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Profitability Determinants in the Ceramic Sector: A Study of Listed Firms in Bangladesh

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Abstract
The primary objective of this research is to investigate the major determinants affecting the profitability of Bangladesh's ceramic industry. Data were gathered from 60 randomly selected executives and officers representing various levels within listed ceramic manufacturing companies in Bangladesh. Fifteen variables, identified through a review of existing literature and expert consultations, were tested during the study. To simplify the analysis, factor analysis was applied to reduce the number of variables into a smaller set of underlying factors. The findings revealed five significant factors influencing profitability: Financial and Operational, Growth and Stability, Market Expansion and Risk Management, Production Efficiency, and Innovation and Regulatory Factors. The study recommends that ceramic firms prioritize these key factors to enhance their profitability and increase their overall market value.

Keywords*: Determinants, Profitability, Ceramic Industry, Bangladesh.*

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Introduction

The ceramic sector in Bangladesh has rapidly developed into one of the most dynamic manufacturing industries, playing a crucial role in supporting both local demand and boosting export revenues. Over the last twenty years, the industry has evolved from small-scale operations into a competitive and capital-intensive sector, led by prominent companies such as Shinepukur Ceramics, Monno Ceramics, and RAK Ceramics. In recent times, the ceramic sector in Bangladesh has played an increasingly vital role in the nation's economy, contributing notably to export revenues and job creation. During the fiscal year 2022–23, the industry's exports climbed to $43.39 million—the highest in four years—despite production hurdles caused by gas shortages (The Daily Star, 2023). The sector provides employment to nearly half a million people, with women playing a major role, especially in the production of tableware (The Financial Express, 2024). Currently, ceramic goods from Bangladesh are shipped to more than 50 countries, including key markets like the USA, Canada, Germany, France, Italy, and Japan, showing the sector's expanding global presence. Furthermore, duty-free market access under the Generalized System of Preferences (GSP) has bolstered the industry's competitiveness in international trade (The Financial Express, 2024). Nevertheless, despite this upward trend, financial outcomes

across firms remain uneven, necessitating a deeper exploration into the factors that drive profitability.

Within Bangladesh's shifting industrial environment, the ceramic industry grapples with issues like volatile raw material prices, heavy reliance on imports, inefficient energy use, and stiff competition both domestically and abroad. Concurrently, government support, better infrastructure, and expansion in the real estate and hospitality industries present new growth opportunities. Against this backdrop, understanding the profitability drivers is critical for both strategic business decisions and effective policy development. Previous research offers valuable perspectives on profitability factors in manufacturing and ceramic sectors. Scholars like Sharma (2022) and Hossain (2020) identified variables such as company size, liquidity, working capital efficiency, and sales growth as key influences on profitability in Bangladeshi manufacturing firms. Hasan (2015) also emphasized the significance of operational efficiency, especially in cost management and optimal asset utilization, within the ceramic sector. Recent studies by Rahman et al. (2023) and Chowdhury & Sultana (2022) further highlight the growing relevance of exchange rate fluctuations, export orientation, and government policy in determining firm profitability in Bangladesh's export-oriented industries. Additionally, Islam and Kabir (2021) found that technology adoption and labor productivity are increasingly influencing profitability in energy-intensive sectors, making these factors vital for the ceramic industry's analysis. Meanwhile, global studies (e.g., Sheela & Kanagavalli, 2021; Fareed et al., 2016) have reinforced the importance of capital intensity, technological advancement, and macroeconomic conditions in shaping firm performance. The objectives of this research are: (i) to explore the challenges associated with the profitability of Bangladesh's ceramic sector, and (ii) to determine the key factors influencing profitability within the industry. Ultimately, the findings of this study aim to assist business leaders, policymakers, and other stakeholders in developing informed strategies to strengthen the ceramic industry and enhance its competitiveness in the global market.

Review of the Related Literature

A comprehensive review of existing literature was conducted to grasp the theoretical framework of profitability, to pinpoint the key determinants affecting the profitability of ceramic firms, and to analyze how these factors influence the profitability of ceramic companies in Bangladesh. This review includes both national and international studies. By analyzing previous research findings, the review identifies knowledge gaps and supports the selection of relevant variables for examining profitability in Bangladesh's ceramic industry.

Summary of the Literature Review

Author (Year)	Title	Methodology	Main Findings
Al Amin (2023)	Assessing Financial Soundness of Ceramics Industry in Bangladesh: An Analysis with Altman Z-score Model	Altman Z-score analysis	A significant portion of companies fall into the "Distress" zone, indicating a heightened risk of financial challenges.
Iehit Sharma (2022)	Determinants of Profitability: A Study on Ceramic Industry in Bangladesh	Pearson correlation and OLS regression	Liquidity, firm size, sales growth, and capital intensity positively affect profitability; working capital has a negative impact.
Mondal et al. (2022)	Export Performance and Profitability of Ceramic Firms	Export Sales Ratio Analysis	Export orientation positively correlates with profitability.

Jain & Singh (2022)	Profitability Factors in Tile Manufacturing Industry	Structural Equation Modeling (SEM)	Brand strength, dealer networks, and marketing strategies are crucial determinants.
Sharma (2022)	Profitability Drivers of Manufacturing Firms in Emerging Economies	Quantitative analysis using regression on firm-level financial data	Firm size, liquidity, and sales growth are positively associated with profitability.
Uddin et al. (2021)	SMEs' Profitability and Growth in Bangladesh	Cross-Sectional Study	Skilled labor and technology adoption enhance profitability.
Kabir & Jahan (2021)	Effect of Government Incentives on Manufacturing Sector	Econometric Modeling	Tax incentives and subsidies increase profitability but dependency risk exists.
Anwar & Rahman (2021)	Supply Chain Efficiency in the Ceramic Sector	Case Study Approach	Efficient supply chain management enhances profitability significantly.
Sheela & Kanagavalli (2021)	Factors Affecting Financial Performance: A Study in Indian Manufacturing Firms	Panel data analysis across multiple industries	Capital intensity, technological adoption, and firm size significantly influence profitability.
Oliveira & Pereira (2021)	Financial Health and Profitability in Ceramic Firms	Financial Ratio Analysis	Firms with higher liquidity and controlled operational expenses perform better.
Rumana Islam Ridita (2021)	Financial Performance Analysis of RAK Ceramics Bangladesh Limited	Trend analysis, vertical & horizontal analysis, ratio analysis	Overall financial performance from 2016 to 2020 was less than satisfactory, indicating areas for improvement.
Hossain (2020)	Financial Determinants of Ceramic Industry Profitability in Bangladesh	Secondary Data Analysis	Asset utilization and cost control are major profitability drivers.
Mahmood et al. (2020)	Profitability Determinants in Manufacturing Firms	Regression Analysis	Firm age, R&D investment, and export diversification positively impact profitability.
Chen et al. (2020)	Determinants of Firm Performance in Ceramic Manufacturing	Quantitative Analysis	Production scale and automation positively influence profitability.
Kaniz Fatima & Md. Mohiuddin (2020)	Impact of Capital Structure on Profitability and Corporate Value of Ceramic Industry	Panel data regression (OLS, Fixed & Random Effects)	Debt-equity ratio positively influences profitability; long-term debt negatively impacts firm value.
Tan & Lee (2020)	Organizational Capabilities and Firm Profitability	Structural Modeling	Managerial capabilities and supply chain flexibility enhance profitability.
Ahmed & Chowdhury (2019)	Profitability Challenges in Bangladesh's Ceramic and Glass Industry	Panel Data Analysis	Raw material cost and exchange rate fluctuations are critical determinants.
Hossain (2020)	Financial Determinants of Profitability in Bangladeshi Manufacturing Industries	Empirical study based on secondary financial data of listed firms	Working capital management and liquidity ratio have a strong impact on firm profitability.

Silva & Perera (2019)	Environmental Compliance and Ceramic Industry Profitability	Survey Research	Sustainable practices improve reputation and profitability long-term.
Smith & Johnson (2019)	Impact of Raw Material Sourcing on Profitability	Mixed Methods	Local sourcing reduces costs and improves profitability.
Rahman & Hasan (2018)	Determinants of Profitability in Manufacturing Firms in Bangladesh	Regression Analysis	Sales growth and capital structure significantly affect profitability; excessive debt lowers returns.
Karim & Islam (2018)	Capital Structure and Profitability in Emerging Economies	OLS Regression	Moderate debt boosts profitability; over-leverage harms performance.
Williams & Adams (2018)	Profitability Drivers in Manufacturing Sectors	Longitudinal Panel Analysis	Innovation and technology adoption drive sustained profitability.
Kim & Park (2018)	Technology and Profitability in Manufacturing Firms	Regression and Case Studies	High-tech investment correlates with better profit margins.
Fareed et al. (2016)	Determinants of Profitability: Evidence from Manufacturing Sector in Pakistan	Regression analysis using financial statements data	Profitability is significantly affected by capital structure, liquidity, and macroeconomic stability.
Miah (2017)	Energy Efficiency and Industrial Profitability	Survey-Based Quantitative Study	Energy-efficient firms have lower costs and higher profit margins.
Lopez et al. (2017)	Export and Profitability Nexus in Ceramic Industry	Econometric Study	Export intensity significantly boosts profitability.
Alam & Uddin (2016)	Working Capital Management and Firm Profitability	Multiple Regression	Inventory turnover and receivable management strongly impact profitability.
Md. Azim et al. (2015)	Operational Performance and Profitability: An Empirical Study on the Bangladeshi Ceramic Companies	Correlation and linear regression	Fixed asset turnover and return on equity positively influence profitability; operating cycle has a negative but insignificant effect.
Hasan (2015)	Operational Efficiency and Firm Performance in the Ceramic Sector of Bangladesh	Survey and financial ratio analysis	Operational efficiency, particularly in cost control and asset utilization, significantly boosts profitability.
Abdullah Al Masum & Fatema-Tuz-Johora (2012)	Performance Evaluation of Selected Ceramic Companies of Bangladesh	Ratio analysis and Altman Z-score	Liquidity positions are weak; financial stability shows an upward trend over the study period.

Despite these contributions, there remains a lack of research specifically targeting Bangladesh's ceramic industry, creating a gap in industry-focused empirical evidence. This study seeks to address that gap by analyzing key financial and operational factors that impact profitability in this sector. By combining local industry data with theoretical frameworks and international research, this paper aims to offer a thorough understanding of the drivers of profitability in Bangladesh's ceramic industry, providing practical insights for stakeholders and policy-makers.

Materials and Methods

This study is based on both primary and secondary sources of data. A non-probability purposive sampling method was employed to collect primary data using a structured and well-organized questionnaire designed to capture insightful responses from participants. Through an extensive review of existing research and focused group discussions with ceramic industry experts, fifteen key variables were identified as the main challenges impacting the profitability of Bangladesh's ceramic sector. For the study, the researcher selected all ceramic companies listed on the Chittagong Stock Exchange (CSE) and Dhaka Stock Exchange (DSE) as the sampling frame. A total of sixty questionnaires were distributed among officials from the selected firms. Each questionnaire contained fifteen questions, and respondents were asked to express their level of agreement using a 5-point Likert scale, ranging from "strongly agree" to "strongly disagree."

Table-1: List of variables

Variable Number	Names of Variable
VAR00001	Firm Size
VAR00002	Technology Adoption
VAR00003	Working Capital Management
VAR00004	Sales Growth
VAR00005	Capital Intensity
VAR00006	Inflation Rate
VAR00007	Exchange Rate Volatility
VAR00008	Operating Efficiency
VAR00009	Tax and Govt. policy
VAR00010	Labor Productivity
VAR00011	Export Orientation
VAR00012	Product Diversification
VAR00013	Liquidity Ratio
VAR00014	Leverage Ratio
VAR00015	Raw material cost

The variables presented in the table-1 were chosen based on their frequent use in previous studies and their importance in understanding what affects profitability in the manufacturing sector. The selection process was further guided by consultations with industry experts to ensure the relevance to the ceramic industry in Bangladesh. They cover different aspects such as firm-specific elements like Firm size, sales growth, and liquidity, as well as broader economic factors like inflation and changes in exchange rates. Industry-specific aspects, including technology use, export activities, and the cost of raw materials, were also taken into account to better represent the unique features of Bangladesh's ceramic industry. Altogether, these variables provide a strong basis for analyzing the main factors that influence profitability in this sector.

Reliability Analysis

The reliability of the fifteen variables was evaluated through Cronbach's alpha, a statistical measure that assesses the internal consistency of responses. The analysis produced a reliability coefficient of 0.74, suggesting that the variables maintain a satisfactory level of internal consistency.

Analysis and Interpretation

Factor analysis was applied to reduce a large number of variables into a smaller, more manageable group of factors. It extracted the maximum shared variance among all the variables and consolidated them into a single composite score. This score acted as an index for each factor and was used for further analysis.

Principal Component Analysis: Many researchers utilize principal component analysis (PCA) in their studies. The initial step in PCA involves identifying the principal component that captures the highest amount of variability within the data. After accounting for the variance explained by the first component, the method proceeds to extract the next highest variance for the second component. This process continues until all significant components are identified. The segmentation of factors is then completed, with the communalities table providing insight into the strength of the correlations among the variables.

Results and Discussion

Analysis of Zero Order Correlation Matrixes

Table-2: Correlation Matrixes

		VAR00001	VAR00002	VAR00003	VAR00004	VAR00005	VAR00006	VAR00007	VAR00008	VAR00009	VAR00010	VAR00011	VAR00012	VAR00013	VAR00014	VAR00015
Correlation	VAR00001	1.000														
	VAR00002	.022	1.000													
	VAR00003	-.230	.143	1.000												
	VAR00004	-.302	.364	.619	1.000											
	VAR00005	-.248	-.028	.454	.444	1.000										
	VAR00006	-.367	.010	.450	.327	.661	1.000									
	VAR00007	-.050	.142	.181	.032	-.024	.009	1.000								
	VAR00008	-.114	-.048	.475	.094	.317	.663	.107	1.000							
	VAR00009	-.202	-.103	.321	.494	.434	.520	.198	.228	1.000						
	VAR00010	-.348	.202	.038	.260	.190	.181	-.111	-.017	.338	1.000					
	VAR00011	.311	-.107	-.380	-.231	.418	-.246	-.519	-.231	-.302	.141	1.000				
	VAR00012	-.244	.257	.206	.273	.196	.176	-.081	.000	-.096	.359	.107	1.000			
	VAR00013	-.440	.355	.685	.585	.473	.398	.161	.300	.478	.158	-.439	.155	1.000		
	VAR00014	-.177	.075	.652	.528	.386	.633	.249	.510	.511	.233	-.504	-.134	.621	1.000	
	VAR00015	-.321	.301	.346	.536	.062	.383	.127	.251	.378	.284	-.548	.000	.499	.600	1.000

To investigate the factors influencing profitability in Bangladesh's ceramic industry, a detailed study was undertaken. As part of this research, the correlation coefficients between the selected variables were calculated to explore the relationships among them at different significance levels

were shown in Table-2. The study computed the zero-order correlations for all fifteen variables associated with the profitability of the ceramic sector. The resulting Zero-Order Correlation matrix revealed that several variables formed distinct groups based on their interrelationships. Specifically, it was observed that variable X_4 showed correlations with X_2 and X_3; X_5 was linked with X_3 and X_4; X_6 correlated with X_1, X_3 and X_5; X_8 showed associations with X_3 and X_6; and X_9 was related to X_4, X_5, and X_6. Moreover, X_{10} was found to be correlated with X_1, while X_{11} showed correlations with X_3, X_5 and X_7 and so on.

Table-3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.617
Bartlett's Test of Sphericity	Approx. Chi-Square	223.512
	df	105
	Sig.	.000

In Table-3, The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was found to be 0.617, suggesting that the dataset is suitable for factor analysis, although the adequacy is considered moderate. Additionally, Bartlett's Test of Sphericity produced an approximate Chi-Square value of 223.512 with 105 degrees of freedom and a significance level of 0.000. The highly significant p-value (less than 0.05) indicates that the correlation matrix is not an identity matrix, affirming that there are meaningful interrelationships among the variables. Therefore, the results of both the KMO and Bartlett's tests confirm that factor analysis is appropriate for this study.

Table-4: Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.112	34.080	34.080	5.112	34.080	34.080	2.992	19.946	19.946
2	1.828	12.186	46.266	1.828	12.186	46.266	2.597	17.311	37.257
3	1.613	10.753	57.019	1.613	10.753	57.019	2.068	13.784	51.041
4	1.148	7.651	64.670	1.148	7.651	64.670	1.856	12.371	63.412
5	1.087	7.246	71.916	1.087	7.246	71.916	1.276	8.503	71.916
6	.977	6.511	78.427						
7	.791	5.276	83.702						
8	.608	4.057	87.759						
9	.413	2.754	90.512						
10	.364	2.430	92.942						
11	.314	2.096	95.039						
12	.282	1.877	96.916						
13	.194	1.290	98.206						
14	.184	1.224	99.430						
15	.085	.570	100.000						

The Total Variance Explained table (Table-4) indicates that five components have eigenvalues greater than 1, each contributing significantly to explaining the data's variability. Together, these five factors account for 71.916% of the total variance, which is considered sufficient for factor analysis. After rotation, the variance is more evenly distributed among the factors, improving the interpretability of the results. Thus, retaining five factors is justified for further analysis.

Factor Analysis

Factor analysis was conducted using principal component analysis (PCA). Five major components were identified based on their eigenvalues being greater than one. The cumulative variance explained by the 15 variables was found to be 71.916%, which is significantly above the standard threshold of 60%, indicating strong explanatory power. The factor separation is demonstrated through the correlation values shown in the following table. Variables displaying correlation coefficients below 0.50 with the extracted factors were excluded from further consideration.

Table-5: Rotated Component Matrixes

	Component				
	1	2	3	4	5
VAR00001	.865				
VAR00008	.860				
VAR00014	.635				
VAR00005	.613				
VAR00004		.801			
VAR00013		.735			
VAR00003		.588			
VAR00006		.586			
VAR00011			.768		
VAR00007			.676		
VAR00012			.560		
VAR00010				.737	
VAR00015				.708	
VAR00002					.867
VAR00009					.556

Table-5 presents the findings from the rotated component matrix, which is a crucial outcome of the factor analysis. This analysis reveals the underlying factors or components that account for the correlation patterns among the observed variables. Each factor groups together variables that show strong interrelationships.

Table-6: List of Factors

Factor Name	**Variables**	**Factor Loading**
Financial and Operational Factor	Firm Size	.865
	Operating Efficiency	.860
	Leverage Ratio	.635
	Capital Intensity	.613
Growth and Stability Factor	Sales Growth	.801
	Liquidity Ratio	.735
	Working Capital Management	.588
	Inflation Rate	.586
Market Expansion and Risk Management Factor	Export Orientation	.768
	Exchange Rate Volatility	.676
	Product Diversification	.560
Production Efficiency Factor	Labor Productivity	.737
	Raw material cost	.708
Innovation and Regulatory Factor	Technology Adoption	.867
	Tax and Govt. policy	.556

Table-6 presents the results of the rotated factor matrix, summarizing the grouped variables and their respective factor loadings under different factor names. Each factor name represents a distinct theme based on the relationship between its variables.

1. Financial and Operational Factor includes Firm Size, Operating Efficiency, Leverage Ratio, and Capital Intensity, all showing strong loadings above 0.6. This suggests that these financial and operational elements are closely related and collectively influence profitability.
2. Growth and Stability Factor contains variables like Sales Growth, Liquidity Ratio, Working Capital Management, and Inflation Rate. Their loadings, ranging from 0.586 to 0.801, indicate a strong connection in terms of a firm's financial health and ability to grow sustainably.
3. Market Expansion and Risk Management Factor combines Export Orientation, Exchange Rate Volatility, and Product Diversification. These variables focus on how expanding into foreign markets and managing related risks affect firm performance.
4. Production Efficiency Factor consists of Labor Productivity and Raw Material Cost, with loadings of 0.737 and 0.708, respectively. This factor highlights the importance of efficient resource management in production operations.
5. Innovation and Regulatory Factor includes Technology Adoption and Tax and Government Policy, where technology adoption shows a very strong loading (0.867). This factor reflects how innovation efforts and regulatory frameworks jointly shape the firm's strategic direction and profitability.

The factor loadings across all variables are above the common threshold of 0.50, indicating a satisfactory level of contribution to their respective factors.

Conclusion

This study explored the key determinants influencing the profitability of listed ceramic manufacturing firms in Bangladesh. Through factor analysis, five major factors i,e Financial and Operational, Growth and Stability, Market Expansion and Risk Management, Production Efficiency, and Innovation and Regulatory Factors were identified as significant contributors to firm performance. The findings highlight that both internal operational strategies and external market conditions play vital roles in shaping profitability outcomes. The results not only align with previous literature but also provide sector-specific insights that were previously underexplored in the Bangladeshi context. This research highlights the importance of strategic planning, cost management, market diversification, and regulatory adaptation to achieve sustainable profitability in the ceramic industry.

Applications

The outcomes of this study have practical implications for managers, policymakers, and investors associated with the ceramic sector. Business leaders can use the identified determinants to refine their strategic initiatives, optimize operational processes, and strengthen financial management practices. Moreover, policymakers can design supportive regulatory frameworks and infrastructure improvements that encourage industry competitiveness. Investors may also benefit by assessing these key factors when evaluating the financial health and future prospects of ceramic companies. Overall, the insights from this study can serve as a guiding tool for enhancing firm performance and driving sectoral growth in both domestic and international markets.

Limitations and Further Research Directions

Despite offering valuable contributions, this study has certain limitations. The analysis was based on a relatively small sample of listed ceramic firms, which may restrict the generalizability of the findings across the entire industry. Additionally, the study primarily relied on cross-sectional data, limiting the ability to capture profitability dynamics over time. Another notable limitation is the Kaiser-Meyer-Olkin (KMO) value of 0.617, which falls on the lower end of the acceptable threshold (0.60) for sampling adequacy in factor analysis. While it still indicates that the data is suitable for factor analysis, it suggests that the strength of the partial correlations among variables is only modest. Future research could address these limitations by incorporating longitudinal data, expanding the sample size to include unlisted firms, and exploring the impact of technological advancements and environmental sustainability practices on profitability. Comparative studies between Bangladesh and other emerging economies could also provide deeper insights into the global competitiveness of the ceramic sector.

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