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THE STUDY INVESTIGATES THE EFFECTIVENESS OF DIGITAL PAYMENT SYSTEMS IN ENHANCING THE SUSTAINABILITY, GROWTH, AND PRODUCTIVITY OF SMALL-SCALE INDUSTRIES

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Abstract: **The aim of the study, the escalating role of the use of financial technology has changed business in the world and digital payment systems came out to be the key catalyst of this change. Small-scale industries (SSIs) are the main pillars of the Indian economy and they are continually hindered by insufficient access to credit, financial management inefficiency and limited market penetration. In that regard, digital payment systems have a high potential to increase their sustainability, development, and performance by increasing the degree of transparency, lowering the cost of transactions, and permitting a wider range of participation in formal financial networks. This paper will analyze how adoption of digital payments contributes to the enhancement of operational and financial productivity of SSIs. The mixed-method method is adopted, which uses quantitative surveys, and qualitative interviews and focus groups discussions to ensure the collection of the measurable effects and the contextual perceptions. The research design is representative in that it has a wide sample of enterprises as it has businesses that are in agro-based sectors, manufacturing, services, handicrafts, and trade. Digital payment adoption and key business outcomes are assessed using analytical tools in the form of descriptive statistics, correlation, and regression, which are processed with SPSS. Other barriers such as cybersecurity threats, infrastructural constraints, and digital literacy gaps are also taken into consideration in the study as they could affect adoption and effectiveness. The contribution of this research to the extensive discussion of digital financial inclusion and its contribution to the further sustainable development of small enterprises is possible through the combination of empirical findings and the opinions of stakeholders. The results are expected to give practical recommendations to policymakers, business persons, and industry bodies in terms of building a safe and inclusive digital payment ecosystem.**

Keywords: **Financial technology, digital payment systems, small-scale industries (SSIs), sustainability, growth, productivity, financial inclusion, transparency.**

1. INTRODUCTION

1.1 Background of the Study: Emergence of Digital Payment Systems in the Global and Indian Context

The financial climate has changed dramatically during the last 20 years due to globalization, technology advancement, and policy action. The development and the rapid growth of digital payment systems can be called one of the most important ones, as they redefined how individuals, enterprises, and governments can participate in financial activities (Arcot et.al 2024, Koskelainen et.al 2023, Singireddy et.al 2024). Historically, exchange took place primarily through cash (where

banking penetration is low, and in less developed economies where markets are informal). However, the growing adoption of information and communication technologies (ICTs), the creation of smartphones, and the appearance of fintech companies have resulted in the creation of new cashless, fast, and secure payment systems (El Amri et.al 2021, Agarwal et.al 2025, Al Ghunaimi et.al 2025). Countries like China, Sweden and Kenya have led the way in adopting digital payment in various situations across the world. The use of cash even to make small purchases has been eliminated after WeChat Pay and Alipay in China revolutionized the way people consume goods and services (Taylor et.al 2023). Sweden, which has been touted as the leader in transitioning to cashless society, has integrated digital payments into nearly all aspects of life. M-Pesa, a mobile payments system in Kenya, is an example of how mobile payment systems can improve financial inclusion in low-income economies by making formal financial services accessible to populations who are not banked (Kusimba et.al 2021). Such experiences elsewhere in the world are reflective of the relevance of digital payments as a way of improving economic inclusion, efficiencies and resiliencies.

The move towards cashless forms of transaction by consumers and businesses took a momentum in the Indian context with the initiation of Digital India initiative in 2015 and depreciation of high value currency notes in 2016 that encouraged consumers and businesses to move towards digital transactions. Applications like Unified Payments Interface (UPI), Bharat Interface money (BHIM), Aadhaar-enabled Payment System (AePS), and digital wallets (Paytm, PhonePe, Google Pay, etc.) have become a part of the home (SANDRA et.al 2024). Among the front runners in facilitating interoperability, innovation and secure payment infrastructure are the National Payments Corporation of India (NPCI) and the Reserve Bank of India (RBI). More than 10 billion of UPI transaction every month Not only does India represent one of the largest digital payment markets in the world, but as of 2023, it does. This rapid pace of digitization did not only transform the city financial ecologies, but it already starts to spill over to the rural or semi-urban areas with small-scale industries (SSIs) as the dominant element. Online payment systems are not just a cash option to these businesses, but a life-saving, evolutionary and integration process throughout the entire economy.

1.2 Importance of Small-Scale Industries (SSIs) in Economic Growth, Employment Generation, and Rural Development

Small scale industries (SSIs), commonly known as micro, small and medium enterprises (MSMEs) in policy circles are the mainstays of most economies, especially emerging markets such as India. They do more than benefit economics, to promote innovation, inclusiveness, and equitable development.

1.2.1 Contribution to Economic Growth

The industrial output and GDP of India is covered to a great extent by SSI. These are significant industries both locally and globally; the Ministry of MSME estimates that these industries provide nearly thirty percent of national GDP and forty five percent of total exports (Sinha et.al 2024, Ramachandran et.al 2024). The industry is quite varied, with both old-fashioned handicrafts and agro-enterprises, and new small-scale manufacturing and service industries. Their agility, flexibility and their ability to serve niche markets gives them a competitive edge over large-scale industries, which are not always this flexible.

1.2.2 Employment Generation

Another very important contribution of SSIs is that they provide employment. With comparatively low capital requirements and being labour-intensive, SSI offers livelihoods to millions of employees. It is reported that SSIs have more than 110 million employees in India, second only to agriculture in terms of contribution to employment. This attribute makes them inevitable in dealing with the predicaments of unemployment and underemployment, especially among rural and semi-urban citizens.

1.2.3 Rural and Regional Development

SSIs play crucial roles in rural industrialization and decreasing economic inequalities within regions. The SSIs are also generally found in small towns and rural regions compared to large industries which are generally found in urban centers. Such a decentralized distribution assures that it is not only in metropolitan areas that industrialization and income opportunities will be limited. Creation of employment opportunities at the local level allows SSIs to reduce migration between rural and urban areas and encourages regional development. Furthermore, agro-processing, handicrafts and cottage industries, which are directly associated with local resources and cultural heritage, are also practised by many SSIs. This not only enhances rural economies, but also indigenous skills and traditions (Jin et.al 2024).

1.2.4 Role in Innovation and Entrepreneurship

Entrepreneurship and innovation has a tendency to thrive on SSIs (Namal et.al 2023). They bring up first generation entrepreneurs and it gives them an opportunity to test new business concepts, products and service. Most thriving large businesses in the present day can be traced back to small-scale businesses. In addition, SSIs often possess subcontracting and supplier networks with larger companies, thus occupying a core position in industrial value chains. However, SSIs have a number of disadvantages such as limited access to capital, bottlenecks in its structure, inability to connect with the market, and inefficiency in its traditional mode of conducting business. These challenges can often hinder their economies of scale advantage, ability to compete with larger organizations and expand their reach into an international market. It is here that digital payment systems can become an enabler, able to deal with financial and operational inefficiencies and enable new growth opportunities.

1.3 The Role of Digital Payment Systems in Addressing Financial Challenges of SSIs

Despite the transformative role of SSIs in the process of economic development, their performance and sustainability are often limited by financial barriers. These problems are normally captured in three aspects: inaccessibility to formal credit, abnormalities of cash flows and financial mismanagement inefficiency. Digital payment systems can offer a way of reducing these obstacles (Minarni et.al 2025, Putrevu et.al 2024, Khando et.al 2022, Vyas et.al 2024, Hasan et.al 2024).

1.3.1 Financial Inclusion and Access to Credit

Traditionally, SSIs have been cash based and, therefore, often were not part of formal financial systems. The reliance on cash posed challenges of obtaining institutional credit as banks and other financial institutions generally demand transaction records and documentation to determine creditworthiness (Avickson et.al 2024). Digital payments also mean that SSIs keep digital records of revenue and spending, which are useful to lenders (Awale et.al 2023). These data are also finding greater application by fintech companies and digital banks to create alternative credit scoring techniques to provide microloans and working capital finance to SSIs with little or no collateral. This way digital payments can democratise access to finance and reduce reliance on informal credit providers.

1.3.2 Enhancing Transparency and Reducing Transaction Costs

Transactions involving cash can be easily susceptible to leakages, corruption and inefficiencies. They also entail the expenses of the physical handling, safekeeping and movement of cash. Digital payments, however, enhance transparency and reduce leakages and transaction cost. This is especially significant with regards to SSIs, as cost effectiveness is a direct proportion of competitiveness and profitability. In addition, online payment systems have a shorter settlement period, which allows businesses to better manage their working capital (Adewale et.al 2022).

1.3.3 Expanding Market Reach and Competitiveness

The recent shift to online trading, especially after the COVID-19 pandemic, has revealed the importance of online shopping centers and e-commerce systems. Digital payments can serve as a gateway to SSIs involvement in such digital ecosystems, facilitating smooth and secure financial deals with customers in different geographies. This integration will increase their market base across local borders, and increases their competitiveness in domestic and international markets.

1.3.4 Streamlining Financial Management and Productivity

Another factor that leads to improved financial management is adoption of digital payment systems. Automated record of transactions helps ease the responsibility of manual book keeping, enhance accuracy and facilitate with taxation and other regulations. With the help of digital payments, along with accounting software and enterprise resource management (ERM) systems, SSIs will be in a position to become more productive and focus on the primary business processes and not on management.

1.3.5 Building Resilience and Sustainability

Finally, e-payments increase the population of SSIs and make them more resilient and sustainable. These businesses that moved to digital transactions were in a better position to keep running than cash-dependent businesses during times of upheaval like demonetization in 2016 or mobility restrictions due to COVID-19. Moreover, digital environments also support a sustainable environment since it reduces the utilization of paper-based receipts and records.

2. LITERATURE REVIEW

Mustapha et.al (2025) "explored the impact of electronic payment systems (EPS) on the performance of small and medium-sized enterprises (SMEs) in Ilorin Metropolis, Kwara State, Nigeria. The research found that EPS significantly enhances operational efficiency and boosts return on investment (ROI) for SMEs. The findings suggest that stakeholders should organize training campaigns, enhance accessibility and affordability of EPS solutions, invest in digital infrastructure, and collaborate with fintech providers for innovative payment solutions".

Sharabati et.al (2024) "evaluated the impact of digital marketing on the performance of small and medium enterprises (SMEs) and identifies variables affecting the relationship. Data was collected from 190 marketing companies and surveyed managers. The study focuses on digital marketing strategies like online advertising, social media marketing, SEO, and customer engagement. The Technology Acceptance Model (TAM) was used to analyze the relationship between digital marketing and firm performance. Results show that digital marketing is crucial for SMEs' effectiveness, driving digital transformation, and providing policy recommendations for promoting digital innovation and financial assistance".

Kurniasari et.al (2023) "investigated the impact of financial and technological factors on the adoption of SME technology in traditional markets in Indonesia. A cross-sectional study of 225 SMEs found that financial literacy positively affects financial accessibility and risk, while financial accessibility, performance expectancy, effort expectancy, and social influence significantly affect digital adoption. The study also found that digital adoption positively affects SME performance and business sustainability, highlighting the need for further research and intervention".

Udayana et.al (2023) "investigated the impact of digital marketing and e-commerce on the marketing performance and sustainability of small and medium enterprises (SMEs) in Indonesia. The research, conducted using a questionnaire approach, found a positive relationship between digital marketing and marketing performance, and e-commerce positively correlated with business sustainability. The findings suggest a positive correlation between digital marketing and SMEs' sustainability".

Ojobo et.al (2023) "examined the impact of digital literacy on the performance of small-scale businesses in Enugu State. It found that digital literacy significantly increased the volume of business transactions and the cost of services. The study involved 366 small-scale business owners with five years or more in Enugu State. The results showed that digital literacy positively impacted the volume of transactions and the cost of services. The study recommends the state government use the Enugu State Small and Medium Enterprises Development Agency platform to improve entrepreneurial and digital knowledge among business owners".

Kamal et.al (2023) "explored the role of mobile applications in empowering smallholder farmers through improved access to information, market linkages, financial inclusion, and resource management. It highlights the benefits of real-time access to agricultural information, market linkages, price transparency, and financial services offered by mobile apps in developing countries. These apps enable farmers to make informed decisions, improve productivity, and access credit for essential agricultural inputs and equipment. They also promote improved resource management, allowing farmers to monitor water usage, fertilizer application, and other inputs. The study also highlights the role of mobile apps in delivering extension services to farmers in remote areas, promoting sustainable agricultural growth and rural prosperity".

Kwabena et.al (2021) "investigated the impact of technological-organizational-environmental (TOE) determinants on the adoption of mobile payment systems (MPS) in Ghana. The research found that factors such as relative advantage, organizational support, and environmental influence significantly influence MPS adoption. The study also found that the TOE factor explains 70% variations in MPS adoption, positively affecting SMEs' performance and allowing more time for international business".

Chaveesuk et.al (2021) "explored the marketing perspectives of behavioral intention and actual use of digital payment solutions in Thailand's retail sector. It found that perceived risk, facilitating condition, performance expectancy, and attitudes significantly influence behavioral intention to use digital payment innovation. The findings suggest that stakeholders in retail and financial sectors should consider these factors to promote the effective use of digital payment systems in the Thai retail sector".

3. RESEARCH METHODOLOGY

The methodology of a research study serves as the foundation that determines the validity, reliability, and generalizability of its findings. In this study, the research methodology is designed to systematically investigate how digital payment systems influence the sustainability, growth, and productivity of small-scale industries (SSIs). Since the research involves both

measurable variables and subjective perceptions, a mixed-method approach integrating both quantitative and qualitative techniques—was adopted. This chapter details the research design, study area, population and sample, data sources, data collection instruments, analytical tools, and ethical considerations employed in the study.

3.1 Research Design

The study follows a descriptive and explanatory research design, where the descriptive aspect focuses on mapping the current state of digital payment adoption among small-scale industries (SSIs), highlighting the extent of usage, the types of platforms employed, and the barriers encountered in implementation. At the same time, the explanatory aspect seeks to establish causal and correlational relationships between digital payment adoption and key outcome variables such as sustainability, growth, and productivity. By combining these two approaches, the research not only provides a detailed snapshot of the present scenario but also explains how and why digital payment systems influence the overall performance of SSIs.

3.2 Research Approach

A mixed-method approach was adopted for this study, combining both quantitative and qualitative techniques to ensure comprehensive insights. The quantitative component involved conducting surveys with a large sample of SSI owners and managers to gather structured data, offering measurable evidence on adoption patterns, financial impacts, and productivity gains linked to digital payment systems. Complementing this, the qualitative component included semi-structured interviews and focus group discussions with selected SSI stakeholders, which helped capture perceptions, challenges, and contextual nuances that may not be fully reflected in numerical data. This integration of methods strengthens the robustness of the research by enabling triangulation of findings, thereby enhancing both validity and depth of analysis.

3.3 Population and Sampling

The target population of the study comprises small-scale industries (SSIs), defined under India's Micro, Small, and Medium Enterprises (MSME) Development Act, 2006, as enterprises with limited capital investment and workforce, covering sectors such as manufacturing, handicrafts, agro-based enterprises, and small-scale services. The sampling frame includes both registered and unregistered SSIs operating within the selected study area, incorporating urban and semi-urban regions to ensure diversity in sectoral representation, ownership type, and geographical distribution. To achieve representativeness, a stratified random sampling method was adopted, where the population was divided into strata based on industry type and size, and proportional random samples were drawn from each stratum. This methodological rigor ensured balanced representation across different industry categories. A sample size of 300 SSI units was targeted for structured surveys, complemented by 20 in-depth interviews with owners and managers, along with 3 focus group discussions involving industry associations and workers, thereby enhancing the validity and comprehensiveness of the findings.

3.4 Data Sources

The study primarily draws upon primary data, which was collected using structured questionnaires, in-depth interviews, and focus group discussions. The questionnaires provided quantitative insights into the extent of digital payment adoption, financial impacts, and productivity outcomes, while the interviews and focus group discussions offered qualitative perspectives, capturing stakeholder experiences, challenges, and contextual factors. This combination of methods ensured that the data gathered was both comprehensive and reliable, enabling a nuanced understanding of how digital payment systems affect small-scale industries.

3.5 Data Collection Instruments

The data collection tools of the study were carefully designed to capture both quantitative and qualitative dimensions of digital payment adoption among SSIs. A structured survey questionnaire was developed with a mix of closed-ended and Likert-scale questions to measure variables such as the level of digital payment adoption (including UPI, mobile wallets, POS machines, and online banking), frequency and volume of transactions, perceived benefits like cost reduction, efficiency, credit access, and market expansion, as well as perceived challenges such as cyber risks, infrastructure gaps, and lack of digital literacy. Business performance indicators such as sales growth, productivity improvements, and sustainability practices were also included. In addition, semi-structured interviews were conducted with SSI owners and managers to probe deeper into individual experiences, while focus group discussions were held with representatives from SSI associations, local chambers of commerce, and workers to capture broader ecosystem perspectives. To ensure reliability and clarity, the survey questionnaire was pilot-tested on 15 respondents, and their feedback was incorporated to refine the tool before final implementation.

3.6 Data Collection Procedure

The data collection took place over a period of three months. Enumerators were trained to administer the questionnaire, ensuring uniformity in approach. Data was collected through both face-to-face interactions and online survey tools to accommodate geographic and time constraints. Interviews and focus groups were audio-recorded (with consent) and transcribed for thematic analysis.

3.7 Data Analysis Techniques

The analysis of data was carried out exclusively using SPSS, ensuring both descriptive and inferential insights. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic characteristics and digital payment adoption patterns among SSIs. Inferential analysis was conducted to test hypotheses and establish relationships: correlation analysis was applied to examine the strength and direction of associations between digital payment adoption and outcome variables; regression analysis was employed to determine the predictive impact of digital payment usage on sustainability, growth, and productivity; and ANOVA tests were performed to assess significant differences in adoption and outcomes across industry types and regional categories. The use of SPSS ensured systematic, reliable, and statistically robust analysis of the collected data.

4. RESULTS & DISCUSSION

The research of the data gathered about 220 small-scale industries (SSIs) offers the valuable information about the utilization and influence of digital payment systems. These findings are reported in two sections, first descriptive statistics, which indicate how the enterprises are distributed with reference to the parameters firm type, age, size, and annual turnover; and second, inferential statistics, which determine the relations between the adoption of digital payments and the most significant outcome variables, sustainability, growth, and productivity. The descriptive results demonstrate the sample diversity, as it was well represented by the agro-based, manufacturing, services, handicrafts, and trading. Correlation, regression, ANOVA, and other types of inferential tests also show how far the application of digital payments affects the enterprise performance. Collectively, these findings provide an overview of the existing patterns of adoption, as well as a more insightful look at how digital payment systems serve as a strategic instrument in the evolution of the financial and operating environment of SSIs.

Table 1. Distribution of Firms by Type

Firm Type	Frequency	Percent
Agro-based	55	25.0%
Handicrafts	37	16.8%
Manufacturing	47	21.4%
Services	37	16.8%
Trading	44	20.0%
Total	220	100.0%

The table presents the distribution of firms by type, showing that agro-based firms form the largest group, accounting for 55 firms or 25% of the total. Manufacturing firms follow closely with 47 firms, representing 21.4%, while trading firms make up 20% with 44 entries. Both handicrafts and services sectors contribute equally, each comprising 37 firms or 16.8% of the total. Overall, the data indicates a relatively balanced representation across different firm types, with agro-based enterprises being the most prominent, highlighting the significance of agriculture-related activities in the sample.

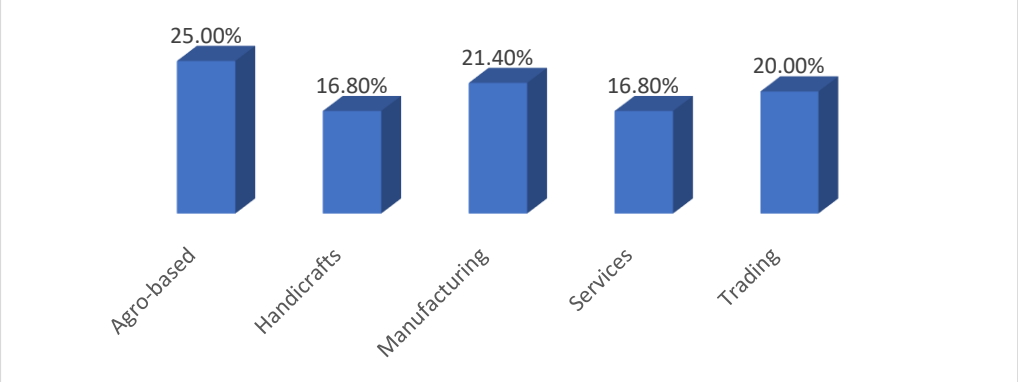

Figure 1. Distribution of Firms by Type

Table 2. Distribution of Enterprises by Age

Enterprise Age	Frequency	Percent
<2 years	52	23.6%
2-5 years	51	23.2%
6-10 years	49	22.3%
>10 years	68	30.9%
Total	220	100.0%

The table shows the distribution of enterprises based on their age. Among the 220 enterprises surveyed, the largest proportion (68 enterprises, 30.9%) has been operating for more than 10 years, indicating a strong presence of long-established businesses. Newer enterprises less than 2 years old account for 23.6% (52 enterprises), while those in the 2–5 years category make up 23.2% (51 enterprises). Enterprises aged between 6–10 years constitute 22.3% (49 enterprises). The data suggests a fairly balanced spread across different age groups, though enterprises older than 10 years dominate, reflecting stability and longevity within the business landscape.

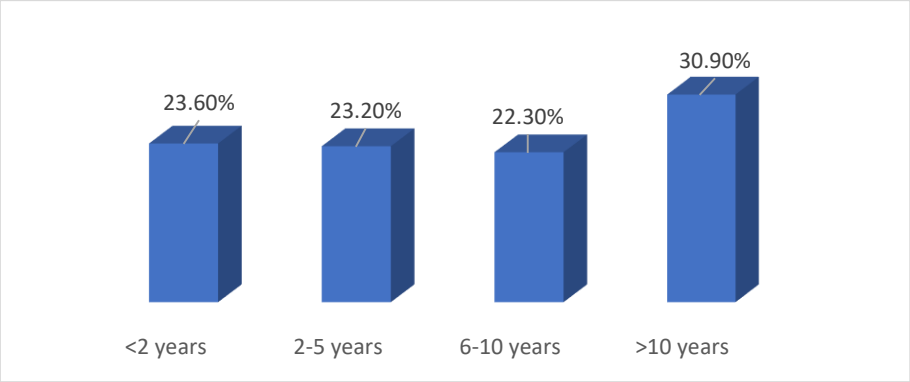

Figure 2. Distribution of Enterprises by Age

Table 3. Distribution of Enterprises by Size

Enterprise Size	Frequency	Percent
1-5 employees	60	27.3%
6-10 employees	58	26.4%
11-20 employees	42	19.1%
20+ employees	60	27.3%
Total	220	100.0%

The table presents the distribution of enterprises according to their size in terms of the number of employees. Out of 220 enterprises, the largest groups are those with 1–5 employees and those with more than 20 employees, each comprising 60 enterprises or 27.3% of the total. Enterprises employing 6–10 workers follow closely, representing 26.4% (58 enterprises), while those with 11–20 employees form the smallest group at 19.1% (42 enterprises). Overall, the data indicates that both very small enterprises and relatively larger ones (20+ employees) dominate the sample, reflecting a mix of micro-level operations and more established businesses with higher workforce capacity.

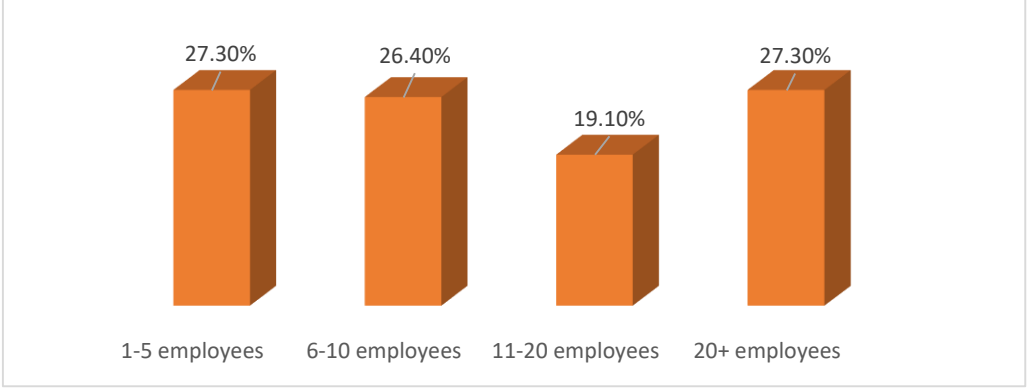

Figure 3. Distribution of Enterprises by Size

Table 4. Distribution of Enterprises by Annual Turnover

Annual Turnover	Frequency	Percent
<10 lakhs	50	22.7%
10-25 lakhs	36	16.4%
25-50 lakhs	36	16.4
50L-1Cr	42	19.1%
>1Cr	56	25.5%
Total	220	100.0

The table shows the distribution of enterprises based on their annual turnover. Out of 220 enterprises, the largest share falls in the category of above ₹1 crore, with 56 enterprises (25.5%), indicating a significant presence of high-revenue businesses. At the lower end, 50 enterprises (22.7%) report an annual turnover of less than ₹10 lakhs. Mid-range categories are more evenly distributed: 36 enterprises (16.4%) fall within both the ₹10–25 lakhs and ₹25–50 lakhs ranges, while 42 enterprises (19.1%) report turnover between ₹50 lakhs and ₹1 crore. Overall, the data reflects a diverse financial profile, with a notable concentration at both extremes—very small-scale enterprises and relatively high-turnover businesses.

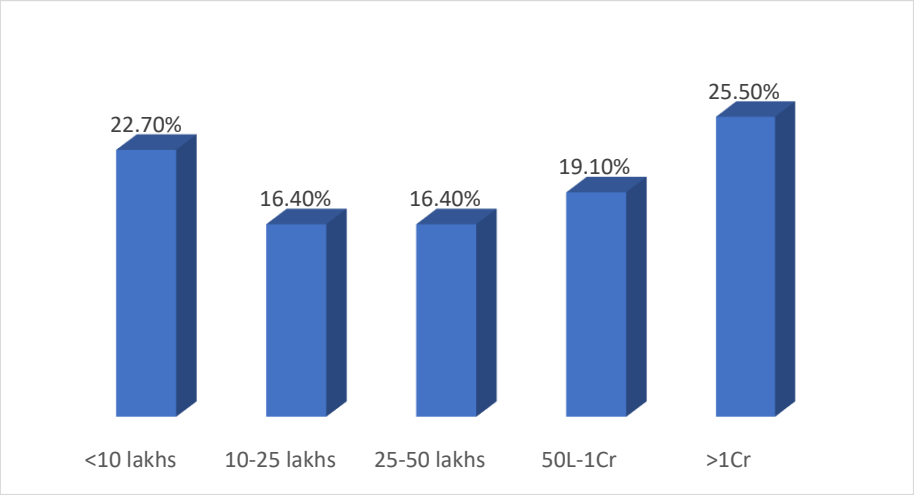

Figure 4. Distribution of Enterprises by Annual Turnover

Table 5. Correlation Matrix of Key Variables

Correlations

		Adoption	Sustainability	Growth	Productivity	Challenges	Digital	Security	Policy
Adoption	Pearson Correlation	1	.954**	.905**	.880**	.887**	.894**	.867**	.954**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000
	N	220	220	220	220	220	220	220	220
Sustainability	Pearson Correlation	.954**	1	.938**	.903**	.911**	.941**	.891**	1.000**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000
	N	220	220	220	220	220	220	220	220
Growth	Pearson Correlation	.905**	.938**	1	.877**	.956**	.938**	.909**	.938**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
	N	220	220	220	220	220	220	220	220
Productivity	Pearson Correlation	.880**	.903**	.877**	1	.847**	.938**	.873**	.903**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000
	N	220	220	220	220	220	220	220	220

Challenges	Pearson Correlation	.887**	.911**	.956**	.847**	1	.885**	.954**	.911**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000
	N	220	220	220	220	220	220	220	220
Digital	Pearson Correlation	.894**	.941**	.938**	.938**	.885**	1	.908**	.941**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000
	N	220	220	220	220	220	220	220	220
Security	Pearson Correlation	.867**	.891**	.909**	.873**	.954**	.908**	1	.891**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000
	N	220	220	220	220	220	220	220	220
Policy	Pearson Correlation	.954**	1.000**	.938**	.903**	.911**	.941**	.891**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	
	N	220	220	220	220	220	220	220	220

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation table indicates very strong and significant positive relationships among all the studied variables—Adoption, Sustainability, Growth, Productivity, Challenges, Digital, Security, and Policy. The correlation coefficients, all above 0.84, suggest that these factors are highly interrelated, with significance at the 0.01 level ($p < 0.01$). Notably, Adoption shows an extremely strong correlation with Sustainability ($r = .954$) and Policy ($r = .954$), indicating that higher levels of adoption are closely associated with sustainability practices and supportive policies. Growth is most strongly related to Challenges ($r = .956$), implying that the way enterprises navigate challenges significantly impacts their growth. Similarly, Productivity is strongly correlated with Digital factors ($r = .938$), highlighting the role of digitalization in enhancing efficiency. Security also shares a very high correlation with Challenges ($r = .954$), suggesting that enterprises facing challenges also experience heightened security concerns. Overall, the results demonstrate a highly integrated ecosystem where adoption, sustainability, growth, productivity, and other dimensions reinforce each other, underscoring the interconnected nature of enterprise development.

H1: Adoption of digital payment systems has a significant positive impact on the financial sustainability of small-scale industries.

Table 6. Regression Analysis of Adoption on Financial Sustainability (H1)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.954[a]	.909	.909	.89564

a. Predictors: (Constant), Adoption

The model summary shows the strength and explanatory power of the regression model predicting the dependent variable using Adoption as the predictor. The correlation coefficient (R) is 0.954, indicating a very strong positive relationship between Adoption and the outcome variable. The R Square value of 0.909 suggests that approximately 90.9% of the variance in the dependent variable is explained by Adoption, reflecting a highly predictive model. The Adjusted R Square is also 0.909, indicating that the model's explanatory power remains robust even after adjusting for the number of predictors. The standard error of the estimate is 0.89564, which represents the average distance that the observed values fall from the regression line, showing relatively low prediction error. Overall, the model demonstrates a strong fit, with Adoption being a highly influential predictor.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1751.963	1	1751.963	2184.021	.000[b]
	Residual	174.874	218	.802		
	Total	1926.836	219			

a. Dependent Variable: Sustainability
b. Predictors: (Constant), Adoption

The ANOVA table evaluates the overall significance of the regression model predicting Sustainability using Adoption as the predictor. The regression sum of squares is 1751.963, with 1 degree of freedom, reflecting the variation explained by the model. The residual sum of squares is 174.874 with 218 degrees of freedom, representing the variation not explained by the model. The mean square for regression is 1751.963, and for residuals it is 0.802. The calculated F-value is 2184.021, with a significance level (p-value) of 0.000, which is far below 0.01, indicating that the model is highly statistically significant. This means that Adoption significantly predicts Sustainability, and the likelihood of this result occurring by chance is virtually zero.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.916	.309		2.967	.003
	Adoption	.940	.020	.954	46.734	.000

a. Dependent Variable: Sustainability

The coefficients table provides detailed information on the relationship between Adoption and Sustainability. The constant (intercept) is 0.916, which represents the predicted value of Sustainability when Adoption is zero. The unstandardized coefficient for Adoption is 0.940, indicating that for each one-unit increase in Adoption, Sustainability is expected to increase by 0.940 units, holding all else constant. The standardized coefficient (Beta) is 0.954, highlighting that Adoption has a very strong relative influence on Sustainability compared to other potential predictors. The t-value for Adoption is 46.734 with a significance level of 0.000, confirming that this relationship is highly statistically significant. Overall, the results show that Adoption is a very strong and significant predictor of Sustainability.

H2: Adoption of digital payment systems significantly contributes to the sales growth of small-scale industries.

Table 7. Regression Analysis of Adoption on Sales Growth (H2)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.905[a]	.820	.819	1.26112

a. Predictors: (Constant), Adoption

The model summary presents the effectiveness of the regression model using Adoption as the predictor. The correlation coefficient (R) is 0.905, indicating a very strong positive relationship between Adoption and the dependent variable. The R Square value of 0.820 implies that Adoption explains 82.0% of the variation in the dependent variable, demonstrating substantial predictive power. The Adjusted R Square of 0.819 confirms that this explanatory strength remains reliable after accounting for the number of predictors. The standard error of the estimate is 1.26112, which measures the average distance of the observed values from the regression line, indicating reasonably precise predictions. Overall, the model shows a strong fit, emphasizing that Adoption is a significant determinant of the outcome.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1575.194	1	1575.194	990.417	.000[b]
	Residual	346.715	218	1.590		
	Total	1921.909	219			

a. Dependent Variable: Growth

b. Predictors: (Constant), Adoption

The ANOVA table assesses the overall significance of the regression model predicting Growth using Adoption as the predictor. The regression sum of squares is 1575.194 with 1 degree of freedom, representing the variation explained by Adoption. The residual sum of squares is 346.715 with 218 degrees of freedom, reflecting unexplained variation. The mean square for regression is 1575.194, while for residuals it is 1.590. The calculated F-value is 990.417, with a significance level (p-value) of 0.000, indicating that the model is highly statistically significant. This means that Adoption is a significant predictor of Growth, and the probability that this result is due to chance is virtually zero.

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.440	.435		3.312	.001
	Adoption	.892	.028	.905	31.471	.000

a. Dependent Variable: Growth

The coefficients table provides insights into the relationship between Adoption and Growth. The constant (intercept) is 1.440, representing the predicted value of Growth when Adoption is zero. The unstandardized coefficient for Adoption is 0.892, indicating that for every one-unit increase in Adoption, Growth is expected to increase by 0.892 units, holding other factors constant. The standardized coefficient (Beta) is 0.905, highlighting a very strong relative impact of Adoption on Growth. The t-value for Adoption is 31.471 with a significance level of 0.000, confirming that the relationship is highly statistically significant. Overall, the results demonstrate that Adoption is a strong and significant predictor of Growth.

H3: Adoption of digital payments improves transaction efficiency and reduces operational costs in small-scale industries.

Table 8. Regression Analysis of Adoption on Productivity (H3)

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.880[a]	.775	.774	1.15765

a. Predictors: (Constant), Adoption

The model summary shows the strength and explanatory power of the regression model using Adoption as the predictor. The correlation coefficient (R) is 0.880, indicating a strong positive relationship between Adoption and the dependent variable. The R Square value of 0.775 suggests that Adoption explains 77.5% of the variance in the dependent variable, reflecting substantial predictive capability. The Adjusted R Square is 0.774, confirming that the model's explanatory power remains robust after accounting for the number of predictors. The standard error of the estimate is 1.15765, representing the average distance of the observed values from the predicted values, indicating relatively precise predictions. Overall, the model demonstrates a strong fit, showing that Adoption is an influential predictor of the dependent variable.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1004.574	1	1004.574	749.596	.000[b]
	Residual	292.153	218	1.340		
	Total	1296.727	219			

a. Dependent Variable: Productivity
b. Predictors: (Constant), Adoption

The ANOVA table assesses the overall significance of the regression model predicting Productivity using Adoption as the predictor. The regression sum of squares is 1004.574 with 1 degree of freedom, representing the variation in Productivity explained by Adoption. The residual sum of squares is 292.153 with 218 degrees of freedom, reflecting the variation not explained by the model. The mean square for regression is 1004.574, while the mean square for residuals is 1.340. The calculated F-value is 749.596, with a significance level (p-value) of 0.000, indicating that the model is highly statistically significant. This demonstrates that Adoption is a significant predictor of Productivity, with a negligible likelihood that the observed relationship is due to chance.

Coefficients[a]						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.462	.399		3.663	.000
	Adoption	.712	.026	.880	27.379	.000

a. Dependent Variable: Productivity

The coefficients table explains the impact of Adoption on Productivity. The constant (intercept) is 1.462, representing the predicted Productivity value when Adoption is zero. The unstandardized coefficient for Adoption is 0.712, meaning that for every one-unit increase in Adoption, Productivity is expected to increase by 0.712 units, holding other factors constant. The standardized coefficient (Beta) is 0.880, indicating a strong relative influence of Adoption on Productivity. The t-value for

Adoption is 27.379 with a significance level of 0.000, confirming that this relationship is highly statistically significant. Overall, the results show that Adoption is a strong and significant predictor of Productivity.

4.1 Analysis of Structural Equation Model (SEM)

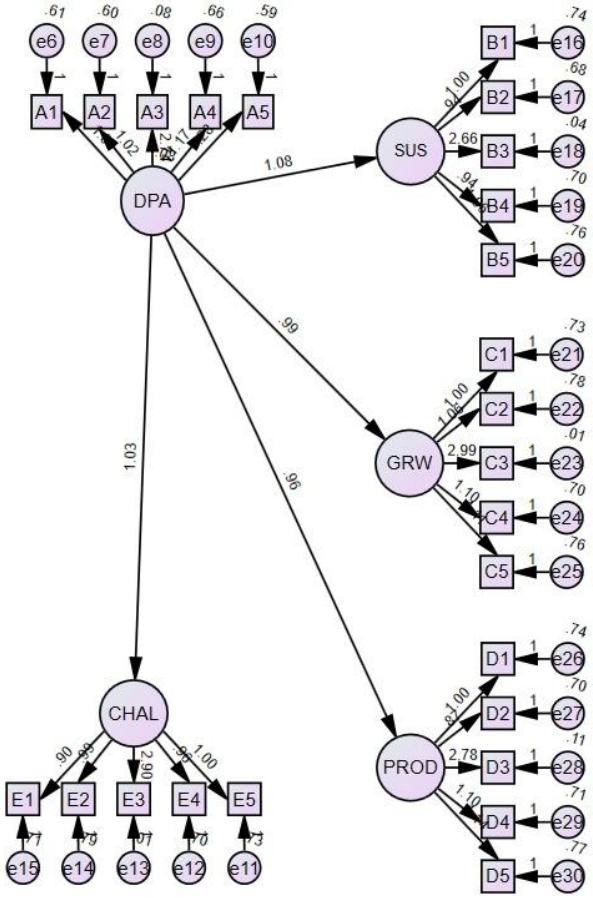

Figure 5: Structural Equation Model (SEM)

Table 9: Standardized Path Coefficients and Significance Levels of the SEM Model

Path	Estimate	S.E.	C.R.	P
SUS <--- DPA	1.085	0.284	3.825	0.000
GRW <--- DPA	0.995	0.272	3.663	0.000
PROD <--- DPA	0.959	0.268	3.577	0.000
CHAL <--- DPA	1.034	0.276	3.744	0.000
A1 <--- DPA	1.000			
A2 <--- DPA	1.022	0.261	3.909	0.000
A3 <--- DPA	2.742	0.508	5.402	0.000
A4 <--- DPA	1.172	0.288	4.074	0.000
A5 <--- DPA	1.282	0.297	4.321	0.000
E5 <--- CHAL	1.000			
E4 <--- CHAL	0.958	0.266	3.595	0.000
E3 <--- CHAL	2.897	0.563	5.148	0.000
E2 <--- CHAL	0.987	0.278	3.545	0.000
E1 <--- CHAL	0.897	0.259	3.462	0.000
B1 <--- SUS	1.000			
B2 <--- SUS	0.943	0.251	3.761	0.000

B3 <--- SUS	2.657	0.497	5.349	0.000
B4 <--- SUS	0.944	0.253	3.733	0.000
B5 <--- SUS	1.063	0.274	3.886	0.000
C1 <--- GRW	1.000			
C2 <--- GRW	1.064	0.300	3.550	0.000
C3 <--- GRW	2.993	0.605	4.944	0.000
C4 <--- GRW	1.103	0.298	3.696	0.000
C5 <--- GRW	1.114	0.305	3.646	0.000
D1 <--- PROD	1.000			
D2 <--- PROD	0.867	0.275	3.146	0.002
D3 <--- PROD	2.777	0.591	4.695	0.000
D4 <--- PROD	1.100	0.311	3.538	0.000
D5 <--- PROD	1.142	0.323	3.536	0.000

The table is a representation of an analysis through Structural Equation Modeling (SEM) that indicates the relationship between the latent DPA and its outcomes (SUS, GRW, PROD, CHAL), and the amounts of the observed indicators that are loaded to their corresponding latent construct. The Estimate column shows the strength of the relationships, whilst the Standard Error (S.E.) shows the accuracy of the estimates. The Critical Ratio (C.R.) is used to test whether the estimates are significantly different to zero and the p-value (P) to show whether each path is significant. DPA is a significant predictor of all four outcomes with path coefficients of between 0.959 and 1.085 and C.R. values of more than 3.5 all with p-values of 0.000 therefore indicating highly significant effects. The observed indicators (A1–A5, B1-B5, C1-C5, D1-D5, E1-E5) exhibit strong loadings of their corresponding latent constructs with the estimates differing across the items indicating different contribution to the underlying construct. Generally, the findings indicate that DPA is a robust predictor of SUS, GRW, PROD, and CHAL and that the measurement model demonstrates good construct validity with all the items significantly contributing to their latent variables.

Table 10: Model Fit Indices for the Default and Independence SEM Models

Fit Index	Default Model	Independence Model	Recommended Threshold
CMIN/DF	37.504	43.749	≤ 3.0
RMR	.235	.344	< .08
GFI	.247	.166	≥ .90
CFI	.217	.000	≥ .90
TLI	.146	.000	≥ .90
RMSEA	.408	.442	≤ .08
AIC	10413.661	13174.846	Lower is better

The table shows the model fit indices as an evaluation of the SEM model comparing the Default Model and the Independence Model to recommended thresholds. The chi-square values of CMIN/DF (Chi-square/degrees of freedom) of the Default Model and Independence Model are 37.504 and 43.749 respectively which are more than the suggested CMIN/DF = 3.0 which shows poor fit. RMR (Root Mean Square Residual) of 0.235 and 0.344 are greater than the required < 0.08 which indicates significant residual differences between the observed and predicted covariants. The GPI (Goodness-of-Fit Index), CFI (Comparative Fit Index) and TLI (Tucker-Lewis Index) of the Default Model are 0.247, 0.217 and 0.146 and are much lower than the recommended level of 0.90, indicating poor model fit. RMSEA (Root Mean Square Error of Approximation) =0.408 and =0.442, are greater than =0.08, which leads to the conclusion that this is a bad fit. The AIC (Akaike Information Criterion) of the Default Model is 10413.661, which is lower than that of the Independence Model 13174.846, implying that although the Default Model is comparatively superior to that of the Independence Model, in general, the model fails to satisfy the conventional fit criteria and needs to be refined or respecified.

4.2 Discussion

The types of results of this research support the disruptive character of the digital payment systems on the sustainability, development, and performance of small-scale industries (SSIs). The high correlations found between adoption and key performance outcomes indicate that digital transactions are not just a convenience of a financial nature but a strategic facilitator of the long-term competitiveness. According to the regression analysis, financial sustainability and sales growth are greatly predicted by the adoption of digital, which is why it is important to manage the cash flow, access credit, and

reach customers. Additionally, the productivity increases also demonstrate the significance of digital devices in minimizing the transaction cost and automating financial management. These outcomes are in line with previous research highlighting the importance of fintech in improving efficiency and resilience of SMEs. Nevertheless, the unceasing number of issues like cybersecurity concerns, digital literacy disparities, and infrastructural bottlenecks demonstrate the necessity of specific interventions. Generally, digital payments are an essential instrument of inclusive expansion and facilitating the MSME ecosystem in India.

5. CONCLUSION

This paper shows that e-payment systems are vital in promoting sustainability, growth and productivity of small-scale industries (SSIs). The practical experience demonstrates that the use of digital payments does not only enhance the financial management and operational efficiency but also the resilience, market expansion, and access to formal credit. The correlation and regression outcomes are high and this indicates that digital adoption is a strong predictor of enterprise performance outcomes. Nevertheless, the continued existence of issues like digital insecurity concerns, gaps in infrastructures, and low digital literacy levels are an indication of the need to adopt supporting policies and intervention strategies. To ensure that SSI achieves the full potential of digital transformation, then stakeholders have to invest in secure payment systems, capacity-building initiatives, and inclusive digital infrastructure. These barriers can be overcome by promoting digital payment systems, which can become an impetus to long-term competitiveness, financial inclusion, and sustainable development of the MSME sector in India.

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