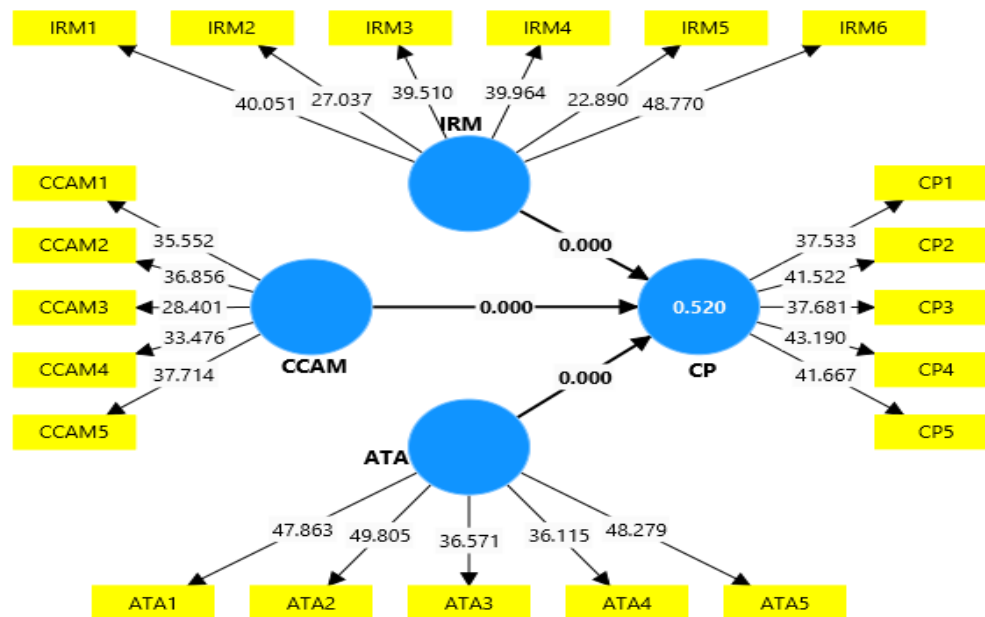


Figure 3 Structure Assessment Model

4.4. Discussion

This study highlights the substantial influence of agricultural technology adoption, climate change adaptation measures, and institutional risk management on crop productivity. The positive correlation between ATA and CP illustrates the significant impact of technology in enhancing agricultural efficiency and productivity. This finding is consistent with research highlighting the significance of mechanisation, precision agriculture, and enhanced seed varieties in boosting agricultural productivity (Jones et al. 2019). Some studies indicate that the benefits of technological adoption may be limited by challenges, including restricted access to resources, insufficient training, and elevated initial costs, especially in developing regions (Smith & Brown, 2020).

This research emphasises the impact of CCAM on CP, suggesting that proactive measures such as sustainable irrigation, soil conservation, and climate-resilient cropping patterns improve agricultural resilience. These findings support previous research, indicating that the adaptive capacity of farmers is essential for alleviating the negative impacts of climate variability (Kumar

et al., 2021). In contrast, other studies indicate that CCAM adoption is inconsistent due to insufficient institutional support, implying that these measures may not consistently lead to substantial productivity improvements (Taylor et al., 2020).

IRM has emerged as the most significant variable, underscoring the critical role of institutional frameworks in the management of agricultural risks and maintenance of sustained productivity. This underscores the research highlighting the importance of effective policies, credit systems, and insurance schemes in mitigating farmers' risk exposure and promoting innovation. Critics contend that institutional inefficiencies, corruption, and inadequate governance structures may diminish the effectiveness of risk management initiatives, consequently restricting their impact on productivity (Williams 2021).

This study illustrates that the ATA, CCAM, and IRM are essential for enhancing CP, highlighting the necessity for integrated strategies to improve agricultural results. Policymakers must prioritise technology dissemination, enhance adaptive measures, and foster institutional development to promote sustainable productivity. Future research should investigate the obstacles to the effective implementation of these interventions and the contextual factors that affect their scalability.

5. Conclusion

5.1 Theoretical Contribution

This study offers important insights into the theoretical framework governing crop production (CP) dynamics. The findings support the principles of the Diffusion of Innovation Theory, highlighting that the adoption of new agricultural technologies (ATA) results in enhanced productivity. The beneficial impact of the ATA on CP supports the theory that innovation disseminates and yields economic advantages over time. These findings support Resilience Theory, emphasising the significance of climate change adaptation measures (CCAM) in improving the capacity of agricultural systems to endure environmental shocks. This highlights the adaptive capacities developed through systematic risk-reduction strategies, which is consistent with theory.

This study is consistent with Institutional Theory, which asserts that strong institutional frameworks improve operational efficiency. The impact of institutional risk management (IRM) on CP illustrates that formalised structures mitigate uncertainties, thereby enhancing productivity. Nonetheless, the results contrast with conventional Production Function Theories, which frequently neglect non-technical elements, such as institutional management and adaptive strategies. The findings enhance theoretical discussions by incorporating socio-institutional dynamics along with production outcomes, underscoring their essential role in agricultural development.

5.2 Policy and Practical Implications

The findings of this study have substantial implications for agricultural development in terms of policies and practices. Policymakers must prioritise the promotion of agricultural technology adoption and institutional risk management as essential elements of sustainable crop production strategies. Incentivising ATA can enhance productivity, while strengthening IRM frameworks can reduce risks and improve agricultural resilience. Integrating climate change adaptation measures (CCAM) into national agricultural policies enhances the capacity of the sector to address

environmental challenges. These insights can guide agricultural policies designed to promote innovation and reinforce institutional frameworks for improved crop production.

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Risk Management and Socioeconomic Drivers of Crop Productivity in Ghana

**Dexter Senanu Kofi Hewlett¹, Evans Tee², Kojo Essel-Mensah³, Charles Adzagbre⁴*

*¹Department of Banking and Finance, University of Professional Studies, Accra, Ghana and
Accra Institute of Technology/Open University, Malaysia*

*²Department of Economics and Actuarial Science, University of Professional Studies, Accra,
Ghana,*

*³Department of Mathematical Statistics and Actuarial science, University of the Free State,
South Africa,*

⁴Department of Finance, KAAF University College, Accra

Corresponding author: [¹dhewlett@upsamail.edu.gh](mailto:dhewlett@upsamail.edu.gh),

[²evans.tee@upsamail.edu.gh](mailto:evans.tee@upsamail.edu.gh), [³EsselMensahKA@ufs.ac.za](mailto:EsselMensahKA@ufs.ac.za) [⁴Chazbre@gmail.com](mailto:Chazbre@gmail.com)

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Abstract

This study explores the impact of risk management strategies and socioeconomic factors on crop productivity among smallholder farmers in Ghana. Utilising a cross-sectional survey design, data were gathered from 4,065,095 agricultural households, as reported by the Ghana Census of Agriculture (2018). The sampling frame, derived from the 37,657 Enumeration Areas defined by the Ghana Statistical Service (GSS), provided a systematic approach for identifying the target population. Key variables include crop productivity (measured in kilograms per hectare), socioeconomic factors (education levels, marital status, and gender), agricultural practices (plot size, mixed cropping, and irrigation), and economic and demographic factors (labour costs, hours of work, average market price of crops, and age). The findings reveal that educational attainment at basic and medium levels significantly enhances crop productivity, while higher education levels do not show direct benefits. Mixed cropping and irrigation practices are shown to significantly increase productivity, underscoring their importance in agricultural risk management. Larger plot sizes demonstrate economies of scale, contributing to higher productivity. Sociodemographic factors such as marital status and gender influence productivity, with male and married farmers achieving higher yields. Labour and input costs are critical determinants of productivity, highlighting the financial risks inherent in farming. The study emphasizes the need for integrated policies that incorporate agricultural insurance, education, financial services, and sustainable farming techniques to build a resilient agricultural industry in Ghana. These findings highlight the potential for agricultural insurance and risk management measures to reduce vulnerabilities and improve sustainability.

Keywords: Agricultural Productivity, Smallholder Farmers, Risk Management, Irrigation, Mixed Cropping, Education, Ghana.

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1. Introduction

Agriculture is the backbone of Ghana's economy, contributing considerably to employment, food security, and rural community development. However, Ghanaian farmers confront various obstacles endangering agricultural production. The principal categories of risk are pricing risk, coming from volatility in market prices, and production risk, stemming from uncertainty in yield levels owing to shifting environmental and operational circumstances (FAO, 2021). Price volatility has been exacerbated by trade liberalisation, which exposes local markets to global price shifts, while production risks are heightened by the effects of climate change, such as irregular rainfall patterns, droughts, and extreme weather events (Antwi-Agyei et al., 2012; World Bank, 2019). Most of Ghana's agricultural industry is controlled by smallholder farmers, who frequently lack the wherewithal to adequately handle these hazards.

Aside from these hazards, there are also biological threats like pests and diseases (Nyantakyi-Frimpong et al., 2019) that negatively influence productivity. Despite the relevance of these hazards, there is a considerable vacuum in thorough research that examines their cumulative and linked consequences on smallholder farmers. Understanding the nature, intensity, and interdependencies of these risks is critical for establishing targeted, effective mitigation solutions (Abaidoo & Agyapong, 2024). In response, it is vital to understand how farmers in Ghana manage these risks to boost crop output and adapt to evolving agricultural conditions. Yet, successive administrations in Ghana have struggled to adopt solid agricultural policies that address these difficulties thoroughly, leaving many smallholder farmers without enough assistance (Ghana Statistical Service, 2020).

Unchecked agricultural hazards can lead to severe decreases in farmers' income, requiring them to draw from their savings or sell off assets to make ends meet. This not only weakens their long-term resilience but also lowers the value of assets in times of broad crisis, since many families seek to sell at the same time (Ellis, 2000). Such financial volatility adds to rural poverty and affects the standard of living for many farmers, underlining the need for good risk management strategies (Owusu & Rahman, 2011). However, the success of existing solutions utilised by farmers and agricultural organisations in Ghana remains questionable, with minimal research examining their strengths and limitations (Danso-Abbeam et al., 2021).

Agricultural hazards, including production, income, and price risks, continue to make the industry unattractive to young people who might otherwise engage in farming as a sustainable vocation. This reluctance contributes to the ageing farmer population in Ghana, providing further concerns for the sector's future viability. Enhancing the resilience of Ghana's agriculture to these different hazards is vital for guaranteeing food security, stabilising incomes, and supporting larger economic development goals (FAO, 2021).

On the other hand, smallholder farmers, who make up the bulk of the agricultural labour in Ghana, have several challenges such as changes in the climate, fluctuations in the market, and limitations on resources (Dercon et al., 2014; Salifu & Salifu, 2024). Limited access to formal risk management strategies, such as agricultural insurance, makes these vulnerabilities even worse. These products might help reduce the negative consequences of crop failure and income volatility (Maddison, 2007; Moomen et al., 2024).

Studies have shown that demographic and socioeconomic factors, such as education and gender significantly influence agricultural outcomes. Farmers with basic education are more likely to adopt innovative practices, including risk management strategies, and enhancing productivity (Barrett, 2008). Additionally, mixed cropping and irrigation systems have been identified as critical techniques for mitigating environmental risks and improving yields (Baffour-Ata et al., 2023). This study aims to explore the interplay between socioeconomic conditions, agricultural techniques, and resource utilisation in shaping productivity among Ghana's smallholder farmers. This research attempts to explore the dynamics of agricultural risk, its influence on crop yield, and the variables determining successful risk reduction.

Addressing these knowledge gaps is critical for informed policymaking and for developing resilient, sustainable agricultural practices that can improve the livelihoods of smallholder farmers and bolster Ghana's food security in the face of future challenges (Antwi-Agyei et al., 2012). This study intends to completely evaluate the complicated link between agricultural risk management techniques and crop yield within Ghana's agricultural industry. Specifically, it studies the dynamics, obstacles, and efficacy of various risk management measures Ghanaian farmers utilise. By doing so, our research gives insights on supporting sustainable agricultural practices that limit risks, increase productivity, and improve farmers' livelihoods. The outcomes of this study are projected to guide policy decisions that promote agricultural resilience, therefore helping Ghana's larger economic development goals (World Bank, 2022).

2. Literature Review

2.1. Theoretical Framework

This research integrates different theoretical approaches to completely explore the dynamics of agricultural risk management, its influence on crop yield, and the adoption of sustainable practices among farmers in Ghana. The theories studied give valuable insights into many parts of the study and correspond with the research aims as follows:

2.1.1. Expected Utility Theory

Expected Utility Theory provides a core framework for understanding farmers' decision-making processes about risk management techniques. Proposed by Von Neumann and Morgenstern (1944), this theory explains how humans make decisions under uncertainty by picking options that maximize their anticipated utility. In the context of this research, it underscores the purpose of examining farmers' selection of risk management measures, guaranteeing they obtain the most advantage. By employing this theory, the study explains the trade-offs farmers evaluate when choosing different risk mitigation options, such as insurance or diversification.

2.1.2. Arrow-Debreu Model

The Arrow-Debreu Model (Arrow & Debreu, 1954) is beneficial for studying the influence of agricultural risk management measures on market outcomes, such as crop prices. This model, anchored on general equilibrium theory, stresses the role of risk allocation and market efficiency in establishing equilibrium prices. Applying this model allows the research to analyze how risk management initiatives, such as futures markets or subsidies, impact price stability, and the larger agricultural market.

2.1.3. Portfolio Theory

Portfolio Theory, created by Markowitz (1952), is used to investigate how agricultural risk management methods affect production. Originating from finance, this theory addresses optimizing risk and return within a portfolio. In agriculture, it is relevant to farmers' decisions to diversify crops, revenue sources, or agricultural practices to minimize risks while optimizing yield. This theory facilitates in measuring the success of such diversification techniques and their effects on total agricultural output.

2.1.4. Adoption Diffusion Theory

Adoption Diffusion Theory, established by Rogers (1962), focuses on the process by which farmers adopt new technology and creative methods. This theory is critical for understanding the factors that impact the adoption of risk management measures, such as climate-resilient crops, enhanced irrigation systems, or financial products like weather-index insurance. By evaluating the distribution of these technologies, the research might identify hurdles to acceptance and recommend measures to boost uptake among smallholder farmers.

2.1.5. Agricultural Risk Management in Developing Economies

Agricultural risk management is vital for limiting the detrimental impacts of environmental, economic, and operational risks on crop yield. Developing nations, where agriculture is predominantly rain-fed, are particularly exposed to climate-related threats (IPCC, 2021). Strategies such as crop insurance, diversification, and access to financial credit have been studied as potential choices for smallholder farmers (Cervantes-Godoy et al., 2013). Crop insurance, for example, offers financial protection against crop loss due to natural catastrophes, although its acceptance remains restricted in many places due to high prices and lack of knowledge (Mahul & Stutley, 2010). In the Ghanaian setting, conventional risk-sharing methods, such as communal support networks, are regularly employed yet may be insufficient to manage large-scale hazards (Abdulai & Huffman, 2020).

Ghanaian farmers have implemented several risk management measures to meet climatic unpredictability and other difficulties. Diversification, such as producing various crop varieties, is a typical technique to prevent revenue loss from crop failure (Nyantakyi-Frimpong et al., 2019). Additionally, farmers apply indigenous knowledge and local techniques, like crop rotation and mixed cropping, to boost resilience against pests and unexpected rains (Olawuyi et al., 2024). Despite these methods, smallholder farmers in Ghana sometimes encounter difficulties in obtaining formal risk management instruments, such as crop insurance or weather forecasting services (Danso-Abbeam et al., 2021).

2.1.6. Impact of Agricultural Risk Management on Productivity

Effective risk management may play a key role in boosting agricultural output and sustainability. Studies have demonstrated that employing risk management strategies not only decreases susceptibility but also boosts resource usage efficiency and improves yield stability (Vigani & Kathage, 2019). For instance, access to agricultural extension services has been associated to better risk management techniques and greater production among smallholder farmers in sub-Saharan Africa (Feder et al., 2019). In Ghana, however, limited extension services and poor infrastructure restrict the broad adoption of better techniques, creating difficulties to sustainable agriculture and food security (Danso-Abbeam et al., 2018).

While there is a growing body of research on agricultural risk management in sub-Saharan Africa, limited works focus explicitly on Ghana's setting. Existing research frequently focuses on regional or national agricultural data, without a specific study of the methods and outcomes

among Ghanaian farmers (Gyimah et al., 2020). This study tries to address this gap by investigating the specific risk management strategies adopted by Ghanaian farmers and evaluating their influence on crop output. Understanding these processes is crucial for policymakers wanting to design targeted measures that boost agricultural resilience and improve rural lives.

2.1.7. Socioeconomic Drivers of Crop Productivity

Education is a cornerstone of agricultural development, enabling farmers to adopt innovative practices and technologies. Studies have shown that basic and secondary education significantly improves productivity by equipping farmers with the knowledge to manage risks effectively, such as diversifying crops or adopting climate-resilient practices (Barrett, 2008). Conversely, higher education levels often have a limited direct impact on productivity, as they may not focus on practical agricultural skills (Doss, 2018). Moreover, targeted training programs tailored to smallholder farmers can amplify the benefits of formal education. These initiatives can bridge knowledge gaps, particularly in understanding agricultural insurance and modern farming techniques (Maddison, 2007).

Gender disparities in resource access significantly affect productivity in Ghana. Female farmers typically experience lower yields compared to their male counterparts due to limited access to land, inputs, and training opportunities (Doss, 2018). Sociocultural norms often exacerbate these inequalities, restricting women's decision-making power in agricultural households. Addressing these barriers through gender-sensitive policies, such as targeted subsidies and training programs, can enhance productivity and resilience (Carter et al., 2017).

The size of farmland is a key determinant of productivity, with larger plots benefiting from economies of scale. Farmers with larger plots are more likely to access credit and invest in improved inputs, resulting in higher yields (Barrett, 2008). However, smallholder farmers, who often cultivate less than two hectares, face significant challenges in achieving similar productivity levels. Micro-insurance schemes targeting smallholders can mitigate risks and reduce the disparities associated with plot size (Dercon et al., 2014).

The cost of labour and the price of inputs are major elements that impact agricultural productivity, especially for crops that demand a lot of work. Smallholder farmers are often constrained in their capacity to hire enough workers or invest in productivity-enhancing inputs like fertilisers and improved seeds due to rising labour costs, which are driven by rural-urban migration and demographic shifts (Fafchamps & Quisumbing, 2005). Comparably, variable input prices, which are made worse by inflation and disruptions in the global supply chain, boost production costs, making it tough for farmers to retain their yield levels at an acceptable level (Adjimoti & Kwadzo, 2024).

Having access to loans and insurance is vital for eliminating these limits. Farmers who have access to financial services can better handle changes in input costs and invest in labour-saving technology, such as automation and precision farming, which enhances overall efficiency and resilience (Ali et al., 2024). In addition, targeted subsidies, cooperative farming, and digital financial solutions, such as mobile-based lending and insurance platforms, have been proven to enhance resource allocation and boost productivity among smallholder farmers (Acheampong et al., 2024).

2.2. The Empirical Literature Review

The empirical literature on agricultural risk management contains a broad range of research addressing difficulties such as climatic variability, market uncertainty, and adoption of new approaches. This review assesses the merits and limits of these works while emphasising prospects for further study, particularly in the context of Ghana.

Several studies have effectively studied the effects of climatic variability on agricultural output. For instance, Schlenker and Lobell (2010) used climate data to examine how variations in rainfall patterns and temperatures influence crop yields across Sub-Saharan Africa, yielding practical insights into regional vulnerabilities. Research on weather-index insurance, such as that by Carter et al. (2017), has further contributed to understanding the function of financial instruments in lowering farmers' susceptibility to climatic shocks. These studies apply rigorous econometric models to statistically correlate climatic shocks with agricultural results, supporting policymakers in devising targeted responses.

Empirical research employing the Adoption Diffusion Theory (Rogers, 1962) has shed light on variables influencing the acceptance of agricultural innovations, such as drought-resistant seeds and enhanced irrigation systems. For example, Abdulai and Huffman (2005) underlined the relevance of knowledge, market access, and extension services in influencing adoption decisions among African farmers. This line of study highlights the need of capacity-building activities to boost farmers' resilience to hazards.

Studies founded in the Expected Utility Theory have studied farmers' risk preferences and their effect on decision-making. For instance, Ferreira et al. (2022) explored how farmers use resources to reduce risk exposure while increasing benefits. Similarly, the use of Portfolio Theory by Hardaker et al. (2004) revealed how crop diversity decreases risk while boosting revenue stability. These findings underline the importance of diversification methods in mitigating production and market risks.

Much of the existing empirical research focuses on global or regional patterns, with insufficient attention on Ghana. Studies such as Dercon and Christiaensen (2011), while enlightening, sometimes generalise findings throughout Africa, missing distinct socio-economic and environmental constraints faced by Ghanaian farmers. This gap underlines the necessity for specialized research to address context-specific dangers.

Other studies frequently isolate risk factors such as climate, market, or pest-related threats. For instance, Asiedu et al. (2024) evaluated the implications of climatic variability on Ghanaian agriculture but did not account for how these risks combine with market variations or insect outbreaks. This compartmentalised methodology fails to reflect the cascading consequences of interrelated hazards, limiting the comprehensiveness of their conclusions. While measures such as subsidies and insurance programs have been introduced in many developing countries, there is minimal empirical evaluation of their efficacy. Despite increasing government spending on agriculture, smallholder farmers in Ghana have not uniformly enjoyed the advantages. While significant investments have been in agricultural development programs such as the "Planting for Food and Jobs" initiative, challenges remain in reaching all farmers, particularly those in remote areas or with limited access to resources (Prah et al., 2023). Smallholder farmers often face barriers such as inadequate infrastructure, high input costs, and limited access to extension services, which hinder their ability to fully benefit from government interventions. This critique underlines the necessity for policy-oriented assessments to inform more fair actions.

Also, studies on technology adoption tend to concentrate on economic and technological aspects while overlooking socio-cultural and behavioural impacts. For instance, Boakye et al. (2024) emphasised that traditional norms and gender dynamics frequently play a significant role in determining adoption practices, however, these characteristics remain underexplored in most empirical investigations.

3. Methodology

This study explores risk management strategies employed by smallholder farmers in Ghana, focusing on their role in promoting sustainable agricultural productivity. The methodology used for this research is designed to collect data on the adoption of agricultural risk management practices, analyse the factors influencing these decisions, and assess the impact of such strategies on agricultural productivity. A quantitative approach using logistic regression will be applied to estimate the likelihood of adopting risk management strategies, based on various factors such as demographic characteristics, farm size, access to resources, and perceived risks.

3.1. Research Design

The study employs a cross-sectional survey design, gathering data at a single point in time to capture the risk management strategies currently utilized by smallholder farmers across Ghana. This design allows for a comprehensive snapshot of the adoption patterns of agricultural risk management strategies (Creswell, 2014).

The target population for this study consists of smallholder farmers in Ghana from the 2018 Ghana Census of Agriculture, with a total population size of 4,065,095. These households represent a significant portion of the agricultural sector, where risk management practices such as crop insurance, diversification, and government-supported programs are crucial for mitigating risks and sustaining productivity (Ghana Statistical Service, 2018). Each farmer was asked to report on their specific risk management strategies and provide relevant demographic and farm-level data.

The sampling frame for this study was based on the 37,657 Enumeration Areas (EAs) defined by the Ghana Statistical Service (GSS) during the 2010 Population and Housing Census. These EAs are geographically defined areas containing approximately 150 households on average, identifiable on maps. The GCA (Ghana Census of Agriculture) has already adopted these EAs for its agricultural surveys, ensuring that they are suitable for this study (Ghana Statistical Service, 2018). The use of EAs provides a clear and systematic approach to identifying the households that formed part of the study. Given that this is a census study, the analysis focused on the entire population. The data was processed and analysed using Stata 17 software to perform the descriptive and Logistic Regression analyses.

3.2. Variables and Measurements

The table below displays the dependent and independent variables and their associated measurement scales.

Table 1: Variables and Measurements

Variable Type	Variable Name	Measurement
Dependent Variable	Crop Productivity	Output of crops per unit area (kg per hectare) (Continuous)

Independent Variable	Education Levels	No Education, JSS/JHS, Middle, Secondary, Voc/Tech/Comm, Post-Secondary, Tertiary (Categorical)
	Marital Status	Married, Single, Others (Categorical)
	Gender	1 = Male, 0 = Female (Dummy)
	Plot Size	Measured in hectares (Continuous)
	Mixed Cropping	1 = Yes, 0 = No (Dummy)
	Irrigation	1 = Yes, 0 = No (Dummy)
	Labour Costs & Other Costs	Measured in Ghana Cedis (Continuous)
	Hours of Work	Total hours allocated to farming weekly (Continuous)
	Price	Average market price of crops (GHS per kg) (Continuous)
	Age	Measured in years (Continuous)

3.3. Analytical Framework

The analysis employs a multiple linear regression model to estimate the contribution of independent variables to crop productivity. The general model is expressed as:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} + \varepsilon_i$$

Where:

Y_i : Crop productivity for household i .

$X_{1i}, X_{2i}, X_{3i}, \dots, X_{ki}$: Independent variables.

β_0 : Intercept term

$\beta_1, \beta_2, \beta_3, \dots, \beta_k$: Coefficients for the independent variables.

ε_i : Error term for household i , capturing unobserved factors.

Model Assumptions

- Linearity: The relationship between predictors and the dependent variable is linear.
- Homoscedasticity: The variance of residuals is constant across levels of predictors.
- Independence: Observations are independent of each other.
- Normality: Residuals are normally distributed.

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Model Evaluation

1. **Statistical Significance:** Individual coefficients were tested using t-tests, with a significance level of $p < 0.05$
2. **Goodness of Fit:** Adjusted R^2 was used to evaluate the proportion of variance in crop productivity explained by the model.

4. Results And Discussions

4.1. Statistic Descriptive

This section analyses data collected for the study on the impact of agriculture risk management on crop productivity among members of agriculture households and persons engaged in agriculture activities in Ghana. The study identified 4,864,276 households, with 2,585,531 being agricultural households. Of these, 3,037,381 persons aged 15 or older are involved in agriculture, with 65.8% being males and 76.6% in rural areas. Most agricultural holders are male, with 87.1% having either basic education (44.0%) or no formal education (43.1%). The marital status of agriculture households is predominantly male, with nearly three-quarters of the population being married. Over half of agricultural household members aged 16 or older are married, with 33.4 percent having never been married. The proportion of married household members in rural areas is higher than in urban areas, and the proportion of males who have never been married is higher than females. The age range of respondents is 18-29 years, with a significant proportion of respondents aged 30-39 years. Education levels are generally low in most sub-Saharan African countries, with farmers often having low levels of education. The study highlights the importance of having the right education levels to boost agriculture productivity, which is currently at its lowest levels in the country.

Ghana's agricultural activity is primarily focused on arable and tree crops, with 77.7% of households cultivating these crops and 39.3% engaged in livestock activities. Females are more likely to cultivate arable crops than males, with a higher proportion of females (80.6%) than males (76.2%). This pattern is observed in both urban and rural areas. The most common land tenure arrangement for crop and forest tree production is ownership through freehold (52.2%) or inheritance (23.5%), with institutions having a higher percentage (75.3%). However, most holders do not have any documentation covering land tenure arrangements. Over half of land parcels used for crop and forest tree production are small, with a higher proportion (71.4%) belonging to females. Most arable crops are produced on land parcels less than 2 acres, while forest trees are larger. Most holders use agricultural equipment that they do not own, with knapsack sprayers being the most commonly owned. Males generally own and use agricultural equipment more than females, with male holders using tractor, knapsack, and mist blower more than females.

Table 2: Correlation Analysis

	Prod	Edu	Plot	Marital	Sex	log_LC	log_OC	log_Age	Log_pric e	Hrs wk	C_syste m	I_farms
Prod	1.000											
Edu	-0.117	1.000										
Plot	0.115	0.128	1.000									
Marital	-0.017	0.103	-0.100	1.000								
Sex	-0.047	0.021	-0.210	0.440	1.000							
log_LC	0.199	-0.039	0.352	-0.064	-0.124	1.000						
log_OC	0.134	0.012	0.343	-0.081	-0.155	0.447	1.000					
log_Age	0.035	0.151	-0.001	0.381	0.102	0.007	-0.011	1.000				
Log_pric e	-0.423	0.057	0.138	-0.038	-0.064	0.055	0.097	-0.014	1.000			
Hrs wk	-0.004	0.120	0.172	-0.090	-0.195	0.079	0.110	-0.070	0.061	1.000		
C_syste m	0.077	-0.132	-0.014	0.071	0.091	0.058	-0.031	0.069	-0.134	-0.110	1.000	
I_farms	0.102	-0.092	-0.170	0.071	0.098	-0.084	-0.274	0.043	-0.145	-0.067	0.176	1.000

4.2. Regression Analysis

The model's R^2 value of 0.268 suggests a decent fit, as it explains a portion of the variance in crop productivity by the predicting variables. A low R-square of at least 0.1 (or 10 percent) is acceptable because some or most of the predictors or explanatory variables are statistically significant. If this condition is not met, the low R-square model cannot be accepted (Ozili, 2023; Saliya, 2023). This demonstrates the complex and diverse nature of agricultural production, in which numerous factors, such as socioeconomic traits, farming techniques, and environmental conditions, interact to influence outcomes. The modest R^2 result indicates that, while the model captures many of the important drivers of productivity, there may be other unobserved factors impacting crop production that were not included in the research.

Table 3: Regression Analysis

A number of obs.	4,065,092					
F(25,4065066)	59586.580					
Prob (F)	> 0.000					
R-squared	0.268					
Adj R-squared	0.268					
Productivity	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
<i>Education level</i>						
Primary	0.034	0.034	1.000	0.317	-0.032	0.100
JSS/JHS	0.135	0.034	4.000	< 0.001	0.069	0.202
Middle	0.116	0.034	3.440	0.001	0.050	0.182
SSS/SHS	0.029	0.034	0.860	0.388	-0.037	0.096
Secondary	0.111	0.034	3.250	0.001	0.044	0.178
Voc/Tech/Comm	0.081	0.034	2.350	0.019	0.013	0.148
Post-secondary-Non	0.022	0.035	0.630	0.526	-0.046	0.091
Tertiary						
Tertiary	0.002	0.034	0.050	0.963	-0.065	0.068
No education	-0.224	0.034	-6.640	< 0.001	-0.290	-0.158
<i>Plot_size(in acres)</i>						
2-<5	0.091	0.002	61.710	< 0.001	0.088	0.093
5-<10	0.531	0.003	214.380	< 0.001	0.526	0.536
10+	0.765	0.004	208.660	< 0.001	0.757	0.772
<i>Marital status</i>						
Informal/consensual union	0.084	0.004	19.920	< 0.001	0.076	0.093
Married	-0.708	0.003	-23.030	< 0.001	-0.077	-0.065
Separated	0.029	0.005	6.330	< 0.001	0.020	0.037
Divorced	0.068	0.005	14.520	< 0.001	0.059	0.078
Widowed	-0.062	0.004	-15.470	< 0.001	-0.070	-0.054
<i>Sex</i>						
Female	-0.105	0.002	-60.040	< 0.001	-0.109	-0.102
log_LabourCost	0.206	0.001	275.320	< 0.001	0.205	0.208
log_Other Cost	0.136	0.001	189.480	< 0.001	0.134	0.137
log_Age	0.227	0.003	85.650	< 0.001	0.221	0.232
Log_price	-0.460	0.000	-	< 0.001	-0.461	-0.459
			1010.810			

Hrs worked(per week)	0.000	0.000	6.710	< 0.001	0.000	0.000
<i>Cropping system</i>						
Mixed cropping	-0.054	0.001	-40.060	< 0.001	-0.057	-0.052
<i>Irrigated Farms</i>						
No	0.298	0.002	193.470	< 0.001	0.295	0.301
cons	2.254	0.036	63.460	< 0.001	2.184	2.323

The study's results provide important insights into the factors that influence crop productivity among Ghana's smallholder farmers. The findings emphasise the role of diverse demographic, socioeconomic, and agricultural practices in determining agricultural outcomes.

Education has a substantial impact on agricultural output, especially among those with JSS/JHS, Middle, Secondary, and No Education ($p < 0.001$). This shows that lower educational levels, particularly basic and middle school education, have an important role in increasing agricultural output. These findings are consistent with earlier research that has highlighted the role of education in enhancing agricultural knowledge and practices, resulting in greater production (Maddison, 2007). Higher education levels, such as postsecondary, non-tertiary, and tertiary, had no significant influence on agricultural productivity (t-values of 0.63 and 0.05, respectively, and p-values of 0.53 and 0.96). These findings imply that, while higher education may provide advantages in terms of off-farm work or other income alternatives, it has little direct impact on crop output in smallholder farming situations. This indicates that investing in basic and secondary agricultural education might enhance smallholder farmers' production. Considering the distinct demands and obstacles farmers encounter is essential for successfully customising educational programs.

The variables Mixed Cropping and Irrigation are both highly significant ($p = 0.000$), indicating that both practices have a considerable beneficial impact on crop productivity. Mixed cropping aids in risk diversification, which is critical in the face of volatile weather and market prices (Danso-Abbeam et al., 2021). Irrigation, which allows farmers to access water during dry spells, also boosts productivity by mitigating the negative effects of seasonal rainfall variability. These findings complement the research, which suggests that implementing water management and varied farming methods may greatly increase production in rain-fed agricultural systems (Zhang et al., 2015). The integration of mixed cropping and irrigation methods may significantly enhance agricultural yield since they collaboratively tackle many issues encountered by farmers. By integrating these measures, farmers may optimise their yields and mitigate risks related to weather variability and market unpredictability.

The plot size variable is likewise highly significant ($p = 0.000$), showing that greater farm sizes lead to better productivity. This conclusion is consistent with research demonstrating economies of scale in agriculture, in which larger farms can invest in better technology, techniques, and resources, resulting in higher yields (Barrett, 2008). However, it is important to highlight that greater farm sizes may be connected with better access to finance and resources, which can boost productivity even more. Moreover, bigger farms may profit from reduced production costs by distributing expenditures over a greater output. This may also enhance the elevated output seen in farms with larger plot sizes. Moreover, bigger farms may possess greater bargaining power in pricing negotiations with suppliers or consumers, resulting in possibly increased earnings. This competitive edge enables companies to endure market volatility more successfully than smaller enterprises.

Marital status was shown to be extremely important ($p = 0.000$), indicating that married farmers produce more. This might be because marital stability is frequently associated with family stability, allowing for better coordination of agricultural operations and resource allocation (Badstue, 2021). Similarly, sex was extremely significant ($p = 0.000$), with male farmers being more productive than females. This might represent gender differences in access to resources, technology, and decision-making authority in agricultural operations (Doss, 2018). These results underscore the relevance of incorporating social issues in agricultural productivity improvements. Addressing gender inequities and fostering fair access to resources might assist increase overall agricultural production and sustainability. Furthermore, policymakers and non-governmental organisations must develop measures that empower female farmers and guarantee women have equal chances in the agricultural industry. By fostering gender equality, not only may production rise, but it can also lead to more sustainable and inclusive farming methods.

The labour cost, other costs, and hours of work variables all had a substantial impact on crop yield ($p = 0.000$). These findings show that investing in labour, both financially and time-wise, is crucial to increasing productivity. Efficient labour resource management and cost control (such as inputs, machinery, and transportation) are critical for optimising outputs (Fafchamps and Quisumbing, 2005). The findings also highlight the necessity of knowing how smallholder farmers divide their time and labour resources among various agricultural chores. Understanding the distribution of labour resources may assist in identifying areas for improvement and raise overall efficiency in crop production. Additionally, applying techniques to simplify labour costs and hours spent might lead to improved yields and eventually enhance the lives of smallholder farmers.

While age and price were shown to be very significant ($p = 0.000$), their contributions to productivity may differ depending on other factors such as experience and market circumstances. Older farmers may benefit from years of agricultural knowledge and expertise, increasing efficiency, yet price swings might influence farmer incentives and profits. The relevance of these elements reinforces the importance of market stability and the role of experience in increasing productivity. Overall, policymakers and stakeholders need to evaluate the interaction of these elements to establish a favourable climate for sustained agricultural output. Additionally, additional studies might dive deeper into how various combinations of age, price, experience, and market circumstances affect productivity in the agricultural industry.

The findings of the study can be directly related to the role of agricultural insurance and risk management in enhancing crop productivity and mitigating vulnerabilities faced by smallholder farmers. The significant impact of lower educational levels (JSS/JHS, Middle, Secondary, and No Education) on crop productivity highlights the need for targeted education and awareness campaigns. Farmers with basic education may better understand the benefits of agricultural insurance products and adopt risk management practices effectively. Conversely, the insignificance of higher education suggests that insurance programs should focus on simplifying policy terms and procedures to accommodate farmers with limited educational backgrounds. This aligns with earlier studies that have shown educational campaigns significantly improve farmers' understanding of agricultural insurance and risk management practices, leading to greater adoption (Maddison, 2007; Dercon et al., 2014).

The significant influence of mixed cropping and irrigation on productivity underscores the importance of integrating these practices into agricultural risk management strategies. Mixed

cropping inherently diversifies risks by spreading reliance across multiple crops, thereby reducing the impact of crop failure on overall income (Danso-Abbeam et al., 2021). Similarly, irrigation mitigates water-related risks, a critical concern in rain-fed agriculture. Agricultural insurance products can be designed to encourage and support these practices, offering lower premiums for farmers employing mixed cropping or irrigation systems. Index-based insurance schemes, particularly those linked to water availability or crop yield thresholds, can be tailored to protect farmers against climate-related risks.

The positive relationship between plot size and productivity suggests economies of scale, where larger plots allow for better resource utilisation and access to credit and insurance products. Farmers with larger plots are more likely to afford insurance premiums and adopt risk management practices due to better financial stability and access to formal credit markets (Barrett, 2008; McKinsey & Company, 2024). Smallholder farmers with smaller plot sizes, however, are often the most vulnerable to risks but the least insured. Micro-insurance schemes targeting these farmers can address this disparity, providing affordable coverage for those unable to access traditional insurance products.

The significant influence of marital status and gender on productivity suggests that these demographic factors also play a role in risk management behaviour (Sapbamrer et al., 2024). Married farmers may have greater financial stability and labour resources, enabling better adoption of insurance and other risk management tools (Phiri, 2015). On the other hand, the lower productivity among female farmers highlights gender disparities in resource access, which can also affect their ability to participate in insurance programs (Doss, 2018).

The strong relationship between labour costs, other costs, and hours worked with productivity underscores the financial burden faced by farmers. These costs, along with unpredictable price fluctuations, highlight the financial risks inherent in farming. Agricultural insurance can offset these risks by protecting farmers against income shocks resulting from crop failure, rising input costs, or falling market prices (Fafchamps and Quisumbing, 2005). Income-stabilising insurance policies can ensure farmers' ability to meet labour and input costs even during adverse conditions. Also, bundling insurance with credit products can provide the liquidity needed to sustain labour-intensive farming operations.

5. Conclusion

This research emphasises the importance of socioeconomic conditions, agricultural techniques, and resource utilisation in impacting crop yield among Ghana's smallholder farmers. Key findings suggest the following:

1. Educational attainment, particularly at the basic and medium levels, improves agricultural output, but higher education levels have little direct benefit.
2. Mixed cropping and irrigation systems greatly increase production, highlighting their importance as risk-mitigation measures.
3. Plot size illustrates economies of scale since larger farms produce more products.
4. Sociodemographic characteristics, such as marriage status and gender, are important predictors, with male and married farmers having greater production levels.
5. Labour expenses, input prices, and hours worked all contribute considerably to higher yields, highlighting the significance of effective resource allocation.

6. The modest R^2 value highlights the importance of unobserved variables including climate shocks and technological adoption on productivity, in addition to important determinants.
7. These findings highlight the importance of socioeconomic, demographic, and agricultural practices in determining production outcomes. They also illustrate the potential for agricultural insurance and risk management measures to reduce vulnerabilities and improve sustainability.
8. Specialised insurance products and policies can help smallholder farmers overcome vulnerabilities and achieve long-term agricultural growth by addressing education, crop systems, plot size, demographic considerations, labour costs, and market risks. Building a resilient agricultural industry in Ghana requires integrated policies that incorporate insurance, education, financial services, and sustainable farming techniques.

Policymakers should implement targeted teaching initiatives to help smallholder farmers understand agricultural insurance and risk management methods. This can be accomplished by streamlining insurance policies to accommodate farmers with low formal education.

Insurers can incentivize farmers using mixed crops and irrigation systems, such as subsidies or premium reductions. As a result, more people will have access to inexpensive irrigation infrastructure, especially in water-stressed areas. Insurers are consequently urged to design policies that incentivize sustainable practices such as irrigation and mixed cropping, thus strengthening resilience and increasing production (Zhang et al., 2015).

Insurers could provide subsidized micro-insurance products specifically for farmers with smaller plots to ensure fair access to risk mitigation instruments (Carter et al., 2017).

Insurers can create gender-sensitive policies, such as tailored subsidies or training programs, to alleviate resource imbalances encountered by female farmers. They can also improve support networks for smallholder farmers, particularly those from disadvantaged demographic groups, to provide fair access to resources and services.

Further research should look into the effects of climate resilience, technological adoption, and pest control techniques on production.

Future research can look at the long-term consequences of insurance uptake on farmer behaviour and production trends.

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Entrepreneurial Characteristics and Entrepreneurial Intention: The Mediating Role of Entrepreneurial Mindset

**Romel C. Nemiño, Fe G. Villamor, Karen Christine A. Bulan,
Shara Jan P. Mendoza**

North Eastern Mindanao State University, Philippines
Corresponding author: rcnemino@sdssu.edu.ph

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Abstract:

This study aims at examining the relationship between entrepreneurial characteristics and entrepreneurial intention as well as the mediating role of entrepreneurial mindset among university students. A descriptive correlational technique was utilized to conduct a non-experimental quantitative research approach to provide a detailed understanding of the influence among the constructs. This study involved 385 fourth-year Bachelor of Science in Hospitality Management (BSHM) and Bachelor of Science in Business Administration (BSBA) students majoring in Financial Management (FM) and Human Resource Management (HRM) who enrolled in entrepreneurship courses. The result reveals that entrepreneurial characteristics significantly positively affect entrepreneurial intention. Additionally, direct and indirect models show that an entrepreneurial mindset mediates the relationship between entrepreneurial characteristics and entrepreneurial intention. This suggests that entrepreneurial characteristics such as locus of control, need for achievement, risk-taking propensity, innovativeness, self-efficacy, and tolerance to ambiguity are important drivers of entrepreneurial intention, with an entrepreneurial mindset that acts as a catalyst that translates these characteristics to intentions. This study highlights the importance of cultivating an entrepreneurial mindset in higher education to bridge the gap between inherent traits and actual entrepreneurial pursuits, which is per the fourth and eighth sustainable development goals, which indicate quality education, decent work, and economic growth. Future investigations are encouraged to explore additional variables and conduct longitudinal studies to better understand this dynamic.

Keywords: Entrepreneurial Characteristics; Entrepreneurial Intention; Entrepreneurial mindset.

1. Introduction:

Entrepreneurship plays an important part in the economy of every country ([Ferreira et al., 2023](#)). A lot of people are considering the idea of entrepreneurship because it gives them an opportunity

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to make their businesses successful ([Baskaran, 2020](#)). However, a lot of students lack the courage to start their businesses despite being required to finish an entrepreneurship course as a prerequisite for their education to become future entrepreneurs ([Galay et al., 2023](#)). The significance of entrepreneurship has led to the attention of various scholars and researchers who are examining the barriers that may prevent an individual from engaging in entrepreneurship ([Kong et al., 2020](#)).

Due to fierce market competition and legal risks, students starting their own businesses must learn how customers react to their products, who the key players are, and what policies they must follow, which takes a lot of time to adapt and might cause hesitation in entrepreneurial intention ([Thy et al., 2022](#)). Therefore, universities must support student entrepreneurs by hosting a number of product contests and providing resources for the launch of new ventures ([Suprpto et al., 2020](#)).

Entrepreneurial characteristics such as creativeness, risk-taking, and opportunity recognition significantly influence students' interests in entrepreneurial professions ([Kollmann et al., 2021](#)). As to the investigation of [Jebsen and Rohlfer \(2024\)](#), the authors pointed out that innovative thinking, passion for starting a business, job satisfaction, and anticipated opportunity advocated entrepreneurial intention. Thus, [Ndofirepi \(2020\)](#) states that entrepreneurs must face high levels of uncertainty, and due to their risk-taking propensity, they often evaluate the pros and cons of their actions before making decisions ([Zhuang & Sun, 2024](#)). The detailed relationship between entrepreneurial characteristics and entrepreneurial intention emphasizes the need for customized teaching methods to develop innovative business-minded leaders ([Hossain, 2021](#)).

Another study conducted by [Zahroh et al. \(2023\)](#) claims that the need for achievement is an important entrepreneurial characteristic that has a significant effect on student's intention to become entrepreneurs, implying educational programs that help students develop a strong need for achievement can better prepare them to face the risks of being an entrepreneur. Thus, [Atiya and Osman \(2021\)](#) argued that entrepreneurial characteristics can predict university students' entrepreneurial intentions, emphasizing that higher education institutions assessing students' potential for entrepreneurship should provide training and education to support small businesses, which will decrease government burden and joblessness after their graduation.

Numerous studies have investigated the relationship between entrepreneurial intention and the mediated impact of an entrepreneurial mindset among university students ([Sutrisno et al., 2024](#)). For instance, when the pandemic entered the Philippines in early 2020, whether Filipinos liked it or not, it changed how today's college students think, particularly about entrepreneurial mentality traits like being aware of opportunity, anticipating risk, tolerating ambiguity, and having positivity in business, which all contribute to the student's intention to start a business ([Arnaut et al., 2022](#)). The research study of [Prayoga et al. \(2023\)](#) highlighted that students with a strong entrepreneurial mindset have high intentions due to their ability to think based on their beliefs and abilities, inspire positive behavior, and apply their knowledge to start entrepreneurship. Therefore, an entrepreneurial mindset shapes students' entrepreneurial intentions and, at the same time [Cui et al. \(2019\)](#) suggested that a school culture that supports entrepreneurial attempts affects students' willingness to succeed. In their study, [Cui and Bell \(2022\)](#) reveal that university students who develop a healthy entrepreneurial mindset can identify business opportunities and be enthusiastic about pursuing such ideas, thereby enhancing their entrepreneurial abilities.

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Entrepreneurial characteristics are fundamental in shaping an individual's entrepreneurial mindset, influencing their entrepreneurial intentions and success (Cui et al., 2019). According to the research of Mukhtar et al. (2021). Personality traits such as a willingness to take risks, a tolerance for ambiguity, and optimism help college students develop an entrepreneurial mindset, which in turn makes them more likely to want to start their own business. Moreover, Rodriguez and Lieber (2020) demonstrated that teaching entrepreneurship improves students' entrepreneurial characteristics especially in areas like communication, collaboration, recognizing opportunities, critical thinking, and problem-solving skills. This indicates how important educational programs are for building a strong entrepreneurial mindset that leads to entrepreneurial success.

Several studies provide empirical evidence of the positive link between entrepreneurial characteristics, entrepreneurial intention, and entrepreneurial mindset. However, these combined constructs were less exploited in the university students especially regarding their interest to engage in business. The primary purpose of this study is to lay the groundwork for important advances in entrepreneurship research and education. It aims to provide a better understanding of the things that affects entrepreneurs' decision-making by looking at the level of entrepreneurial characteristics, entrepreneurial mindset and entrepreneurial intention. The study also determines the relationship between entrepreneurial characteristics and entrepreneurial intention, and the role of entrepreneurial mindset among the students. This study is in accordance with the fourth and eight sustainable development which indicates quality education, decent work and economic growth. Thus, the result of this study would likely offer a useful understanding of how educational programs and interventions can be customized to promote entrepreneurial behavior and thinking amongst forthcoming business leaders.

This study evaluated the implication of entrepreneurial characteristics and entrepreneurial intention through entrepreneurial mindset among the students in the Department of Business and Management of NEMSU-Tagbina Campus, Surigao del Sur. Specific objectives of the study include:

1. Ascertain the level of entrepreneurial characteristics in terms of:
 - 1.1. Risk Taking Propensity;
 - 1.2. Innovativeness;
 - 1.3. Internal locus of Control;
 - 1.4 Need for Achievement; and
 - 1.5 Tolerance of Ambiguity.
2. Identify the level of entrepreneurial intention in terms of:
 - 2.1. Attitude towards the Behavior;
 - 2.2. Subjective Norms; and
 - 2.3. Behavioral Control.
3. Assess the level of entrepreneurial mindset.
4. Determine the significant relationship between:
 - 4.1. Entrepreneurial Characteristics and Entrepreneurial Intention;

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- 4.2. Entrepreneurial Characteristics and Entrepreneurial Mindset; and
- 4.3. Entrepreneurial Mindset and Entrepreneurial Intention.

- 5. Find out the mediating impact of entrepreneurial mindset on the relationship between entrepreneurial intention and entrepreneurial characteristics.

2. Literature Review:

2.1. Entrepreneurial Characteristics

Entrepreneurial characteristics are a set of specific traits that will determine whether this person may be classified as an entrepreneur or not ([Gao & Huang, 2023](#)). Entrepreneurial characteristics are shaped by various factors, such as individual, social, and environmental factors ([Ibidunni et al., 2020](#)). Several authors, such as [Gürol and Atsan \(2006\)](#) and [Hsieh et al. \(2019\)](#), as cited by [Ibidunni et al. \(2020\)](#) argued that individual factors, also known as the trait models, involve the personal characteristics of entrepreneurs. These personal traits are considered to be unique traits, attitudes and values. Meanwhile, social factors include personal experiences, career and family background. On the other hand, environmental factors are external aspects such as opportunities, channels for investment, wealth creation and tax reduction. This study focused more on personality traits as entrepreneurial characteristics.

Various research studies have analyzed certain personality traits as the characteristics of entrepreneurs. In the systematic literature review conducted by [Yangailo and Qutieshat \(2022\)](#), the authors presented various empirical studies that posited different personality traits that successful entrepreneurs possess and those that do not lead to entrepreneurial intention and success. For instance, empirical research posited that successful entrepreneurs have characteristics such as risk-taking propensity, locus of control, need for achievement, self-efficacy, innovativeness and tolerance to ambiguity, among others ([Genç, 2020](#); [Kerr et al., 2017](#); [Nodoro & van Niekerk, 2019](#); [Yangailo & Qutieshat, 2022](#)).

Risk-taking propensity is an individual's ability to avoid potential risks. With high risk-taking propensity, an individual takes advantage of opportunities in decision-making situations ([Yani, 2024](#)). Innovativeness is a crucial attribute for entrepreneurs who constantly seek new opportunities (Steenkamp et al., 2024). In particular, innovation is often what makes entrepreneurs successful ([Pindado et al., 2023](#)).

Entrepreneurs identify different gaps in the market or any areas where existing offers can be enhanced ([Tehseen et al., 2021](#)). Locus of control is an individual's desires, regardless of their ability to control their life conditions. An individual who tends to have an internal locus of control believes that they can control their environment with their actions and that they are responsible for their own destiny ([Mareta et al., 2021](#)). The need for achievement motivates an individual to struggle for success until it is achieved. People with a high need for achievement like to obtain feedback from others to evaluate and improve their performance; as such, entrepreneurs that receive favorable feedback are inspired and driven to succeed ([Damayanti, 2023](#)). General self-efficacy is an individual's persistence in their actions despite facing challenges. As to the investigation of [Idrus and Setiyadi \(2020\)](#), self-efficacy boosts confidence if the individual can

perform the tasks and there are no obstacles to inhibit their work. The construct of self-efficacy is considered to be a determinant factor in mobilizing an individual in the direction of venturing into a new business ([Gielnik et al., 2020](#)). Tolerance of Ambiguity is an individual's ability to handle uncertain situations (Aulia & Evanita, 2020). It is a characteristic of an individual's personality traits that affect their ability to handle and interpret information in situations that have various interpretations ([Yang, 2022](#)). An individual who possesses a high level of tolerance for ambiguity actively seeks out further information to minimize or eliminate uncertainties ([Yu et al., 2022](#)).

The role of entrepreneurial characteristics, especially in students, has been analyzed in the works of many scholars, and each author has indicated that these factors explain why people are successful in their entrepreneurial activities ([Salamzadeh et al., 2014](#)). [Ibidunni et al. \(2020\)](#) posited that this is probably due to the emerging trend that nations must take advantage of youth to improve economic growth and ensure the ongoing success of high-profile firms. Researchers have studied the entrepreneurial characteristics of university students with the purpose of understanding the level of entrepreneurial characteristics of entrepreneurially inclined students and those who are not ([Anwar & Saleem, 2019](#)). Moreover, according to [Hong et al. \(2012\)](#) students' entrepreneurial characteristics can be inferred from their subjective goals, including their motivations and innate psychological attributes.

2.2. Entrepreneurial Intention

A mentality that embraces an entrepreneurial point of view while simultaneously maintaining a focus on one's personal experiences is referred to as entrepreneurial intention ([Suprpto et al., 2020](#)). [Wibisono and Thao \(2023\)](#) defined this as a psychological characteristic that positively has an impact on behavior and encourages an individual to make a determined commitment to participate in the behavior. Many studies have been done on entrepreneurial intention, and the Theory of Planned Behavior (TPB) by [Ajzen et al. \(2009\)](#) is often used for any studies related to the intent of doing an action. This theory says that three main things affect someone's decision to become an entrepreneur: how they feel about the behavior, what they think are the social norms, and how much control they think they have over their behavior ([Zhuoma & Panyagometh, 2023](#)). The theory of planned behavior indicates that entrepreneurial intention is affected by factors such as attitude toward the behavior, subjective norms, and behavioral control ([Mohammed et al., 2017](#)).

An individual's attitude towards the behavior will be determined by the entire set of accessible behavioral beliefs associated with various experiences and outcomes since it encapsulates an individual's personal beliefs and perceived outcomes associated with entrepreneurial actions, which in turn, influence the intention to pursue entrepreneurship ([Liñán & Fayolle, 2015](#)). Subjective norms are the levels of social wellness that people perceive as locking or unlocking a particular behavior ([Masur et al., 2021](#)). The mental states of those important to the individual, such as family, friends, coworkers, and loved ones, impact this factor ([An et al., 2024](#)). Meanwhile, behavioral control pertains to the perception of an individual about the ease or difficulty of performing entrepreneurial behaviors as well as achieving entrepreneurial goals ([Asimakopoulou et al., 2019](#)). Along with attitudes and subjective norms, behavioral control is an essential component in determining the desire to become an entrepreneur, including the things like how capable people think they are, the resources they have access to, as well as external limits that may

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benefit or hinder entrepreneurial activities ([Liñán & Fayolle, 2015](#)).

A study conducted by [Mei et al. \(2020\)](#) claims that the educational system and schools have a crucial effect on the growth and future development of entrepreneurial intentions. These institutions offer educational and growth opportunities that can promote entrepreneurial skills, knowledge, and mindset and integrate entrepreneurship education into the curriculum that might enable educational institutions to assist students in developing ambitions to become entrepreneurs through curricular modifications and the establishment of an environment that fosters innovation and willingness to take risks ([Cui, 2021](#)). According to the findings of a study that was conducted by [Abun et al. \(2022\)](#), the desire of students to start their own businesses is a challenging topic that requires greater research for the purpose of fully understanding how to successfully apply several kinds of approaches in order to accomplish this objective. It is important for someone to have an entrepreneurial intention before it is possible to begin the lengthy procedure of starting a business because intending to start a business is considered to be a step before actually executing it ([Jones et al., 2022](#)).

For example, the attitudes toward the behavior of the students can be garnered through educational interventions and experiential learning approaches ([Castaldi et al., 2020](#)). When they are taught entrepreneurship, their understanding of how they would perceive themselves improves through acquiring new entrepreneurship knowledge, skills, and confidence in embracing entrepreneurship ([Fayolle & Gailly, 2015](#); [Wardana et al., 2020](#)). The study of [Vargas-Martínez et al. \(2023\)](#) disclosed that a positive attitude toward entrepreneurship has a significant influence on the entrepreneurial intention of the students to enter entrepreneurship. Numerous scholars concur that attitudes toward behavior that emerged because of entrepreneurial education influence student's intention to start and manage their businesses ([Bahaw et al., 2024](#); [Maydiantoro et al., 2021](#); [Mohammed et al., 2017](#); [Otache et al., 2019](#)). [Wijayati et al. \(2021\)](#) further argued that entrepreneurship attitudes are higher in business students than those who are not.

Academicians determined that subjective norms notably contributed to the entrepreneurial intention of university students, which means that supportive social environments increase the chances of engaging in entrepreneurial pursuits ([Al-Jubari, 2019](#); [Maydiantoro et al., 2021](#); [Mohammed et al., 2017](#)). Subsequently, [Lestari et al. \(2022\)](#) posited that the influence of subjective norms towards entrepreneurial intention may vary depending on social context. For instance, [Karimi et al. \(2021\)](#) stated that there is a higher level of emphasis on the outcome of subjective norms in collectivist traditions because of the value of social harmony and conformity to group expectations. This cultural factor provides an understanding of the importance of family and community's role in the decision-making process ([Chahal et al., 2024](#); [Chua et al., 2021](#)). Entrepreneurial education programs that involve social networks and provide mentorship opportunities can enhance the positive effects of subjective norms, thereby fostering stronger entrepreneurial intentions ([Bahaw et al., 2024](#); [García-Rodríguez et al., 2013](#); [Kusumojanto et al., 2021](#)). Nonetheless, [Mawardi and Baihaqi \(2020\)](#) disclosed that subjective norms do not significantly affect entrepreneurial intention.

Intentions are the best predictor of any intended behavior, including entrepreneurship and acquiring knowledge about the basic causes that drive intentions enhances our comprehension of

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the intended behaviors ([Shrivastava & Acharya, 2020](#)). Studies show consistent findings that individuals who believe that they have a lot of control over their behavior are more likely to be interested in establishing their own businesses ([Shinnar et al., 2014](#)). For instance, [Kurjono \(2022\)](#) states that perceived behavioral control strongly affects entrepreneurial behavior emphasizing the relevance of self-confidence and perceived abilities in entrepreneurial decision-making. Similarly, [Bahaw et al. \(2024\)](#) contend that individuals feel to be more capable of starting entrepreneurship with higher behavioral control. Various empirical studies also found that perceived behavioral control has positively influenced entrepreneurial intentions ([Aga, 2023](#); [Mawardi & Baihaqi, 2020](#)), with [Wijayati et al. \(2021\)](#) putting more emphasis on business administration students. Nevertheless, [Mohammed et al. \(2017\)](#) found that perceived behavioral control does not affect entrepreneurial intention.

2.3. Entrepreneurial Mindset

An entrepreneurial mindset encompasses the ability to identify potential customers, possess entrepreneurial consciousness, respond right away, foresee new possibilities, and identify poor decision-making methods ([Asenge et al., 2018](#); [Langemo, 2023](#); [Naumann, 2017](#)). The entrepreneurial mindset influences human behaviors toward entrepreneurial actions and results ([Saptono et al., 2020](#)). There are several factors affecting entrepreneurial mindsets. [Ndlovu et al. \(2023\)](#) argued that it is influenced by cultural and social factors, whereas [Zhang et al. \(2022\)](#) posited that psychological factors greatly contribute to the entrepreneurial mindset development.

Several studies have supported these claims. For instance, [Nazmi \(2020\)](#) concur that the high level of entrepreneurial mindset is influenced by four predictors such as connectedness, innovativeness and entrepreneurial knowledge. It is also correlated with entrepreneurial competencies and predicted by factors such as risk propensity, planning, creativity and financial literacy ([Pihie & Arivayagan, 2016](#)).

Other scholars highlighted the crucial role of higher educational institutions in improving entrepreneurial mindsets, especially among university students by providing institutional support and the accessibility of resources within educational institutions ([Mohamoud, 2024](#); [Pinto et al., 2024](#)). The entrepreneurial mindset is a prerequisite for students who want to enter entrepreneurship and, later on, focus on execution, adapt effectively, and engage everyone in their field of expertise ([Ngwoke et al., 2020](#)). Students can develop an entrepreneurial mindset by actively participating in problem-solving and decision-making activities within business-oriented situations ([Bosman et al., 2022](#)). Thus, universities must teach entrepreneurial thinking to reduce redundant graduates ([Mukhtar et al., 2021](#)). The low level of entrepreneurial mindset of small and medium enterprises entrepreneurs is associated to their lack of entrepreneurial education ([Neneh, 2012](#)). The entrepreneurial mindset is essential for entrepreneurial success. A high level of this aspect is more likely to generate sustainable revenues and achieve success in their entrepreneurship ventures ([Jemal et al., 2023](#)).

2.4. Entrepreneurial Characteristics and Entrepreneurial Intention.

Many researchers and authors have recognized the importance of various personality traits that influence entrepreneurial behavior. Scholars argued that locus of control, risk-taking propensity,

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innovativeness, tolerance to ambiguity and innovativeness are identified to be the five personality dimensions that directly impact entrepreneurial intentions ([Dubey, 2022](#)). Additionally, in a systematic literature review conducted by [Yangailo and Qutieshat \(2022\)](#) entrepreneurial characteristics predict entrepreneurial intention and, ultimately, guarantee entrepreneurial success, highlighting the key top personality traits such as locus of control, need for achievement, innovativeness, self-efficacy and conscientiousness that unarguably predict entrepreneurial intention and success. The apparent link between these constructs implies that personal characteristics enhance the entrepreneurial intention of an individual by boosting their confidence and improving their ability to succeed in entrepreneurial ventures ([Emrizal & Primadona, 2023](#)). This is also true among university students. [Ledi et al. \(2022\)](#) disclosed that there is a need to cultivate these characteristics to promote entrepreneurial activities as students who manifest higher levels of entrepreneurial characteristics could potentially develop their intention toward entrepreneurship. Numerous empirical studies have also determined that locus of control, need for achievement, self-efficacy, and innovativeness affects entrepreneurial intention of entrepreneurs and students ([Agustina & Fauzia, 2021](#); [Asmara et al., 2016](#); [Kurjono et al., 2022](#); [Li-Yu & Jian-Hao, 2019](#); [Ndofirepi, 2022](#); [Nursyirwan et al., 2022](#); [Tentama & Abdussalam, 2020](#); [Uysal et al., 2021](#); [Wang & Huang, 2022](#); [Wathanakom et al., 2020](#)). Nevertheless, some authors revealed that tolerance of ambiguity ([Nazir & Lone, 2022](#); [Susana & Kurjono, 2023](#)) and self-efficacy had no direct effect on entrepreneurial intention ([Romero-Galisteo et al., 2022](#)). Based on the literature, the following hypothesis was drawn.

/H₁: There is a significant relationship between entrepreneurial characteristics and entrepreneurial intention.

2.5. Entrepreneurial Characteristics and Entrepreneurial Mindset

On the other hand, empirical research determined the connection between entrepreneurial characteristics and entrepreneurial mindset. According to the findings of the study of [Jiatong et al. \(2021\)](#) and [Oulhou and Ibourk \(2024\)](#) the characteristics of entrepreneurs, such as self-efficacy and resilience are essential in the process of developing an entrepreneurial mindset. Persons who have these characteristics think creatively, survive in the face of difficulties and are likely to have greater level of confidence which are crucial components of an entrepreneurial mindset. This idea supports the arguments of [Al-Ghazali et al. \(2022\)](#) that personality aspects affect the development of an entrepreneurial mindset. This is further reinforced by the idea of [Handayati et al. \(2020\)](#) who also argued that an entrepreneurial mindset does not only encompass self-efficacy but includes creativity, problem-solving, opportunity-seeking, attitudes, beliefs, knowledge and experience. [Pidduck et al. \(2021\)](#) also added innovativeness and risk-taking propensity as factors contributing a positive correlation with an entrepreneurial mindset. With this, [Aima et al. \(2020\)](#) contends that developing a mindset that benefits the success of entrepreneurs can be achieved by enhancing characteristics like self-efficacy and resilience through customized remedies and educational programs. Therefore, the study posits this hypothesis.

H₂: There is a significant relationship between entrepreneurial characteristics and entrepreneurial mindset.

2.5. Entrepreneurial Intention and Entrepreneurial Mindset

The relationship between having an entrepreneurial mindset and entrepreneurial intention suggests that entrepreneurial mindset increases one's intent towards entrepreneurship ([Jiatong et al., 2021](#)). Research scholar reinforced this idea by positing that the source of innovation and entrepreneurship comes from the minds of individuals and hence, entrepreneurial mindset and entrepreneurial intention are closely associated ([Cater et al., 2023](#)). They further contend that people with entrepreneurial intentions often associate themselves with entrepreneurial activities, such as starting a business and emotionally engaging in the entrepreneurial process. [Ikhram and Novadjaja \(2020\)](#) investigated the manner in which university support and entrepreneurship education have an impact on students' intentions to become entrepreneurs, and they figured out that both of these factors significantly strengthen the mindset of students towards entrepreneurship. Scholars like [Handayati et al. \(2020\)](#) found a positive relationship between entrepreneurial mindset and entrepreneurial intention, thus emphasizing the critical role of entrepreneurship education in developing the entrepreneurial mindset of the students ([Mars et al., 2024](#); [Sun et al., 2023](#)). Hence, this assumption was suggested.

H₃: There is a significant relationship between entrepreneurial mindset and entrepreneurial intention.

Mediating Role of Entrepreneurial Mindset

Numerous research studies have found that entrepreneurial mindset performs a pivotal role between entrepreneurial characteristics and the intention to become involved in entrepreneurial endeavors ([Handayati et al., 2020](#); [Lee & Jung, 2021](#); [Y. Li et al., 2023](#); [Mukhtar et al., 2021](#); [Sun et al., 2023](#)). Possessing an entrepreneurial mindset allows individuals to think like entrepreneurs. Hence, those who have a well- developed entrepreneurial mindset have a greater capacity to transform their entrepreneurial characteristics into actual business goals ([Prayoga et al., 2023](#)). A study conducted by [Bosman and Fernhaber \(2021\)](#) concurred that individuals who have high levels of entrepreneurial mindset are likely to show willingness to develop intentions to engage in business activities. Additionally, the investigation shows that having an entrepreneurial mindset characterized by a positive attitude towards entrepreneurship and the ability to recognize and take advantage of opportunities is associated with a higher likelihood of participating in an entrepreneurial endeavor. Thus, this study hypothesized the potential of an entrepreneurial mindset to mediate the relationship between entrepreneurial characteristics and entrepreneurial intention.

H₄: There is no mediating effect of entrepreneurial mindset on the relationship between entrepreneurial characteristics and entrepreneurial intention.

2.6. Theoretical and Conceptual Framework:

This study is anchored on the Theory of Planned Behavior (TPB), which is an enhancement of the Theory of Reasoned Action ([Ajzen, 1985](#)), which states that an individual's behavior is influenced directly by behavioral intention and perceived behavioral control. [Mentrikoski et al. \(2019\)](#) stated

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that the stronger the intention to engage in the behavior, the more likely the behavior will be performed based on the theory of planned behavior (TPB). Theoretically, planned behavior theory links the intention to start a business and the formation of an entrepreneurial mindset, which is significantly influenced by certain entrepreneurial characteristics ([Handayati et al., 2020](#)). Therefore, this theory will provide entrepreneurial instructions in educational institutions to assist students in their entrepreneurial intentions, as it motivates individuals to take the initial steps toward starting a business as future leaders ([Hassan et al., 2022](#)).

The conceptual framework presented one (1) independent variable, which is the entrepreneurial characteristic assessed by six (6) indicators: risk-taking propensity, innovativeness, locus of control, need for achievement, general self-efficacy, and tolerance of ambiguity ([Anwar & Saleem, 2019](#)). It also presented one (1) dependent variable, which is the entrepreneurial intention, as assessed by three (3) indicators: attitude towards the behavior, subjective norms, and behavioral control ([Li et al., 2023](#)). Entrepreneurial mindset is presented as the mediating variable ([Nazmi, 2020](#))

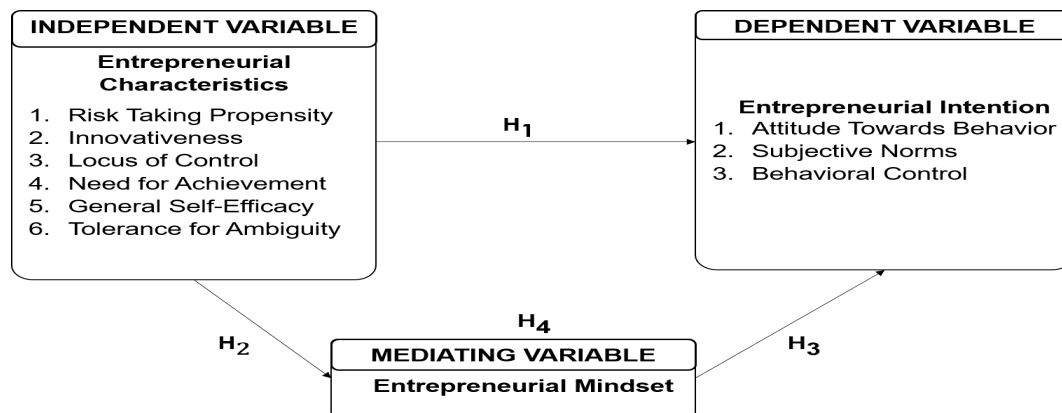


Figure 1. Conceptual Framework

3. Research Method

3.1. Research Design

This study used a descriptive correlational technique to conduct a non-experimental quantitative research approach. A descriptive correlational technique was used to investigate the relationship between entrepreneurial characteristics, entrepreneurial intention and entrepreneurial mindset. Non-experimental quantitative research employing mediation analysis was utilized to conduct the study and determine the degree of entrepreneurial characteristics and entrepreneurial intention, and the mediating effect of the entrepreneurial mindset of the students in the Department of Business and Management in NEMSU- Tagbina Campus.

3.2. Sampling

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The respondents of this study were the students in the Department of Business and Management. Respondents were selected on the basis of randomization through stratified random sampling technique. This study involved 385 fourth-year Bachelor of Science in Hospitality Management (BSHM) and Bachelor of Science in Business Administration (BSBA) students majoring in Human Resource Management (HRM) and Financial Management (FM) students enrolled in the entrepreneurial management course.

3.3. Data Collection

The study primarily utilized a modified closed-ended survey questionnaire in the English language for data collection. The questionnaire has three sets of questions that focus on a specific variable. The first set of questions was about the degree of entrepreneurial characteristics of the student, involving risk-taking propensity, innovativeness, locus of control, the need for achievement, general self-efficacy, and tolerance of ambiguity. The second set of questions focused on the students' degree of entrepreneurial intention. It involves the attitude towards behavior, subjective norms and behavioral control. The third set of questions was the degree of entrepreneurial mindset of the students. The survey items aim to better understand the subject under investigation.

The questions used to assess the entrepreneurial characteristics of the respondents were derived from a multi-item scale developed by [Anwar & Saleem \(2019\)](#). The measurement of entrepreneurial intention was conducted using a scale that was developed by [\(Li et al., 2023\)](#), while the entrepreneurial mindset of the respondents was assessed with a questionnaire that was adapted from [\(Nazmi, 2020\)](#). The study made use of the 5-point Likert scale to assess each of the items in the questionnaire. Respondents were provided with this rating system ranging from (1) strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree, and (5) strongly agree.

The survey questionnaires underwent validation from experts in the field of study that resulted 0.99 using Lawshe's Content Validity Index (CVI). A reliability test was conducted afterwards to assess consistency and accuracy of the sets of questions and generated a Cronbach Alpha value of 0.946.

3.4. Measures

The data collected in this study underwent evaluation and interpretation using descriptive statistics, Pearson r correlation and regression analysis. Descriptive Statistics were used to interpret the level of entrepreneurial characteristics, entrepreneurial intention and entrepreneurial mindset. Pearson Product-Moment Correlation (Pearson r) was preferred to determine the relationship between entrepreneurial characteristics and entrepreneurial intention and entrepreneurial mindset to entrepreneurial intention and entrepreneurial characteristics. Ultimately, regression analysis was used to determine the mediation effect of entrepreneurial mindset on the relationship between entrepreneurial characteristics and entrepreneurial intention

4. Results And Discussion:

4.1. Level of Entrepreneurial Characteristics

Presented in Table 1 is the level of entrepreneurial characteristics. The overall mean level of entrepreneurial characteristics is 3.85, and the standard deviation (sd) of 1.01 indicates a very high

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descriptive level. Among the indicators, *Locus of Control* obtains the highest mean of 3.96, followed by *Need for Achievement* ($\bar{x} = 3.93$). This is followed by *General Self-Efficacy* ($\bar{x} = 3.88$), *Risk Taking Propensity* ($\bar{x} = 3.82$), *Innovativeness* ($\bar{x} = 3.79$), and *Tolerance of Ambiguity* ($\bar{x} = 3.71$) which these characteristics also demonstrate a high descriptive level. These findings show that entrepreneurial characteristics are always manifested among students.

Table 1. Level of Entrepreneurial Characteristics

Indicators	Mean	SD
Risk-Taking Propensity	3.82	1.02
Innovativeness	3.79	0.96
Locus of Control	3.96	1.05
Need for Achievement	3.93	1.06
General Self-Efficacy	3.88	0.98
Tolerance of Ambiguity	3.71	1.01
Overall	3.85	1.01

The very high level of value of locus of control in the context of entrepreneurial characteristics is attributed to its influence on the self-perceived control of success, which increases the students' initiatives and proactive behaviors, risk-taking, and problem-solving skills essential for entrepreneurship. This finding validates the idea of ([Hamzah & Othman, 2023](#)) and ([Mareta et al., 2021](#)) that individuals with an internal locus of control believe that they can influence their environment and that their activities directly affect the consequences or rewards they attain. This finding is also in consonance with the idea of ([Karya et al., 2022](#)) where individuals with strong self-control make themselves believe that their quality of life is self-determined and that their actions lead to life events. They are inclined to believe that they have the ability to influence the results of their endeavors. Thus, they are willing to work hard to achieve success.

As highlighted in the information above, it is most likely that students with a high locus of control have confidence in their own abilities, are more likely to seize opportunities, and are more proactive and alert to entrepreneurial opportunities. These findings are also congruent with the idea of ([Karya et al., 2022](#)) who opined that individuals with a clear vision of the future and internal locus of control are more likely to engage in entrepreneurial activities and start new businesses ([Karya et al., 2022](#)). ([Baldegger et al., 2017](#)) contended that individuals with an internal locus of control think they will succeed in entrepreneurship. Moreover, this characteristic allows owner-managers to find and discover profitable business opportunities ([Asante & Affum-Osei, 2019](#)). As cited by ([Hamzah & Othman, 2023](#)), prior research found a significant connection of internal locus of control to career motivations ([Baldegger et al., 2017](#)), opportunity recognition ([Asante & Affum-Osei, 2019](#)), entrepreneurial intentions of vocational high school students ([Tentama & Abdussalam, 2020](#)), and learning from failure, and resilience ([Zhao & Wibowo, 2021](#)).

The need for achievement also indicates a very high descriptive level. This result is manifested by task interest, positive mood and organizational spontaneity. The study also parallels the idea of ([Akhtar et al., 2020](#)) who also purport that the need for achievement is one of the major motivational factors for learners or students regarding their career choices. Entrepreneurial

characteristics such as general self-efficacy risk, risk-taking propensity, innovativeness, and tolerance of ambiguity form part of the very high descriptive level. Such findings also corroborate to the study of ([Anwar & Saleem, 2019](#)), who argues that students who are entrepreneurially inclined show higher levels of entrepreneurial characteristics such as high-risk taking propensity innovativeness, tolerance of ambiguity, need for achievement, and locus of control, except general self-efficacy which remains similar to those students who are not entrepreneurially inclined.

4.2. Level of Entrepreneurial Intention

Displayed in Table 2 is the level of entrepreneurial intention that exhibits an overall mean level of 3.91 and standard deviation of 1.05. It indicates a very high descriptive level. This result implies that entrepreneurial intention among fourth year students is always manifested. Among the three indicators, *Attitude Towards the Behavior* obtained the highest mean of 4.06 which results to a very high descriptive level. *Subjective Norms* garners a mean of 3.85 also classified as very high descriptive level. *Behavioral Control*, the least among the indicators, generated a mean of 3.83; however, it achieved a very high descriptive level.

Table 2. Level of Entrepreneurial Intention

Indicators	Mean	SD
Attitude Towards the Behavior	4.06	1.06
Subjective Norms	3.85	1.09
Behavioral Control	3.83	1.02
Overall	3.91	1.05

The theory of planned behavior indicates that entrepreneurial intention is affected by factors such as attitude toward the behavior, subjective norms, and behavioral control. ([Mohammed et al., 2017](#)). The findings show an overall result of a surprisingly very high level of the three indicators, thus determining that the students who have undergone entrepreneurial education possess a remarkable entrepreneurial intention. The findings are in agreement with the study by ([Wijayati et al., 2021](#)) who determined that entrepreneurship attitude and perceived behavior in business students appear to be higher than those who are not, thus, perceiving a high level of entrepreneurial intention due to entrepreneurial education they received. Further, the results of prior research posited that entrepreneurial attitude and subjective norms have a significant effect on the entrepreneurial intentions of university students ([Maydiantoro et al., 2021](#); [Mohammed et al., 2017](#)). In contrast to ([Mohammed et al., 2017](#)), perceived behavioral control showed no significant effect on entrepreneurial intention. Nevertheless, ([Aga, 2023](#)), findings emphasized that behavioral control positively predicts entrepreneurial intentions and partially mediates the relationship between entrepreneurship education and entrepreneurial intentions. Similarly, ([Mawardi & Baihaqi, 2020](#)) found that behavioral control and entrepreneurial attitude positively impact entrepreneurial intentions, noting that subjective norms do not have a significant effect.

Further, the exceptionally high descriptive level of the entrepreneurial intention of the respondents may be due to factors such as entrepreneurial education, as these students have enrolled in subjects that supply entrepreneurial knowledge and skills. The very high level of attitude toward the behavior is attributed to a person's negative or positive evaluation of entrepreneurship ([Wardana](#)

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et al., 2020). It also reveals the extent to which the individual considers becoming an entrepreneur favorable. Parallel to the study of (Otache et al., 2019), they observed that changes in attitudes toward behavior occur through the influence of entrepreneurial education, and this was found to have a mediated moderation effect on intentions. Similarly, (Bahaw et al., 2024) noted that a positive change in attitude toward behavior indicates that participants have a favorable perception of starting and managing their own businesses. Because these students have already undertaken entrepreneurial education in the business administration program, they will most likely enhance their attitudes toward behavior.

Subjective norms, another indicator, is an individual's perception of other people's beliefs and expectations toward their entrepreneurial intention (Lavelle, 2019). These influential individuals are their friends, families, partners, and other groups of people (Chahal et al., 2024). The respondents' entrepreneurial education could explain the remarkably high level of subjective norms as they perceived. These results are in consonance with the idea of (Kusumojanto et al., 2021) and (Bahaw et al., 2024) that individuals with entrepreneurial education are more likely to achieve positive approval from others to pursue entrepreneurship as social pressure can affect a person's intention to act. As mentioned in the review paper of (Cardella et al., 2022), the authors noted that the students with entrepreneurial knowledge and skills understood their career paths well, enhancing parental support for entrepreneurship intentions.

Further, behavioral control that achieved a very high descriptive level is attributed to the perceived ease or difficulty in carrying out a behavior (Lavelle, 2019). An empirical study by (Bahaw et al., 2024) determined that an increase in behavioral control means that the participants felt more capable of launching successful embark of entrepreneurship ventures. The author further cited research findings that revealed that both students in vocational education who undergo entrepreneurial education perceive themselves to be more capable of performing entrepreneurial tasks and experience greater control over their entrepreneurial behaviors than those who do not undergo formal entrepreneurial education.

4.3. Level of Entrepreneurial Mindset

Illustrated in Table 3 is the level of entrepreneurial mindset. It generated an overall mean of 3.79 with the standard deviation of 0.98, indicating a very high descriptive level. This result implies that the entrepreneurial mindset is always manifested by the respondents. The indicator *I keep trying until I found the solution to a problem* generated the highest mean of 4.07. It is followed by *I can plan tasks in a project* ($\bar{x} = 3.79$), *I see opportunities where others see it as problems* ($\bar{x} = 3.73$), and *I am often the first to come up with a solution for a problem* ($\bar{x} = 3.58$) which are all classified with very high descriptive level.

Table 3. Level of Entrepreneurial Mindset

Indicators	Mean	SD
I am often the first to come up with a solution for a problem	3.58	0.98
I keep trying until I found the solution to a problem	4.07	1.01
I see opportunities where others see it as problems	3.73	0.99
I can plan tasks in a project	3.79	0.95

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Overall	3.79	0.98
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The entrepreneurial mindset generated a very high overall descriptive level. The entrepreneurial mindset is attributed to an individual's ability to create new ideas, search for and select opportunities, and take the necessary actions to create and manage an enterprise. In essence, it is closely related to an individual's capacity to reason and choose, using available resources to seize opportunities ([Asenge et al., 2018](#); [Naumann, 2017](#)). The findings of the study revealed that the students are capable of creating new ideas, assessing risks and opportunities and starting or managing a business. These results are aligned with the study of ([Nazmi, 2020](#)), positing that there is a high level of an entrepreneurial mindset among university students as determined by the predictors such as connectedness, evaluation, innovative employee and entrepreneurial knowledge. Moreover, the finding is also in consonance with the study of ([Pihie & Arivayagan, 2016](#)), who disclosed that university students have moderate levels of entrepreneurial mindset, which is associated with entrepreneurial competencies. The authors also revealed creativity, risk propensity, planning, and financial literacy as significant predictors of an entrepreneurial mindset. Other scholars highlighted the important role of higher educational institutions in creating a curriculum that targets the enhancement of entrepreneurial mindset among university students ([Pinto et al., 2024](#)).

Other studies have also arrived at similar conclusions in terms of business ventures or work-related aspects. The findings of ([Abun et al, 2022](#)) revealed a high level of entrepreneurial mindset among the employees. The author also noted that an entrepreneurial mindset is correlated to an individual's work performance. On the other hand, this is in contrast to the study by ([Neneh, 2012](#)), which found that entrepreneurs of small and medium enterprises in South Africa had a low level of entrepreneurial mindset. Neneh's study further explained that this is due to the low level of growth mindset and lack of entrepreneurial education, which are significant in the success of an enterprise. In their study, ([Jemal et al., 2023](#)) opined that entrepreneurial mindset was associated to entrepreneurship success in Vancouver. Startups owned by people with higher levels of entrepreneurial mindset are likely to generate sustainable revenues and acquire funding and quality employees. People who have resilient mindsets, accept failures, and do not give up in the course of the venture have higher chances of making their ventures succeed.

Ultimately, the abovementioned studies means that individuals who possess high levels of entrepreneurial mindset are people who have gained entrepreneurial knowledge or entrepreneurial education. Moreover, those individuals who possess entrepreneurial mindsets have the potential to achieve venture success

4.4. Relationship Among Entrepreneurial Characteristics, Entrepreneurial Mindset and Entrepreneurial Intention

Depicted in Table 4 is the correlation between constructs used in this study. These relationships are essential as requisites in the conduct of the mediation analysis. Closely examining the associations between the two constructs, entrepreneurial characteristics and entrepreneurial intention are statistically significant to each other with an r-value of 0.859 and a $p < 0.01$, signifying that H1 was supported. The r-value contributed to the significant overall correlation of

the two main constructs. This suggests that entrepreneurial characteristics and entrepreneurial intention have significant relationship with each other. Moreover, entrepreneurial characteristic is statistically significant to entrepreneurial mindset (r value = 0.841, $p < 0.01$) and entrepreneurial mindset is significant to entrepreneurial intention (r -value = 0.820, $p < 0.01$, signifying that H2 and H3 were deemed acceptable. This generated result indicated that an entrepreneurial mindset is highly associated with entrepreneurial characteristics and entrepreneurial intention.

Table 4. Relationships among Entrepreneurial Characteristics, Entrepreneurial Mindset and Entrepreneurial Intention

<i>Correlated Constructs</i>	<i>r-value</i>	<i>p-value</i>	<i>Decision</i>
<i>Entrepreneurial Characteristic and Entrepreneurial Intention</i>	0.859*	0.00	H1: Accepted
<i>Entrepreneurial Characteristics and Entrepreneurial Mindset</i>	0.841*	0.00	H2: Accepted
<i>Entrepreneurial Mindset and Entrepreneurial Intention</i>	0.820*	0.00	H3: Accepted

The overall result on the correlation of the constructs reveals a positive relationship to each other. From a holistic point of view, entrepreneurial characteristics are always manifested and are positively associated with entrepreneurial intention. A number of research studies have disclosed that students' entrepreneurial characteristics are positively significant in relation to their entrepreneurial intention. The results are congruent to the study of (Wang & Huang, 2022), who determined that internal locus of control has a positive and significant impact on entrepreneurial intention. In the same way, the finding of this study is parallel to the investigation of (Tentama & Abdussalam, 2020), contending that students' internal locus of control can predict students' entrepreneurship intention. Moreover, (Uysal et al., 2021) reported that locus of control has a significant effect on entrepreneurial intention. The author also noted, using conditional indirect effect, that the locus of control depended on sex, with the effect being higher for men.

The study by Wardana et al. (2024) revealed that the need for achievement affects students' entrepreneurial intention. Pursuing this further, Asmara et al. (2016) also revealed a direct effect of the need for achievement and an indirect effect of risk-taking propensity on the entrepreneurship intention of students through entrepreneurship attitude. The same result was found by (Agustina & Fauzia, 2021) on Generation Z. However, it is not mediated by an entrepreneurial attitude. Several scholars have also determined the relationship between entrepreneurial characteristics such as self-efficacy, innovativeness, and tolerance of ambiguity. The result supports the study of several authors as they inferred that entrepreneurial self-efficacy positively influences entrepreneurial intention of students toward entrepreneurship. (Li-Yu & Jian-Hao, 2019; Ndofirepi, 2020; Nursyirwan et al., 2022). In the same way, the finding of this study is parallel to the result of (Wathanakom et al., 2020), contending that innovativeness can effectively predict entrepreneurial intention among undergraduate students. Moreover, locus of control and tolerance of ambiguity had a positive effect on entrepreneurial intention (Kurjono, 2022). These findings support the literature that entrepreneurial characteristics significantly impact entrepreneurship intentions (Sun et al., 2023). Nevertheless, the findings contrast with those of (Romero-Galisteo

[et al., 2022](#)), who reported that self-efficacy had no direct effect on entrepreneurial intention. The study was also in contrast to the empirical study of ([Nazir & Lone, 2022](#)), where their results revealed that the except for tolerance of ambiguity, indicators such as need for achievement, locus of control, self-confidence, risk-taking propensity, and innovativeness influence the entrepreneurial intention of the students. Furthermore, ([Susana & Kurjono, 2023](#)) found that locus of control, self-confidence, need for achievement, and innovation positively and significantly influence social entrepreneurial intentions, while the propensity to take risks and tolerance of ambiguity do not.

On the other hand, the significant association of the three constructs is also supported by different studies. The study's findings are aligned with ([Handayati et al., 2020](#)), who highlighted studies that posited entrepreneurial mindset do not only focus on self-efficacy but also encompasses factors like knowledge, experience, creativity, problem-solving, opportunity-seeking, attitudes, and beliefs. They are in congruence with the entrepreneurial characteristics as highlighted by ([Al-Ghazali et al., 2022](#)), who established that personality aspects played a crucial role in enhancing the entrepreneurial mindset, which impacted the entrepreneurial ambition of university students in Saudi Arabia. In the context of ([Lindberg et al., 2017](#)), an entrepreneurial mindset is a person's orientation toward activities and outcomes associated with entrepreneurship. ([Fayolle & Gailly, 2015](#)) stated the importance of this mindset in the formulation of entrepreneurship decisions and activities.

Other research studies reinforced the conclusion of the study. For instance, the study of ([Pidduck et al., 2021](#)) find that there is a positive correlation between entrepreneurial orientation dimensions, innovativeness, and risk-taking with entrepreneurial mindset. In their model, it is stated that these traits modulate value beliefs with opportunity beliefs, either enhancing or inhibiting their expression. This interplay impacts how such beliefs are looked at by these individuals, what choices are made and what actions are taken, making subjectivity key to the understanding of the entrepreneurial mindset.

Moreover, the findings of the study are supported by empirical studies that demonstrated the association between entrepreneurial mindset and entrepreneurial behavior. The finding is consistent with ([Bahaw et al., 2024](#)), who reported a significant enhancement in the level of entrepreneurial intention among vocational students. This increase was attributed to the entrepreneurial education program that changed not only the intentions of entrepreneurship but also the attitudes, perceived control, and social norms in the creation of businesses for the comprehensive development of the entrepreneurial spirit. Likewise ([Sun et al., 2023](#)) proved that entrepreneurship education both improve the students' entrepreneurial mindset and their intentions of becoming entrepreneurs. ([Handayati et al., 2020](#)) also confirmed a strong relationship between entrepreneurial mindset and students' entrepreneurial intentions; as such, educational programs are critical. Similarly, [Mars et al. \(2024\)](#) noted that for students to possess the right entrepreneurial attitude, their choices of program should incorporate the provision of entrepreneurial leadership training for them irrespective of their academic disciplines, highlighting education on the development of entrepreneurial personal characteristics and intentions.

4.5. Mediating Effect of Entrepreneurial Mindset on the relationship between Entrepreneurial Characteristics and Entrepreneurial Intention

The study aims to determine the mediating role of entrepreneurial mindset towards the relationship between entrepreneurial characteristics and entrepreneurial intention as illustrated in Table 5. The total effect model reveals a significant and positive effect of entrepreneurial characteristics to entrepreneurial intention ($\beta = .949$, $z = 32.97$, $p < 0.01$). The direct effect model also reveals, with the inclusion of the mediator, a significant and positive effect ($\beta = .640$, $z = 12.86$, $p < 0.01$). Furthermore, the indirect effect model depicts a significant and positive effect of entrepreneurial characteristics to entrepreneurial intention as mediated by entrepreneurial mindset ($\beta = .330$, $z = 7.20$, $p < 0.01$). Thus, hypothesis H4 was deemed acceptable.

Table 5. Mediating Result

Effect	Path	β	SE	z	95% CI		p
					Lower	Upper	
Total	EC $\rightarrow$ EI	.95	.03	32.97	.89	1.01	0.00
Indirect	EC $\rightarrow$ EM $\rightarrow$ EI	.33	.04	7.20	.23	.39	0.00
Direct	EC $\rightarrow$ EI	.64	.05	12.86	.54	.74	0.00

Note. EC: Entrepreneurial Characteristics; EM: Entrepreneurial Mindset; EI: Entrepreneurial Intention; SE: Standard Error

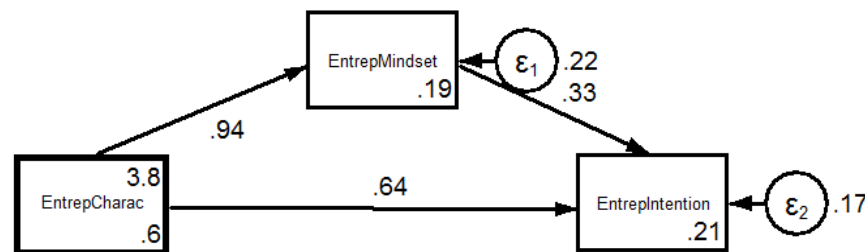


Figure 2. Graph showing regression paths of the variables

This study shows an indirect effect of a significant relationship between entrepreneurial characteristics and entrepreneurial intention mediated by an entrepreneurial mindset. Empirical studies are aligned with the findings of this study, where entrepreneurial mindset mediated two constructs. The study of (Sun et al., 2023) determined that an entrepreneurial mindset mediates the relationship between entrepreneurship education and entrepreneurial intention. (Handayati et al., 2020) also arrived at the same conclusion, highlighting a strong link between entrepreneurial mindset and entrepreneurial intention. Moreover, another study by Lee and Jung (2021) revealed that entrepreneurial mindset mediated the relationship between intolerance of uncertainty and career adaptability. The authors illustrated the importance of cultivating an entrepreneurial mindset during the pandemic. The finding is also parallel with Mukhtar et al. (2021) that entrepreneurial

mindset can explain the relationship between entrepreneurial education, entrepreneurial culture and students' entrepreneurial intention in Indonesia.

5. Conclusion

The findings provide persuasive evidence that entrepreneurial mindset plays a mediating role in the entrepreneurial characteristics and entrepreneurial intention nexus. The findings demonstrate a strong framework that emphasizes the role of intrinsic characteristics and cognitive processes in generating entrepreneurial aspirations. The total effect model suggests that there is a highly significant positive association between entrepreneurial characteristics and entrepreneurial intention. This implies that individuals who exhibit strong entrepreneurial traits, such as resilience, proactivity, and risk-taking, are more likely to express intentions to participate in entrepreneurial activities, thus establishes a fundamental understanding that entrepreneurial characteristics are essential building blocks that drive entrepreneurial intention. Upon examining closely the direct effect model, the introduction of entrepreneurial mindset as a mediator still results in a substantial positive effect, suggesting that the direct relationship between characteristics and intention remains robust, even after accounting for the mediating influence of mindset. This serves as additional confirmation that the entrepreneurial mindset is essential for strengthening the correlation between an individual's characteristics and their aspiration to pursue entrepreneurship. This dynamic is further elucidated by the indirect effect model, which reveals a substantial mediation effect. This finding emphasizes that the entrepreneurial mindset not only directly influences intentions but also enhances the influence of entrepreneurial characteristics on those intentions. Essentially, it functions as a catalyst that converts inherent characteristics into actionable entrepreneurial aspirations.

These discoveries have significant implications for higher education institutions, policymakers, and prospective entrepreneurs especially the students who have the aspirations of such. The integration of business simulations that cultivate an entrepreneurial mindset can be crucial in bridging the divide between innate characteristics and actual entrepreneurial pursuits for educators and training programs. Programs such as turning idea generation into business implementation that are intended to foster critical thinking, resilience, adaptability, and innovation can significantly improve the preparedness of students or participants to engage in entrepreneurial endeavors. Governments can also establish networks which are conducive to entrepreneurship by supporting initiatives that foster the development of the students' entrepreneurial attitudes and characteristics, such as mentorship schemes, workshops, and incubators.

This study comes with several limitations. First, this study focuses on a specific group of students of the Department of Business and Management who underwent entrepreneurial education. Hence, the findings may not be applicable to the general population or other educational institutions and programs. Second, the study only focuses on specific entrepreneurial traits (risk-taking propensity, locus of control, innovativeness, need for achievement, general self-efficacy, and tolerance to ambiguity) and does not include other traits that are relevant to entrepreneurial intention. This recommends further research of the various traits that could provide a more comprehensive understanding of what drives entrepreneurial intention. Third, this study does not include external influences and variables such as institutional support, mentorship, economic conditions, or family

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background that could influence entrepreneurial intention and entrepreneurial mindset. These considerations would provide a more detailed view of the determinants of entrepreneurial intentions and the role of entrepreneurial mindset. The study offers valuable insights into the mediating role of entrepreneurial mindset. However, further research is suggested to investigate additional variables and factors that may affect this relationship. Additionally, longitudinal studies may be advantageous in evaluating the impact of changes in perspective on entrepreneurial intentions as individuals advance through different stages of their careers.

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Impact of Digital Marketing Tools in Customer Purchase Decision towards Shopping Goods in Dhaka City

¹Md. Ujjal Hossain, ¹Abu Hena Md. Mustafa Kamal and
¹Saleh Mohammed Maruf

¹Institute of Science and Technology, National University, Bangladesh
Corresponding Author Mail: mmkiut09@gmail.com

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Abstract

This paper is used to discover the digital marketing tool that affects Consumer buying behavior towards shopping goods. This survey is a part of discovering the factors that affect the consumer's mind. Firstly, a model is created to conduct the study properly, and then the data are analyzed using a Likert Scale (5-point rating scale). Secondly, frequency distribution and percentages were shown to analyze the demographic state of the respondents. Thirdly, to measure, to get some extra information, and to get a clear idea about data, descriptive statistics, such as mean and standard deviation, were used. Finally, multiple regression analysis is used to determine which factor significantly impacts consumer purchasing behavior. SPSS 20.0 has been used to analyze all the data. The findings of the study show that people buy products through digital marketing tools if the website is trusted and user-friendly. Besides, most people are aware of digital marketing tools.

Keywords: Digital Marketing Tools, Shopping Goods, Satisfaction, Social Media, Content Marketing, Trust

1. Introduction

Due to competition and changes brought about by the rise of digital marketing companies that use this strategy because of its affordability and wide reach, every business in the modern world is attempting to hold onto its place in the market. American Marketing Association defined marketing is the motion, set of association and processes for create, communicate, deliver and exchange aid that have value for customers, clients, allies, and society at large. Throughout the history, it has always been important to market the product to its audience and it's the best way to get the brand name out and make sales. Though promotion can be made through many ways, but it's necessary to satisfy the objectives of the organization by minimize the expenses. Digital marketing is the way to satisfy.

[Merisavo \(2006\)](#) pointed out that digital channels are often creating new prospects and ensuring good customer relationships and hence it becomes an essential part of the organization's strategy. Also, digital marketing technology is a new tendency that reaches the worldwide customers efficiently and facilitates them to get the required and updated information in a simplified manner and also provide with economic pricing conveniently. This becomes a part

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of customers' everyday schedules, especially among the younger generation ([Balakrishnan, Dahnil, and Yi 2014](#)).

The application of the internet and related digital technologies in combination with conventional communication to accomplish marketing objectives Digital marketing is the use of the channels in order to reach the desired target market via some of the following channels social media, websites, multimedia advertising, online search engine advertisement, E-marketing, interactive marketing (polls, game adds, mobile marketing). Digital marketing is a new kind of advertising that has given businesses more chances to operate. Digital marketing allows advertisers to quickly and geographically reach out to potential customers directly, regardless of their location. According to recent reports, one of the greatest ways to get past the clutter and communicate with customers directly is through digital marketing. Hence, with the trend toward direct, one-to-one marketing, extra attention is being paid to the utilization of the digital media as a way of efficiently advertising to consumers. While considering digital channels, the recent development is mobile marketing. Because there are more middle-class consumers in India, the mobile market there is expected to develop at one of the quickest rates in the future ten years, reaching millions of users. Therefore, studying digital channel advertising would have a big influence on how businesses operate. The emergence and broad adoption of internet technologies have revolutionized every day and work-related communication in society.

Emergence of new communication tools is one of the most significant indicators of this transition. The term "digital marketing" refers to new communication tools that are emerging along with technological advancement. Facebook, Twitter, Instagram, and other comparable online and virtual platforms social networks spring to mind while discussing digital channels like web sites, micro blogs and search engines. With the advent of new communication to customers with digital channels, already available communication tools are now fetching to be called as "traditional communication tools". Traditional communication tools are printed (journals, newspapers etc.), visual (television, cinema etc.) and audio (radio) communication tools.

2. Literature Review

2.1. Multimedia Advertising

Generally, generating higher profits is the key aim and priority of all business organizations and this is mainly appropriate for businesses that sell products and services effectively. There is a growing need to create modern marketing methods only to compete and survive but also to win with a large market share ([Taiminen & Karjaluoto, 2015](#)). The product's marketing of an organization mainly depends on the consumers' buying intentions and decisions. This issue can be motivated by many marketing strategies and efforts. The consumers' buying decisions are shaped by their interests, expectations, values, attitudes, and behavior. Various digital marketing channels influence consumers' behavior, so their buying decisions can be inspired ([Sonwaney & Chincholkar, 2019](#)). Many influential factors can inspire the buying decisions of the consumers such as online advertising as a digital marketing channel. Many studies, ([Shah, Zahoor, 2019](#)), have confirmed the relationship between these digital marketing channels and buying decisions of the consumers and, therefore, the support of this relation triggers the studies to involve within this area with expanding the literature and fulfilling the research gaps in this scope. Therefore, the study would postulate the following hypothesis:

H1: Online Multimedia advertising has a significant role on consumer buying decisions in

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the Dhaka city.

2.2. Website

Through their attractive search engine and enrich information provided at their websites, the organizations offer a free awareness for the consumers to select their brand and compare it to what other have via the technique of search engines which enable the contemporary businesses to educate people through the amount of information about it ([Altarifi, Al-Hawary, & Al Sakkal, 2015](#)). The positive relations with the customers in general influence their buying decisions and enhance future business success. Through digital techniques, the companies' marketers tell in detail their selling process, prices, the payment methods, delivery ways etc. ([Alghizzawi, 2019](#)). Through providing such details to the consumers, the positive impression and image about the companies' products would be lasting in the eye and mind of the people, which in turn leads to meeting the profit-generation goals and the company's branding process ([Alghizawi et al., 2020](#)). The use of different forms of digital marketing channels on other hand would increase the levels of interaction with the customers and establish strategic customer marketing relations and this is considered a vital aspect of successful businesses and in line with the strategies to achieve the marketing objectives. The processes of purchasing from the companies are also influenced by the extent to which marketing activities engage in satisfactory approaches of marketing and are appropriate with the existing emerging business trends ([Aljumah et al., 2021](#); [Pal, 2020](#)). So, the study would postulate the following hypothesis:

H2: Websites have a significant role on consumer buying decisions in the Dhaka city.

2.3. Social media

Social media is one of the influential factors assessed in the process of consumer decision-making. It is defined as informal communication between a perceived communicator and receiver regarding a product, service or a brand ([Woo et al. 2015](#)). Also, it can be seen as a volitional after-purchase interaction by customers. Most of the studies discussed social media as a factor to help whether increase or decrease the effects of the consumers while selecting a product or service. The literature considers this factor also one of the most sought-after information sources for interested people ([Varadarajan et al., 2021](#)). On other hand, the electronic word-of-mouth (eWOM), also often indicated as online feedback, reviews, online recommendation or opinions, has generated significance with the emergence of the new technological tools. The concept of eWOM referred to the all informal ways of the communications directed to the consumers through Internet-based technological tools regarding the characteristics of a particular product or services ([Nagra & Gopal, 2014](#)). It also adds that this includes interaction between producers and consumers as well between the consumers themselves. Thus, the study would state the following hypothesis:

H3: Social media has a significant role on consumer buying decisions in the Dhaka city.

2.4. Blogs

Despite the fact that the frequency analysis of the results of the survey didn't give significant results in the block of influence marketing, which is mentioned by [Hossain \(2017\)](#), regression analysis showed its significant relationship with marketing in social networks. First of all, if the respondent trusts in what a blogger or a famous person advertises, he buys it ($r = 0.742$). Also, the credibility of a person in advertising attracts the attention of consumers when they view promotional offers in the news line in social networks, encourages to read their contents and even make a purchase under their influence (correlation is 0.307, 0.363 and 0.380,

respectively).

H4: Blogs have a significant role on consumer buying decisions in the Dhaka city.

2.5. Content Marketing

Bogacheva's (2014) papers observed the theoretical basis of content Marketing. It is quite natural that respondents who consider contextual advertising in search results to be relevant and useful for themselves often click on it, which confirms the rather strong correlation between these statements.

H5: Content marketing have a significant role on consumer buying decisions in the Dhaka city.

2.6. Research Objective

The general objective of this research is to determine the impacts of Digital Marketing tools on Consumer buying behavior towards shopping goods. This survey is a part of discovering the factors that affects the buying behavior of Customers.

To study the awareness of digital marketing in Dhaka city

To analyze the influence of digital marketing in purchase decision of shopping goods.

To know about the kind of shopping products bought by utilizing digital channels.

To analyze the impact of digital marketing in shopping goods purchase decision.

3. Research Methodology

3.1. Research Design

The study carried out with both primary and secondary data. The primary data was collected through structured questionnaire from samples of 155 respondents from the specified area. The samples have been considered by using non-probability technique (judgmental sampling method) was validated and took it for further analysis. Secondary data is also being collected from articles, journals etc.

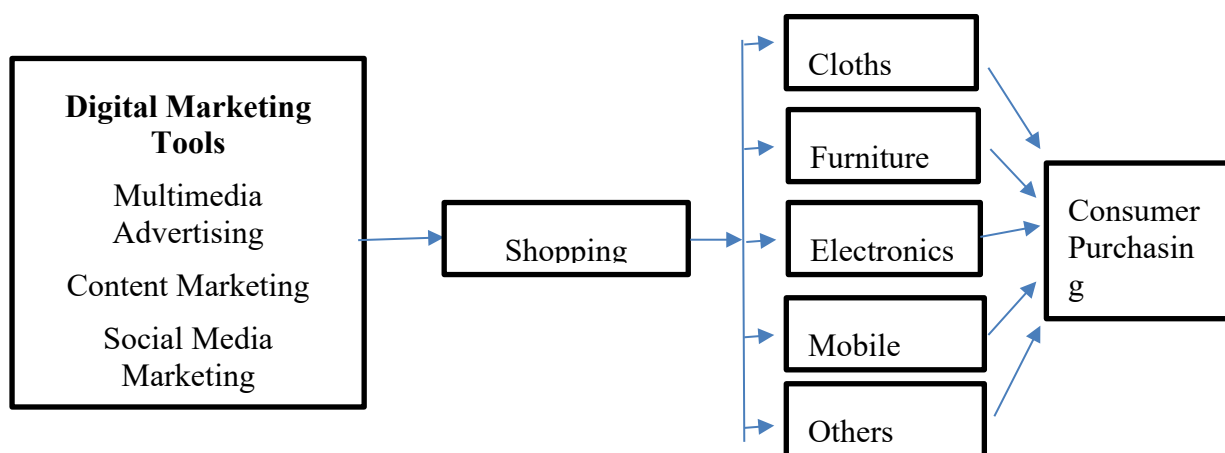


Figure: Conceptual Model

The research design clearly examines the impact of digital marketing tools in the customer

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buying decision towards Shopping Goods. The study mainly focused to examine the intension of the customers to make utilize of the digital marketing tools in their buying decision and also to analyses that what kind of shopping products that they should buy make use of digital marketing more preferably. Social media, Content marketing, website, Multimedia Advertising, Blogs, Video and Image are the research Independent variables. Cloths, Electronics, Furniture, Mobile, computer are dependent variables in this study.

4. Data Analysis and Discussion:

4.1. Demographic Analysis:

Table: 1

Respondents Profile		Frequency	Percent	Valid Percent	Cumulative Percentage
Gander	Male	105	67.7	67.7	67.7
	Female	50	32.3	32.3	100.0
Age	Below 20	9	5.8	5.8	5.8
	21-30	138	89.0	89.0	94.8
	31-40	6	3.9	3.9	98.7
	Above 50	2	1.3	1.3	100.0
Education	HSC	38	24.5	24.5	24.5
	Graduation	79	51.0	51.0	75.5
	Post-Graduation	38	24.5	24.5	100.0
Occupation	Business people	3	1.9	1.9	1.9
	Professionals	12	7.7	7.7	9.7
	Student	129	83.2	83.2	92.9
	Others	11	7.1	7.1	100.0
Income	Less than 30000	53	34.2	34.2	34.2
	31000-50000	54	34.8	34.8	69.0
	51000-70000	31	20.0	20.0	89.0
	Above 70000	17	11.0	11.0	100.0

It is evident that male participants are more prevalent than female participants and the age group within 21-30 belongs higher than other age groups within above 30 range. Beside their maximum education level is a bachelor's degree that is 51% of the total respondents. Finally their monthly income also showed where maximum range is monthly tk. 310000-50000 which is 34.8%.

Table 2. Descriptive Analysis:

	Respondents	Mean	Std. Deviation
Cloth	155	3.7692	.81528
Computer	155	3.6250	.99696
Furniture	155	3.1346	1.07989
Mobile	155	3.5769	1.09449
Luxurious	155	3.2308	1.04492

From the above table it shows that respondent use internet to purchase shopping goods. They are more aware of shopping cloth and computer related accessories followed by mobile, furniture and luxurious goods.

Table 3. Popularity of Digital marketing tools:

	Frequency	Percent	Valid Percent	Cumulative Percent
Disagree	8	5.2	5.2	5.2
Neutral	32	20.6	20.6	25.8
Agree	99	63.9	63.9	89.7
Strongly Agree	16	10.3	10.3	100.0
Total	155	100.0	100.0	

It mainly indicates that everyday major respondents knows about digital marketing tools followed by memes and article.

Table 4. Interest on digital platforms

	Frequency	Percent	Valid Percent	Cumulative Percent
Disagree	13	8.4	8.4	8.4
Neutral	41	26.5	26.5	34.8
Agree	76	49.0	49.0	83.9
Strongly Agree	25	16.1	16.1	100.0
Total	155	100.0	100.0	

It depicts that about interesting of digital marketing tools which is very high and near about 84% of responders is interested about using it. It mainly indicates that everyday major respondents are interested about digital marketing tools.

Table 5. User-friendly Website

	Frequency	Percent	Valid Percent	Cumulative Percent
Disagree	5	3.2	3.2	3.2
Neutral	23	14.8	14.8	18.1
Agree	93	60.0	60.0	78.1
Strongly Agree	34	21.9	21.9	100.0
Total	155	100.0	100.0	

The above table depicts the ease of using a user-friendly website, which is very high: about 78% of respondents find it easy when they use it. It mainly indicates that major respondents face a user-friendly website during shopping every day.

Table 6. Trust in digital Media

	Frequency	Percent	Valid Percent	Cumulative Percent
Disagree	11	7.1	7.1	7.1
Neutral	35	22.6	22.6	29.7
Agree	79	51.0	51.0	80.6
Strongly Agree	30	19.4	19.4	100.0
Total	155	100.0	100.0	

The trustworthiness of digital marketing channel which is not very high and about 51% of responders trust when they use it. On the other hand 7% responders was disagree that means they don't trust digital marketing tools. It mainly indicates that everyday major respondents trust them during shopping online.

Table: 7. Entertainment of digital media

	Frequency	Percent	Valid Percent	Cumulative Percent
Disagree	6	3.9	3.9	3.9
Neutral	32	20.6	20.6	24.5
Agree	95	61.3	61.3	85.8
Strongly Agree	22	14.2	14.2	100.0
Total	155	100.0	100.0	

Entertainment of using digital marketing tools which is very high and about 61% of respondents find it entertaining when they use it. It mainly indicates that everyday major respondents get entertainment during purchasing shopping goods.

Table 8. Satisfaction on using digital media

	Frequency	Percent	Valid Percent	Cumulative Percent
Disagree	19	12.3	12.3	12.3
Neutral	43	27.7	27.7	40.0
Agree	81	52.3	52.3	92.3
Strongly Agree	12	7.7	7.7	100.0
Total	155	100.0	100.0	

Satisfaction of using digital marketing tools which is about half and 52% of respondents is satisfied when they buy shopping goods in online by digital marketing tools. It mainly indicates that everyday half of the respondents get satisfaction during purchasing shopping goods.

4.2. Multiple Regression Analysis:

H1: Online Multimedia advertising has a significant role on consumer buying decisions in the Dhaka city.

H2: Websites have a significant role on consumer buying decisions in the Dhaka city.

H3: Social media has a significant role on consumer buying decisions in the Dhaka city.

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H4: Blogs have a significant role on consumer buying decisions in the Dhaka city.

H5: Content marketing have a significant role on consumer buying decisions in the Dhaka city.

Table: 9 Determinant Coeffisien

Model	R	R Square	Adjusted Square	RStd. Error of the Estimate
1	.462 ^a	.214	.176	.76119

a. Predictors: (Constant), Content_Marketing_7, Image_6, Website_2, Blogs_4, Multimedia_Adv_3, Video_5, SM_1

Interpretation: This model summary indicated that there is positive correlation between dependent variable and independent variables. 21.40% variation in the dependent variable can be explained by independent variables. This model also indicates that independent variables are sufficient enough to explain the dependent variables.

Table 10 ANOVA^a

Model		Sum Squares	ofdf	Mean Square	F	Sig.
1	Regression	23.176	7	3.311	5.714	.000 ^b
	Residual	85.172	147	.579		
	Total	108.348	154			

a. Dependent Variable: Consumer Purchasing Behavior

b. Predictors: (Constant), Content_Marketing_7, Image_6, Website_2, Blogs_4, Multimedia_Adv_3, Video_5, SM_1

Interpretation: As significant value is less than .05 so at least one of the independent variable has effect on dependent variables.

Table: 11. Coefficients Regression

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error				Tolerance	VIF
(Constant)	2.147	.437		4.907	.000		
SM_1	.059	.120	.052	.494	.622	.473	2.114
Website 2	.392	.105	.389	3.737	.000	.493	2.028
Multimedia Adv 3	.036	.090	.037	.403	.688	.636	1.571
Blogs 4	-.062	.083	-.067	-.743	.459	.655	1.527
Video 5	-.069	.095	-.066	-.724	.470	.636	1.573
Image 6	-.036	.087	-.038	-.413	.680	.628	1.593
Content Marketing 7	.117	.093	.115	1.259	.210	.639	1.565

a. Dependent Variable: Consumer Purchasing Behavior

Interpretation: As my significance value is less than .05. So I can safely reject the null hypothesis and can conclude that Website has significant impact in consumer purchasing behavior towards shopping goods. There is no variable which are suffering from multi-collinearity issue because VIF value is close to 1. Besides others variables are not significant

in our model so we can exclude that variables from this model.

Recommendations:

In this research multiple regression analysis intended to assess most important factor of digital marketing tool which impact in consumer purchasing behavior towards shopping goods. Here mainly discuss the major factors of digital marketing tools that affect in background in consumer's buying shopping goods. So those who are the users of this paper can try to viral their contents by following way:

1. Informative contents are most significant for understanding which digital marketing tool affects in consumer purchase decision towards shopping goods.
2. Website is a number 1 platform which affects consumer buying decision.
3. Most of the consumers are aware of digital marketing tools.
4. Finally Trust and satisfaction in digital marketing tools are important for affecting consumer buying behavior.

5. Conclusion:

The study is conducted in a specific geographical region, and the findings show that people are aware of digital channels regardless of their educational background, that customers prefer digital channels to purchase any desired products, and that people's monthly income has little influence on their decision to buy a particular product through digital channels. The study found that people are increasingly purchasing convenience goods online, with clothing and electronics being the top purchases made through digital channels. Customers' satisfaction with the products they purchased via digital channels is seen as a good indicator of the growing influence of digital channels in consumer choice. The current study demonstrates that the influence of digital channels does not support a change in customer opinion toward purchasing a product; however, in the near future, digital channels will influence customer purchase opinion because there is a consideration for digital channels among customers. Consumers purchase things through digital marketing methods when they find the website to be user-friendly and trustworthy. As previously stated, this study conducted in a specific region was unable to produce precise data on the factors. There exists a future scope to analyses the impact of digital channels on customer purchase decision for a wider geographic area to obtain more accurate results.

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