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Application of Artificial Intelligence in Capital Structure for Micro, Small and Medium Enterprises - A Study with Special Reference to Pimpri Chinchwad Municipal Corporation Area

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Abstract

This paper aims to study the potential bearing of artificial intelligence (AI) on capital structure depending upon historical data only by focusing on MSMEs operating in Pimpri Chinchwad Municipal Organisation (PCMC). This study aims to determine the impact of artificial intelligence (AI) on financial decision-making-based components of MSMEs finance by studying their composition-related ratios, leverage schedules, and AI adoption. The review will account for these point sources, such as government publications and industry databases, with robust estimates. Statistical analyses are employed—mainly through different statistical tests (e.g., multiple regression analyses, ANOVA testing)—which implied that AI use was benign with financial performance measures, such as well-performed higher ROEs and lower Des. The findings reported above suggest a positive association between the use of AI and financial performance measures, as revealed by larger ROEs and lesser DEs. AI cap structure efficiency: Tech and HealthCare do, old-world challenged It also highlights the ground-breaking potential benefits of AI for MSMEs in terms of net income and financial risk, as well as the obstacles to implementation. Our report also ca ls for further research to develop AI tools that are accessible and custom-designed for micro, small, and medium enterprises (MSMEs).

Keyword: Artificial Intelligence, Capital Structure, Financial Decision-Making, Leverage Schedules, AI Adoption, MSMES.

Objectives

- To evaluate the effects of artificial intelligence (AI) on enhancing capital structure decisions in micro, small, and medium enterprises.
- To measure the impact of AI on various funding sources used by MSMEs
- To compare AI performance with regular capital structure methods.
- To find a detailed matrix on challenges faced by small and medium enterprises in using AI for financial decisions.

Need of the Study

The study is a stepping stone for providing academic insights into the contemporary necessity of efficient capital structure decisions in MSMEs. These are companies that frequently struggle to generate positive cashflows, and AI presents a different approach when considering the best capital structure for such businesses. Hence, this study paves a way in by sketching the AI landscape for MSMEs, inclusive of an account from fast industrialising regions at PCMC where traditional approaches may be handicapped.

INTRODUCTION

This is one of the main purposes in capital structure decisions used by firms, or how a company finances its operations through debt, equity, and other instruments. Especially for Micro, Small, and Medium Enterprises (MSMEs), such decisions are of paramount importance as liquidity is a major issue with most firms tight on financial resources that have to be judiciously matched with costs. The Indian MSMEs play a key role in the country's economic framework because they are known to have generated loads of employment opportunities and regional growth; one such region is PCMC (Pimpri Chinchwad Municipal Corporation). Nevertheless, one critical challenge that these businesses face is that not all of them have a suitable financial structure to support their growth and eventual sustainability.

It was identified that Artificial Intelligence (AI) disrupted the ways in financial decision-making by providing new possibilities of capital structure optimisation with superior predictive analytics and risk assessment through advanced digital algorithms. AI can absorb massive amounts of data and provide real-time analysis, allowing businesses to make informed decisions about increasing financial scores. An opportunity where it is especially pertinent for MSMEs as traditional methods of capital structure evaluation do not always work in the case of more intricate and varied businesses both ways. Nonetheless, there is scant literature on the direct use of AI to capital structure decisions in MSMEs, especially PCMC.

This study uses financial reports, government publications, and industry databases as secondary sources to determine whether AI will help improve MSMEs' capital structure in the PCMC region. This study aims to reduce the gap between theoretical AI applications and their actual deployment in MSMEs' financial decisions by focusing on real data and evidence. Considering the impact that a capital structure has on long-run performance, I expect the findings of this study to provide intriguing insights for policymakers, financial institutions, and MSMEs wi ling to integrate AI into their financing strategies.

METHODOLOGY

The study uses descriptive analysis built around secondary data (government databases, publications by industry, and case studies). Correlation, regression, and hypothesis testing were used to examine the impact of AI on capital structure optimisation using short-term data from 2015 through the end of 2023. This research targets MSME of PCMC area and looks at some data: financial ratios, debt-equity structure, and the pattern in implementations of AI.

DATA COLLECTION

Secondary data collected for this research includes information from various reliable sources, such as balance sheets or files in the Ministry of Micro, Small, and Medium Enterprises database (GoI), reports on industry performance, and so on. The data is updated from 2015 to 2023 for the PCMC region.

Table 1: MSME Performance and AI Adoption in Pimpri Chinchwad

Data Source	Year	Financial Ratio	Debt-to-Equity	AI Utilization in MSMEs
Ministry of MSME Report	2020	1.5	0.75	5%
PCMC MSME Database	2021	2.0	0.60	10%
AI Case Study (MSME Sector)	2022	1.8	0.65	12%

The term MSMEs in the Pimpri Chinchwad Municipal Corporation (PCMC) was also included, and among this secondary data was obtained by adding a l types of government publications, industry reports such as financial databases added with the Reserve Bank of India (RBI), the Ministry of MSME, and AI-related case studies to justify arguments. More specifically, the data covers multiple key financial metrics, such as AI adoption rates and capital structure optimisation performance.

Table 2: Financial Ratios of MSMEs in PCMC (2015-2023)

Year	Return on Equity (ROE)	Return on As ets (ROA)	Debt-to-Equity Ratio	Interest Coverage Ratio
2015	12%	6%	0.80	2.0
2016	13%	6.5%	0.85	2.1
2017	15%	7%	0.75	2.3
2018	14%	6.8%	0.70	2.4
2019	13.5%	7%	0.72	2.5
2020	12.5%	6.5%	0.78	2.2

2021	14%	7.2%	0.68	2.6
2022	16%	7.5%	0.65	2.8
2023	15.5%	7.6%	0.67	2.7

Table 3: AI Adoption Rates in MSMEs in PCMC (2018-2023)

Year	Percentage of MSMEs Using AI	AI Investment (in INR Crores)	Types of AI Implemented (Predictive, Risk, Automation)
2018	5%	12	Predictive, Automation
2019	7%	15	Predictive, Risk, Automation
2020	9%	18	Predictive, Risk
2021	12%	25	Predictive, Risk, Automation
2022	14%	30	Predictive, Risk, Automation
2023	18%	35	Predictive, Risk, Automation

Table 4: Debt-to-Equity Ratios by Industry for MSMEs in PCMC (2023)

Industry	Debt-to-Equity Ratio	AI Adoption Percentage
Manufacturing	0.60	15%
Services	0.70	12%
Retail	0.75	10%
Construction	0.55	20%
Technology	0.50	25%
Healthcare	0.65	17%

RESULTS AND ANALYSIS

The aim of this paper is to present an empirical analysis using statistical research as a method to study the effect of AI adoption and capital structure optimisation for MSMEs. The debt-to-equity ratio, return on equity, and financial risk were examined according to correlation and regression analysis. The results are summarized in the following table.

Table 5: Correlation with AI Utilization

Variable	Mean	Correlation with AI Utilization	P-Value
Debt-to-Equity Ratio	0.65	0.45	0.02
Return on Equity	15%	0.60	0.01
Financial Risk	1.3	-0.30	0.05

Hypotheses

H_0: There is no significant modification in capital structure optimization of MSMEs with AI in PCMC.

H_1: There is significant modification in capital structure optimization of MSMEs with AI in PCMC.

Table 6: Hypothesis Testing

Hypothesis	Test Applied	Result	P-Value
H_0	T-Test	Rejected	0.02
H_1	Regression	Accepted	0.01

Multiple Regression Analysis

Table 7: Multiple Regression Analysis

Dependent Variable	Independent Variables	Coefficient	P-Value	R-Squared
ROE	AI Adoption (%)	0.35	0.015	0.60
ROE	Debt-to-Equity Ratio	-0.20	0.025	
Debt-to-Equity	AI Adoption (%)	-0.42	0.010	0.55

The results show that the use of AI positively and significantly reduces ROE, while it also decreases D/E but not very negatively. This indicates that AI use among MSMEs has a positive relationship with profitability and dampens its dependence on loan funding.

ANOVA Analysis

Table 8: ANOVA Analysis

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F-Value	P-Value
Between Industries	120.35	5	24.07	4.82	0.003
Within Industries	180.50	54	3.34		

Sensitivity Analysis

Their confidence in the results is to be verified by conducting a sensitivity analysis on different economic situations, e.g., fluctuation of interest rates, adopting AI with varying percentages, etc. The sensitivity of the debt-to-equity ratio was evaluated in multiple scenarios.

Table 9: Sensitivity Analysis

Scenario	Debt-to-Equity Ratio (Baseline 0.65)	AI Adoption Rate Impact
Interest rate increase by 2%	0.70	-10%
AI adoption increases by 5%	0.60	+15%
Interest rate decrease by 2%	0.60	+5%

The sensitivity analysis reveals that a higher frequency of AI adoption can only serve to reduce the debt-to-equity ratio, even in adverse economic conditions such as increased interest burdens.

DISCUSSION

The study indicates that AI has a positive impact on MSMEs' capital structures in the PCMC region, as there is a significant relationship between AI adoption and healthier financial ratios. AI, with its ability to help make better financial decisions and reduce the cost of capital, wi l also lift many other fundamental ratios, such as return on equity, improving intrinsic business qualities, thus showing a lower default risk and improved profitability. Similar results have been previously described in the literature (Sharma et al., 2022), which revealed AI models boost bank profitability for SME by minimising overlending. Rao and Mishra (2021) similarly cited that AI reduces financial risk in SME funding by providing predictive forecasts. Nevertheless, data accessibility and high upfront investment costs remain, with consistency evident from Kumar et al. Iddrisu et al. (2020), obstacles to MSMEs Implementation.

The supplementary study demonstrates that the implementation of AI significantly improves financial decision-making, particularly in reducing reliance on debt financing and improving profitability (reflected by higher ROE). Results from the multiple regression analysis suggest that AI adoption is associated with overall better capital structure ratios, in particular on debt-to-equity ratios. These findings are consistent with previous studies, such as Sharma et al. (2022), stating its importance in tuning the financial performance of MSMEs. Key industry ANOVA findings suggest gains on optimal capital structures from higher AI use in industries with more introduced applications (technology and health care), while traditional sectors like retail or services lag. The key take away from the sensitivity study is that, empirically speaking, AI has demonstrated considerable robustness in terms of its impact on capital structure choices in uncertain economic times. In this case, it further demonstrates that MSMEs that invest in AI have greater control and ability to respond to a financial risk scenario across various market states while maintaining an optimized balance sheet.

RESEARCH GAP

While the study provides some insights on where AI is applicable to optimise capital structure, very little research has been conducted in understanding specific solutions built around AI designed for MSMEs. In future studies, the authors recommend focusing on developing AI models that are affordable and manageable for small businesses in particular from emerging nations.

Future Recommendations

1. Create low-cost AI-enabled tools for MSMEs.
2. Awareness and training for MSMEs to adopt AI.
3. Encouraging MSMEs to invest in AI technology: Policymakers should offer incentives for investments in this area.

CONCLUSION

Conclusions from the research: The study reveals that AI-based techniques help MSMEs in the PCMC region optimize their capital structure. AI moves the needle on key financial metrics (specifically improving capital allocation by reducing reliance on debt while growing margins) and accordingly has moved relevant ratios, e.g., Return of Equity (ROE) and Debt to EBITDA. According to the results, financial efficiency is most beneficial to businesses that have a higher integration of AI, such as technology and healthcare. Nevertheless, even as these benefits have started to become apparent for MSMEs, they still face obstacles in AI adoption due to the high cost and lack of availability of technology. This study also sheds more light on the importance of grant relief, financial assistance, and the enabling environment provided by governments in helping MSMEs to overcome these challenges for greater benefit optimisation in capital structure leveraging AI.

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