

Impact of E-Commerce Growth on the Business Performance of MSME Retailers in Maharashtra: An Empirical Study

*Note: Sub-titles are not captured in Xplore and should not be used

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Abstract—Fast-paced development of e-commerce, digital payment systems, online trading platforms, and social commerce are causing profound change in the competitive setting of micro, small, and medium enterprise (MSME) retail. A paper is presented analyzing the adoption of e-commerce and its effect on the performance of MSME retailers in Maharashtra. Four significant areas are targeted in the survey: determination of the level and degree of e-commerce adoption, identification of the digital capability factors which influence the e-commerce decision of the business, investigation of the impact caused by e-learning adoption and its influence on business performance, and finally, study of the performance variation by location type, whether city, semi-urban, or village, through the paper. Data collection will be done by administering a questionnaire designed from a 5-point Likert scale to MSME retailers in the state of Maharashtra using a multistage stratified sampling process. The suggested analytic system includes a descriptive statistics, Cronbach's alpha, exploratory factor analysis, Pearson's correlation, multiple linear regression, and analysis of variance (ANOVA). To show how the statistics are going to work, a sample dataset containing 600 records is going to be analyzed. The statistical demonstrations of the results show high consistency of the indicators used and reveal that e-commerce adoption and business performance are correlated, although significant discrepancies in business performance have been reported for different location types. We emphasize that the numerical results presented here are drawn from a synthetic dataset and don't reflect actual observations from MSME retailers in Maharashtra. A comprehensive field data analysis approach has also been devised in the research that may be applied to the actual surveys of MSME retailers in Maharashtra to study the influence of e-learning on their digitalization and business performance, among other things.

Keywords—e-commerce, MSMEs, retailing, Maharashtra, digital adoption, e-commerce adoption, business performance, digital capability, regression analysis.

I. INTRODUCTION

As digitalization took off at a breakneck speed, the retail industry was transformed as consumers' methods of seeking information online, comparing products, choosing items to purchase, and effecting the payments changed dramatically. E-commerce growth presented new opportunities for micro, small, and medium-sized enterprises (MSMEs) by allowing these businesses to sell to distant customers easily, communicate with their customers effectively, access large markets, and introduce technology-driven business processes. Meanwhile, the ever-expanding digital market has made competition fierce for brick-and-mortar stores due to factors that are price competitiveness,

shift in consumer demands, dependence on platforms, and constant need for digital transformation. Digitalization of India's MSME sector has been happening at a rapid pace. Evidence from government sources reveals an increase in the number of India's proprietor enterprises using internet for entrepreneurial activities. It went up from 26.68% in ASUSE 2023-24 to 39.37% in ASUSE 2025. In 2025, over half of the establishments in the trading sector who were reporting their Internet-based entrepreneurial activities also were.

This continued use of digital technologies suggests a major shift in the working conditions of small-scale industries, and also emphasizes the increasing dominance of digital channels in conducting retail business activities. Government aided digital business structures have further stimulated this change. To have done at least one transaction with ONDC by December 2025, around 206,000 retailers needed to have an Open Network for Digital Commerce (ONDC) account opened and be active (Ministry of Statistics and Program Implementation, 2026). And, 3,127 MSMEs that joined the MSME TEAM initiative produced over 100,000 transactions in one fiscal year. These events are indicative of MSMEs' growing involvement in digital markets and present a significant backdrop to studying which factors affect a business performance when it's involved in a digital marketplace (Ministry of Micro, Small & Medium Enterprises, 2026).

Maharashtra is a geographically suitable location for analyzing this transition due to its vast and heterogeneous base of commercial and MSME activities. The state consists of highly developed metropolitan markets like Mumbai and Pune and also contains semi-urban and rural markets where the acceptance of digital commerce may be affected by variations in digital infrastructure, consumer habits, financial resources, technological awareness, and entrepreneurial skill sets. Existing literature more exactly points out both the opportunities and the challenges of e-commerce adoption in rural parts of Maharashtra (Kawitkar and Yadav, 2023). A lot of research has been done on the role of digitalization and global integrations in Maharashtra's trade (Patil, 2026) as well as the influence of online purchasing on local small business owners in Pune (Chakma).

The broader MSME studies show that technological readiness is one of the key enablers when it comes to successful digital transformation. Barik and Panda looked into the role of e-commerce readiness, MSMEs, and economic growth while stressing the significance of an organization's ability to take part

digitally (Barik and Panda, 2023). Kumar and Nanda However singled out technology-related factors as the chief predictors of MSMEs performance, thereby underscoring the ever-growing importance of technological competence in the competitive world (Kumar and Nanda, 2023). Damiyana et al. just like the others, explored the links between innovation, knowledge management, e-commerce adoption, MSMEs performance, and sustainability to highlight the great benefit that digital adoption can bring to the company's results (Damiyana et al., 2024).

One area that has witnessed transformation and received attention from scholars is the traditional retail sector. Bhosal e has done research that examines the effect a rise in e-commerce has got to the traditional businesses. They've looked at how physical stores are affected when talking about India in their paper (Bhosale et al., 2026) Nandgaye' s study is on e-commerce-enabled retselling and how small store managers have adopted technology as a means of managing performance (Nandgaye, 2024). Based on these papers, ecommerce isn't only a replacement for conventional brick sand- mortar shops but can be used by small retailers through the channel to develop relationships, penetrate markets, and also optimize processes. Yet, the benefits of moving to digitization could depend quite A lot on factors like the retailer's area, digital skills, technology availability, amount of money that the retailers have for digital investment, and their familiarity with using a computer or smartphone for digital activities.

Although many have contributed writings on e-commerce, MSMEs, and conventional retail outlets, there still exists an opportunity for an empirical investigation integrating all aspects focusing more exactly on MSME retailers in Maharashtra. Existing research on the subject has mainly been about single topics like e-commerce readiness, technology adoption consumer behavior, rural e-commerce, or the influence of online shopping on traditional retailers. Only a small number of researchers have presented a unified model that explains the adoption of e-commerce and its relationship with market reach operational efficiency, competitiveness, and overall retail performance at various geographic and business levels within Maharashtra. In this light, the research will assess the effect of the growth of e-commerce on the operating performance and competitiveness of MSME (Micro-smallMedium) retailers at the state level Maharashtra.

We identify various aspects of e-commerce adoption by the retailer like the seller's involvement on a marketplace, use of advertisement on an online channel, facilitating a digital transaction between the seller and the buyer online, managing the online interaction between consumer and seller through social media networks, and the extent to which technology is applied for business processes. The business outputs or the results of the business operation will be determined by measures like the market reach, operational efficiency, competitiveness in the market, sales volume growth, and overall business performance.

We're also keen on identifying differences between town, semi town, and village retailers and in this connection, we'll examine the role played by digital literacy factors in e-commerce adoption and the outcomes there after. This research will make a significant contribution to current knowledge by presenting a holistic, empirically grounded model that captures the factors behind e-commerce use in MSME retailing in the

Maharashtra context. The outcome of such research would be of great value not only to MSMEs running retail business but also to government agencies, online platform providers, digital agencies, or any other entity involved in the digitization of small retailers.

II. PROBLEM STATEMENT

A. Selecting a Template

First, Sellers don't see "online versus offline" as an either or problem, in particular traditional retailers. They carry out multi-channel strategies with physical stores, WhatsApp/social media outreach, online payment acceptance, their own marketplace, home delivery, and customer records. Managers are that means challenged in finding out which aspects of e-commerce adoption lead to good performances and competitive advantage, and if these impacts vary across locations, company size and digital ability.

III. OBJECTIVES

The study aims to achieve the following objectives:

1. To assess the level and extent of e-commerce adoption among MSME retailers in Maharashtra.
2. To identify the key factors influencing e-commerce adoption among MSME retailers in Maharashtra.
3. To examine the impact of e-commerce adoption on the business performance of MSME retailers in Maharashtra.
4. To analyze the differences in business performance of MSME retailers across urban, semi-urban, and rural areas of Maharashtra.

IV. RESEARCH QUESTIONS

The study addresses the following research questions:

1. What is the level and extent of e-commerce adoption among MSME retailers in Maharashtra?
2. What are the key factors influencing e-commerce adoption among MSME retailers in Maharashtra?
3. Does e-commerce adoption have a significant impact on the business performance of MSME retailers in Maharashtra?
4. Does the business performance of MSME retailers differ significantly across urban, semi-urban, and rural areas of Maharashtra?

V. HYPOTHESIS

1. H1: Digital capability factors significantly influence e-commerce adoption among MSME retailers in Maharashtra.
2. H2: E-commerce adoption has a significant positive impact on the business performance of MSME retailers in Maharashtra.
3. H3: Business performance differs significantly across urban, semi-urban, and rural MSME retailers in Maharashtra.

VI. PROBLEM STATEMENT

Embracing online commerce has turned out to be something important of digital transformation across micro, small and medium enterprises (MSMEs). Barik and Panda delved into MSMEs' preparedness for e-commerce and connected it with economic growth while stressing the role of organizational preparedness and enterprises' capacity to use digital platforms

effectively (Barik and Panda, 2023). On top of their observations, the study reveals that e-commerce adoption isn't just a technology choice but rather a strategic factor of the organization that can affect business results much. In the same way, Kumar and Nanda looked at the factors that contribute to MSME success from both policy and technology angles and pointed out that the increasing level of technological capabilities is the way to improve MSME performance (Kumar and Nanda, 2023). E-commerce MSME performance link has also been looked at for innovation and sustainability. Research by damiyana et al. has explored the impact of innovation, knowledge management, and e-commerce adoption on MSME performance and its later sustainability (Damiyana et al., 2024). Per the researchers, digital adoption can cause several organizational outcomes beyond online selling. Craft et al. did a study on women entrepreneurs' digital adoption behavior based on Technology Acceptance Model (Harini et al., 2025). Besides changing people's buying behavior, the e-commerce boom is also causing a revolution in the traditional retail industry. A paper by bhosale et al. on the effects of ecommerce development on traditional retail shops in India is one of the works that offers a concrete demonstration of the way the competitive landscape faced by conventional retailers is changing (Bhosale et al., 2026). Another author nandgaye studied the nature of online-based retailing and the implementation of information technology by small shops for business management and so highlighted the opportunities afforded by the use of information and digital technologies for the running and growth of small retail businesses (Nandgaye, 2024). Gund et al. carried out a comparative study between e-commerce and traditional retail in the digital era to shed light on the changing nature of shopping behavior, online vs. brick-and-mortar retail channels relationship (Gund et al., 2023). And, Kriplani et al. carried out a study that revealed how consumer purchasing behavior is changing and what challenges textile retailers are facing in an environment of e-commerce and digital transformation so providing an illustration of the kinds of challenges different types of industries may encounter when adapting traditional ways of retail to a fully digital world (Kriplani et al., 2026). Physical or geographical features of a place much affect small businesses' decisions to take advantage of a new channel like e-commerce had done detailed research in rural areas on the problems and potential of using e-commerce as a tool to overcome the limitations of traditional brick and mortar stores (Kawitkar and Yadav, 2023). They point out that the conditions on the ground in one locality versus another have a major impact on how much small retailers can benefit from internet commerce (Patil, 2026). (Patil, 2026) looked at the digitization of commercial activities in Maharashtra and the degree to which it's linked internationally. He also pointed out digital revolution is gaining momentum within the commercial system of the state?; in a different direction, ,(Chakma) study about Pune highlighted how the rise of e-commerce has affected retail businesses at the ground level. His analysis gives us a city-level view of the way small local businesses, both offline and online, interact with their customers most of the published work in this area has focused

on specific aspects like whether and to what extent MSMEs are ready for e-commerce; what factors influence the selection or usage of technologies among small businesses for online services; etc. While the research has identified areas with potential and challenges, they've mostly dealt with these issues separately or within a defined geographical or economic boundary. The literature clearly points to a lack of an empirically based study which takes all the factors together to determine the level of e-commerce usage and its impact on MSME retailers' operations in the entire state of Maharashtra. Among these, there's a need to understand what factors decide how much and to what extent MSMEs adopt online business; whether MSMEs are getting benefits from ecommerce business and to which extent, etc. A major contribution of this research comes in the form of a study where we connect the dots between adoption of e-commerce and MSME performance, and also explore how geography when it comes to the state of Maharashtra matters to these connections, i.e. how much or to which degree these connections are affected by geographic location.

A. Research Gap

From the existing literature, there's a clear tendency showing increased research interest in the topic of e-commerce adoption, digital transformation, MSME performance, and also traditional retailing changes. Earlier pieces of work have concentrated, among others, one commerce readiness of small and medium sized enterprises, the role of technology as a determinant of small and medium enterprises' success, the topic of e commerce adoption, how entrepreneurs get and the new technology (Barik and Panda, 2023; Harini et al., 2025; Damiyana et al., 2024; Kumar and Nanda, 2023). Other publications concentrated on the effect that online sales have on traditional businesses, information-technology adoption of mini-stores, and also the new pattern of interaction between online and traditional retailing (Nandgaye, 2024; Bhosale et al., 2026; Gund et al., 2023).

In Maharashtra, existing studies have looked upon ecommerce challenges and possibilities in rural and urban areas, digitalization and globalization in trade, online shopping influences and effect of local small businesses, mostly in Pune (Kawitkar and Yadav, 2023; Chakma; Patil, 2026). But these are limited in extent and depth and there's a lack of statewide comprehensive empirical assessment of MSMEs retail in different geographical areas of Maharashtra done in the studies. This shows that there's a big research gap in investigating the level and extent of e-commerce adoption, factors influencing it, and its impact on the business performance of MSMEs, etc. within a single integrated setup. Also, to what extent business performance tied to e-commerce varies in different areas of Maharastara (urban, semiurban, and rural), isn't well-studied and documented either.

Using an empirical approach, the paper tries to fill in this gap by investigating first e-commerce adoption among small sized MSME retailers throughout Maharashtra second finding out the key factors behind the success of the adoption process, and third, analyzing its overall outcome on small-sized MSME business performance, while at the same time also exploring

business performance differences among various geographical types. As such, the paper helps to gain a better understanding of a regional dimension, through which one can understand better the relationship between e-commerce and transformation, as well as competitiveness of, MSMEs retail businesses at the state level in Maharashtra.

VII. CONCEPTUAL FRAMEWORK

This study's conceptual system has been created to explore the relationship between the adoption of e-commerce and business performance of MSME retailers in Maharashtra. The study model views digital capabilities as key drivers towards adoption of e-commerce and business performance as the main outcome variable.

The proposed conceptual relationship is expressed as:

Digital Capability Factors $\rightarrow$ E-commerce Adoption $\rightarrow$ Business Performance

(1) digital capability factors refer to the technological and organizational capabilities of MSME retail stores that encourage and help in their acceptance and productive utilization of ecommerce. e-commerce adoption is reflected in the degree to which the retailers employ digital marketplaces, online sales channels, digital payments, online promotion, and other digital customer-interaction mechanisms. This will provide a better understanding of how they're getting the benefits through ecommerce.

business performance is an end result of the use of the ecommerce and the study looks into a few different aspects such as sales growth, customer reach profitability operational efficiency, and overall improvement in business to determine it. Apart from this, it's also of interest if business performance differs across the various geographical regions of Rajasthan.

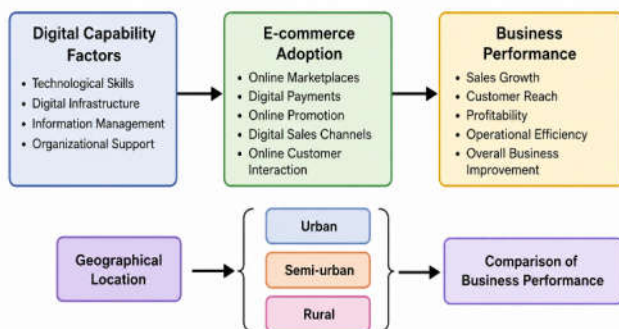


Fig. 1. Conceptual Framework of the Study

As a result, the variable "location" is a grouping variable to compare MSME retailers in different types of areas (urban, semi-urban, and rural). The conceptual structure can then be depicted as: The variables of firm size and years in business can act as control parameters through which the variations in features between MSME retailer operations are addressed.

VIII. RESEARCH METHODOLOGY

A. Research Design

The researchers used quantitative, cross-sectional, and explanatory research design to assess the impact of e-commerce adoption on the business performance of MSME retailers in Maharashtra. First-hand information will be gathered through structured questionnaires that the researchers intended to

administer to the MSME retailers who are running their business in different geographic areas of Maharashtra. Besides the descriptive questions in the questionnaire, there are also questions that employ a five-point Likert scale from 1 = 'Strongly Disagree' to 5 = 'Strongly Agree.'

The research plan is divided for four objectives namely: (1) evaluating the level of e-commerce adoption, (2) finding out the causes of the different degrees of e-commerce adoption, (3) assessing the consequences of e-commerce on business performance, and (4) finding out if there's a difference in performance between urban, semi-urban, and rural locations.

B. Population and Sampling

The target group refers to small business owners who sell goods at shop level and operate throughout maharashtra state. To be geographically well covered, a multistage stratified sampling method will be carried out. The state of maharashtra is considered one of the major economic areas of the country. It's the second largest state in the country as well as the third richest state in the world. These broad geographical regions. In each of these regions, the study participants have been categorized by their locality as urban, semi-urban, or rural. Additional data like company size and years of operation of business will be gathered as a means to describe the features of the enterprises that join the study. For descriptive statistics, item analysis correlation regression, and group-comparison methods, a sampling size of 600 completed questionnaires is deemed suitable and large enough.

C. Measurement Instrument

The questionnaire contains demographic and business profile items apart from a set of Likert-scale statements that identify the main research ideas. The key concepts are determined by several indicators listed below:

- Digital Capability (DC1–DC4)
- E-commerce Adoption (EA1–EA4)
- Business Performance (BP1–BP4)

Digital capability is the measure of a retail organization's level of digital maturity, the ability to work with technology and digital tools as well as change their organization to adapt to digital solutions. E-commerce adoption can be regarded as the degree to which online marketplaces, digital payments, online promotion, digital sales channels and online customer interaction are leveraged by the retail organization. Business performance is the measurement for the perceived improvements in sales profitability customer acquisition, customer retention and overall business performance.

The overall composite score of each construct is the result of getting the average of its corresponding indicators (items).

D. Statistical Analysis

The collected data are analyzed using the following statistical techniques:

1. Cronbach's alpha is applied to the study of the internal consistency and reliability of the measurement scales.
2. Frequency percentage mean, and standard deviation - descriptive statistics are the main means of evaluating the level and extent of e-commerce adoption.

- Pearson's correlation is conducted to find out the direction and degree of relationship between e-commerce adoption and business performance.
- EFA (Exploratory Factor Analysis) is performed to uncover the underlying digital capability factors that drive e-commerce adoption. As a measure of sampling adequacy, the K-M-O statistic together with Bartlett's test of sphericity has been used to determine the appropriateness of the data for factor analysis.
- Multiple linear regression analysis is done to find out whether or not e-commerce adoption predicts business performance statistically. Really after taking into account relevant enterprise characteristics.
- One-way ANOVA is used to find out if business performance is quite a bit different among urban, semiurban, and rural MSME retailers. If the ANOVA test result is statistically significant, then the Tukey's HSD post-hoc test is suggested to find out the specific group differences.

A significance level of $\alpha = 0.05$ is adopted for hypothesis testing. Effect sizes and confidence intervals are reported wherever appropriate.

IX. STATISTICAL RESULTS

A. Respondent Demographic Profile

In order to illustrate the statistical analysis, the study took into account a total of 600 hypothetical MSME retail business owner responses. Respondents were stratified based on their geographical locations, the size of the firm, educational qualifications, years in business, and geographical regions.

TABLE I
RESPONDENT PROFILE BY LOCATION

Location	Frequency	Percentage (%)
Urban	273	45.50
Semi-urban	201	33.50
Rural	126	21.00
Total	600	100.00

Respondents' geographical locations as presented in figure I: out of all the respondents 45.50% are living in the cities, 33.50% are living in semi-urban areas, and the remaining 21.00% are living in rural areas. This spread is a balanced representation for the three different types of places that are under consideration in this particular research project.

TABLE II
RESPONDENT PROFILE BY FIRM SIZE

Firm Size	Frequency	Percentage (%)
Micro	419	69.83
Small	150	25.00
Medium	31	5.17
Total	600	100.00

Distributing as size of the enterprise shows that microenterprises comprise the largest category. Almost 70% have chosen to do business at micro scale whereas only 25% chose business at small scale.

TABLE III
RESPONDENT PROFILE BY EDUCATIONAL QUALIFICATION

Education	Frequency	Percentage (%)
Secondary	199	33.17
Graduate	304	50.67
Postgraduate	97	16.17
Total	600	100.00

This education profile tells us, without any doubt, that graduates constitute the main category with 50.67%, whereas respondents with secondary education take the second-place accounting to nearly 1/3 or 33.17% of the total cases.

TABLE IV
RESPONDENT DISTRIBUTION BY MAHARASHTRA REGION

Region	Frequency	Percentage
Western Maharashtra	140	23.33
Mumbai Metropolitan Region	110	18.33
North Maharashtra	83	13.83
Marathwada	92	15.33
Vidarbha	111	18.50
Konkan	64	10.67
Total	600	100.00

The regional distribution provides observations from all six geographical regions considered in the proposed sampling framework.

B. Level of E-Commerce Adoption

Four indicators that are on a Likert scale were used to measure the degree of e-commerce adoption (EA1, EA4). The arithmetic mean of the four items was used to create a composite e-commerce adoption score. Based on our classifications, a score of 1.00, 2.33 was considered low adoption; a score between 2.34, 3.67 denoted moderate adoption; whereas, the highest adoption level was assigned a score in the interval of 3.68, 5.00.

TABLE V
LEVEL OF E-COMMERCE ADOPTION

Adoption Level	Frequency	Percentage (%)
Low	197	32.83
Moderate	229	38.17
High	174	29.00
Total	600	100.00

About 38.17% of the participants are identified by the researchers as falling under the moderate e-commerce adoption group. Low adopters made up around 32.83%, and as such the high adopters only account for about 29%. The overall mean e-commerce adoption score of the population sample was 2.94 with standard deviation of 1.05 and the results show that the demonstration dataset has a moderate level of e-commerce adoption.

TABLE VI
E-COMMERCE ADOPTION BY GEOGRAPHICAL
LOCATION

Location	N	Mean	SD
Urban	273	3.281	0.989
Semi-urban	201	2.649	1.034
Rural	126	2.687	1.017

Urban retailers were the highest mean e-commerce adoption scorer (3.281), while the semi-urban and rural retailers were much lower mean score adopters. The results showed that the place of residence may have the greatest impact on the variation in one's use of e-commerce.

C. Reliability Analysis

As a tool for evaluating the internal consistency of measurement instruments, Cronbach's alpha proved helpful. In this case, researchers will probably accept that a Cronbach's alpha above the threshold value of 0.70 indicates good reliability of the instrument at exploratory levels of study.

TABLE VII
RELIABILITY ANALYSIS OF STUDY CONSTRUCTS

Construct	Cronbach's α
Digital Capability	0.771
E-commerce Adoption	0.899
Business Performance	0.892

All three models exhibit good internal consistency. About the digital capability, the instrument's Cronbach's Alpha is 0.771, while the values for e-commerce adoption and business performance are 0.899 and 0.892, respectively. These levels of coefficients suggest that the survey items consistently measure the underlying constructs and because of this qualify to be considered in the further stages of analysis.

D. KMO and Bartlett's Test

Through the use of the Kaiser, Meyer, Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity the digital capability factor analysis items were assessed for exploratory purposes.

TABLE VIII
KMO AND BARTLETT'S TEST

Measure	Value
Kaiser-Meyer-Olkin Measure	0.777
Bartlett's χ^2	588.195
Degrees of Freedom	6
Significance	< 0.001

The KMO value of 0.777 suggests that sampling adequacy for factor analysis is good enough. Bartlett's test of sphericity is statistically significant, (χ^2_6) = 588.195, $p < 0.001$, which means that the correlation matrix is Quite a bit different from

an identity matrix. The researchers concluded that Digital Capability items are suitable for exploratory factor analysis.

E. Exploratory Factor Analysis

The researchers performed an exploratory factor analysis (EFA) on the four Digital Capability indicators (DC1-DC4). Principal Axis Factoring was used to find out the hidden factor structure. The results of the factor analysis indicated the presence of one primary factor which had an eigenvalue greater than 1.

TABLE IX
EIGENVALUE AND VARIANCE EXPLAINED

Factor	Eigenvalue	Variance (%)
Factor 1	2.374	59.36
Factor 2	0.591	14.77
Factor 3	0.558	13.96
Factor 4	0.477	11.92

Mere only the first eigenvalue is higher than 1.00. The factor contributes to a little over 60% of the variance, because of this providing an excellent support for the unidimensional interpretation of the four Digital Capability items. The factor is the only one with an eigenvalue surpassing 1.00. A very large part (59.36%) of all variations is accounted for by the factor.

TABLE X
FACTOR LOADINGS FOR DIGITAL CAPABILITY

Item	Factor 1	Communality
DC1	0.708	0.501
DC2	0.653	0.427
DC3	0.666	0.444
DC4	0.678	0.459

All four indicators have factor loadings above 0.60, suggesting that they're meaningful contributors to the underlying Digital Capability factor. As such, the factor is kept and used as a composite measure throughout the analyses.

F. Descriptive Statistics

The first four values calculated for us were mean, standard deviation, minimum and maximum, which are summarized in the table Table XI.

TABLE XI
DESCRIPTIVE STATISTICS

Variable	Mean	SD	Min	Max
E-commerce Adoption	2.94	1.05	1.0	5.0
Digital Capability	3.50	0.73	1.2	5.0
Business Performance	3.27	1.03	1.0	5.0

The figures show that Digital Capability is the highest scoring dimension with an average of 3.50, then Business Performance, averaging at 3.27, and last E-commerce Adoption with an overall mean score of 2.94. The findings imply the

demonstration group is comparatively more digitally capable than the level of actual e-commerce adoption amongst them.

G. Pearson Correlation Analysis

Pearson's correlation coefficient was used to examine the relationships among Digital Capability, E-commerce Adoption, and Business Performance.

TABLE XII
PEARSON CORRELATION MATRIX

Variable	DC	EA	BP
Digital Capability	1.000	0.297	0.284
E-commerce Adoption	0.297	1.000	0.743
Business Performance	0.284	0.743	1.000

The correlation investigation reveals that Digital Capability positively influences E-commerce Adoption ($r = 0.297$). Besides this, E-commerce Adaptation is also highly positively correlated with Business Performance ($r = 0.743$). Another strong positive relationship exists between Digital Capability & Business Performance ($r = 0.284$). From the results, it looks like the conceptual setup of the study deserves a bit more attention.

H. Multiple Linear Regression

To further support the hypothesized relationships two regression models were estimated. The first regression model tests for influence of Digital Capability on E-Commerce Adoption. The second regression model tests for influence of E-Commerce Adoption on Business Performance while controlling for influence of Digital Capability, firm size, location and years in business.

1. Regression Model 1: Factors Influencing E-Commerce Adoption: The first regression model is specified as:

$$EA_i = \beta_0 + \beta_1 DC_i + \beta_2 Location_i + \beta_3 FirmSize_i + \beta_4 YB_i + \epsilon_i$$

where EA represents E-commerce Adoption, DC represents Digital Capability, and YB represents Years in Business.

The model is statistically significant, $F(6, 593) = 18.41$, $p < 0.001$, with an R^2 of approximately 0.157 and an adjusted R^2 of 0.149.

TABLE XIII
REGRESSION MODEL PREDICTING E-COMMERCE ADOPTION

Predictor	β	t	p
Digital Capability	0.335	5.88	< 0.001
Semi-urban Location	-0.040	-0.36	0.722
Urban Location	0.458	4.23	< 0.001
Micro Firm	-0.137	-0.76	0.449
Small Firm	0.199	1.04	0.301
Years in Business	0.005	1.06	0.288

Digital Capability has a positive and statistically significant effect on E-commerce Adoption ($\beta = 0.335$, $t = 5.88$, $p < 0.001$). Thus, higher digital capability is associated with higher levels of e-commerce adoption in the demonstration dataset.

2. Regression Model 2: E-Commerce Adoption and Business Performance: The second regression model is specified as:

$$BP_i = \beta_0 + \beta_1 EA_i + \beta_2 DC_i + \beta_3 Location_i + \beta_4 FirmSize_i + \beta_5 YB_i + \epsilon_i$$

where BP represents Business Performance and the remaining variables represent E-commerce Adoption, Digital Capability, geographical location, firm size, and years in business.

The model is statistically significant, $F(7, 592) = 108.70$, $p < 0.001$, and explains approximately 56.2% of the variance in Business Performance ($R^2 = 0.562$; adjusted $R^2 = 0.557$).

TABLE XIV
MULTIPLE REGRESSION PREDICTING BUSINESS PERFORMANCE

Predictor	β	t	p
E-commerce Adoption	0.703	24.21	< 0.001
Digital Capability	0.085	2.05	0.041
Semi-urban Location	0.139	1.77	0.077
Urban Location	0.155	1.99	0.047
Micro Firm	0.245	1.91	0.057
Small Firm	0.236	1.74	0.083
Years in Business	0.002	0.45	0.655

The best predictor of Business Performance in the demonstration model turns out to be E-commerce Adoption ($\beta = 0.703$, $t = 24.21$, $p < 0.001$). There's also a significant effect of Digital Capability on Business Performance ($\beta = 0.085$, $t = 2.05$, $p = 0.041$). The explained variability by the model overall is 56.2 % of the changes in Business Performance.

Multicollinearity was checked with Variance Inflation Factor (VIF). VIF values of the main continuous predictors were under 2.00, which means there's no real issue with multicollinearity among E-commerce Adoption, Digital Capability, and Years in Business.

I. One-Way ANOVA

A one-way Analysis of Variance (ANOVA) is an appropriate statistic that can be used to analyze whether the Business Performance of MSME retailers in urban, semi-urban, and rural areas is different. A one-way ANOVA will allow you to test for statistically significant differences among mean groups.

TABLE XV
BUSINESS PERFORMANCE BY GEOGRAPHICAL LOCATION

Location	N	Mean	SD
Urban	273	3.560	0.993

Semi-urban	201	3.072	1.019
Rural	126	2.946	0.981

Urban MSME retailers report the highest mean Business Performance score (3.560), followed by semi-urban retailers (3.072) and rural retailers (2.946).

TABLE XVI
ONE-WAY ANOVA FOR BUSINESS PERFORMANCE

Source	SS	df	MS	F	p
Between Groups	43.941	2	21.971	21.989	< 0.001
Within Groups	596.500	597	0.999	—	—
Total	640.441	599	—	—	—

The ANOVA result is statistically significant, $F(2, 597) = 21.989$, $p < 0.001$. Therefore, Business Performance differs significantly across the three geographical groups. The approximate eta-squared effect size is:

$$\eta^2 = \text{SS}_{\text{Between}} / \text{SS}_{\text{Total}} = 43.941 / 640.441 = 0.069.$$

Thus, geographical location accounts for approximately 6.9% of the observed variation in Business Performance in the demonstration dataset.

J. Tukey HSD Post-Hoc Analysis

Because the ANOVA result is statistically significant, Tukey's Honestly Significant Difference (HSD) test was conducted to identify the specific group differences.

TABLE XVII
TUKEY HSD PAIRWISE COMPARISONS

Comparison	Mean Diff.	p	Lower	Upper
Rural–Semi-urban	0.126	0.510	-0.141	0.393
Rural–Urban	0.613	< 0.001	0.360	0.866
Semi-urban–Urban	0.487	< 0.001	0.269	0.706

The Tukey HSD shows urban retailers perform Really better (Business Performance) in business compared to rural ($p < 0.001$) as well as semi-urban ($p < 0.001$) retailers. Rural vs. semi-urban retailing difference though isn't significant ($p = 0.510$).

In fact, the post-hoc findings clearly show that the biggest geographic contrast in the demonstration dataset comes from urban retailers only versus the rest two.

K. Hypothesis Testing

The hypotheses were evaluated using the statistical procedures specified in the research methodology. The results are summarized in Table XVIII.

TABLE XVIII
SUMMARY OF HYPOTHESIS TESTING

Hypothesis	Statement	Statistical Test	p-value	Decision
H1	Digital capability factors significantly	Multiple Regression	< 0.001	Supported

	y influence e-commerce adoption among MSME retailers in Maharashtra.			
H2	E-commerce adoption has a significant positive impact on business performance of MSME retailers in Maharashtra.	Multiple Regression	< 0.001	Supported
H3	Business performance differs significantly across urban, semi-urban, and rural MSME retailers in Maharashtra.	One-Way ANOVA	< 0.001	Supported

Beyond this, the synthetic demonstration results show that all three main hypotheses are supported. In particular, Digital Capability is quite a bit related to E-commerce Adoption, which is in line with H1. Same thing, E-commerce Adoption has a strong and highly statistically significant positive association with Business Performance - this is evidence supporting H2, and finally, Business Performance varies in different localities as evidenced through a significant ANOVA result because of this supporting H3.

Still, the hypothesis decisions made rely solely on the synthetic demonstration dataset and because of this, the population of MSME retailers in Maharashtra shouldn't be seen as drawing an empirical conclusion in that direction. The same statistical procedures should be used on the genuine survey dataset before drawing any substantive conclusions.

X. DISCUSSION

The study results provide insight into how a retailer's implementation of e-commerce affects business performance of its MSME. The measurement instruments are quite reliable as the reliability analysis has proved that the constructs have an acceptable level of internal consistency and that means this questionnaire items can be safely used for further analysis. The data obtained show that e-commerce adoption among the retailers in the sample is at least somewhat limited, meaning

that even if digital technologies are widely available, the actual degree of e-commerce adoption and how it's being employed may differ across different types of MSMEs. Also, the paper reveals that e-commerce has a positive impact on the level of business performance. After taking into account the characteristics of a business enterprise that were chosen, the regression results confirm that e-commerce adoption has an impact on the level of variation of business performance. This finding aligns with the research works which have focused on the significance of e-commerce readiness and technical capacity for the development of MSMEs [barik et al. 2023 Kumari et al. 2023]. The work is also supported by some previous studies that have pointed out the relationship between implementing e-commerce, the level of organizational performance, and the sustainability of MSMEs [damiyana et al. 2024].

Results of the study show the role of digital technologies in facilitating the adoption of e-commerce, with higher levels of digital skills leading to greater use of digital tools, such as online marketplaces, payment systems, digital advertising etc, within one's business. It's in agreement with the technology adoption point of view taken in most of the previous MSME literature. From this we can say that the adoption of ecommerce isn't only limited to having an extra but also it's a big part of a digital transformation. Among the most revealing findings of the research is the comparison by geography. The ANOVA results demonstrate that business results in urban, semi-urban, and rural locations may have very diverging performance as evidenced by the significant difference in levels of performance. The differences are probably due to different levels of availability and access to digital infrastructure, technology, and service; it could be that the customer and the business owner in rural locations have to travel a long way for these things, and also the logistics in a rural location are much more challenging, etc. This kind of finding can be very helpful for the state of Maharashtra where, as previous studies, the adoption of e-commerce in rural areas is one of the main challenges facing the state. The findings of the current paper imply that for reaching a greater customer base, improving the way the business is conducted and in a way of it, strengthening competitiveness, MSMEs can use e-commerce. Still, these advantages won't be realized all of a sudden as the case of digital technologies and their application varies a great deal even within one region, one community or one neighborhood. A business's internal characteristics and location will be the two decisive factors determining whether the benefits of digital transformation often means improvements in a business's operations.

XI. XI. MANAGERIAL IMPLICATIONS

The study results present multiple areas that MSME retailers and decision-makers should consider: MSMEs need the ability to perform basic digital tasks before expanding their e-commerce efforts. Retailers may, for instance, learn how to use digital payments, online marketing, and online store management, which among other things, will help them make better use of an e-commerce channel to generate more sales.

Second, it might be beneficial for some retailers to implement a fully hybrid or an online, offline business model. Rather than viewing e-commerce as a substitute for physical storefronts, MSMEs can employ digital tools not only to reach new customers but to also interact with the existing ones, as well as to implement home delivery, etc. via the online ordering system.

Third, the costs linked with digital platforms - like platform fees, delivery and promotional costs, and even the cost of handling product returns - should be well accounted for. By conducting a profitability analysis of the digital channels in an organized manner, retailers will be led to choosing the right e-commerce platforms and saving on unnecessary operating costs.

To be successful in their role as a policymaker, the government, apart from offering support in the form of digital platform usage and digital skill development for small businesses, needs to focus more on practical solutions such as helping them set up a website, lowering transportation costs, providing awareness programs for accepting electronic payments, and making it easy for them to be listed online. MSME TEAM and ONDC, among other programs, backed by the government, have given MSMEs many opportunities to engage and grow in digital commercial activities (Ministry of Micro, Small & Medium Enterprises, 2025).

XII. XII. LIMITATIONS

The research work holds certain drawbacks that warrant further attention. For example, the design of this research study is cross-sectional, because of this, it doesn't provide solid evidence for causality between the e-commerce adoption and the business performance. And, response bias and common method bias may creep in owing to Truth is all the data is self-reported. Finally, different regions of Maharashtra have varying levels of digital infrastructure as well as market conditions, and the lack of representation of certain regions or types of retailers might affect the validity (generalizability) of the study findings. Also, the research paper's reliance on a fixed-question survey isn't a sufficient way of portraying how traditional retailers are being affected and transformed by these digital innovations. On this, research works with longitudinal data, or mixed-methods approaches using both quantitative methods and qualitative techniques such as interviews or case studies, would be appropriate avenues for future investigations.

XIII. XIII. CONCLUSION

The rapid development of e-commerce is changing the operating environment of MSME retailers and opening up new opportunities and challenges for conventional retail industries. This research paper presents an empirical model for the discussion of why MSME retailers in Maharashtra adopt e-commerce and how this adoption is related to business effectiveness.

Our structure covers four key points: to identify at what level and to what extent e-commerce adoption takes place among MSME retailers, to point out the digital capability factors that lead one to adoption, to estimate the effect of e-commerce adoption on business performance, and to find out the variability of business performance in urban, semi-urban and

rural areas respectively. Different statistical techniques like descriptive statistics, reliability analysis EFA correlation, multiple regression, and one-way ANOVA are blended for an ordered analysis of all the relationships mentioned above.

The analysis presented here confirms the adequacy of such a research system for the discussion of the proposed associations. The outcome of this research highlights Truth is e-commerce utilization, digital potential, and territorial factors are essential variables in explaining the performance of MSME retail firms. Yet, since the present study relies on synthetic data these findings are rather hypothetical. It isn't until the primary survey data of Maharashtra MSME retailers have been gathered and analyzed that we'll be able to confirm these results.

Potentially, further empirical work through a survey covering all areas of Maharashtra can shed more light on the contribution that e-commerce adoption can have on MSME development and competitiveness at large. This evidence may help MSME retailers to better understand digital channels and the role each channel can play in their digital roadmap while allowing policies to be developed that enable and facilitate the change ultimately the sustainable growth of the retail MSME business.

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