Sustaining Digital India at the Grassroots: An Empirical Analysis of Common Service Centres and Rural Digital Entrepreneurship

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Abstract. *Common Service Centres (CSCs) operate as front-line delivery points for e-governance and digital services in rural India. As the Digital India program matures, questions about the long-term viability of CSCs—especially the business model sustained by Village Level Entrepreneurs (VLEs)—have become pivotal. This study empirically examines the determinants of CSC profitability and sustainability using primary survey data from 200 VLEs across five districts of Madhya Pradesh (Bhopal, Indore, Gwalior, Ujjain, Dewas). Guided by the Resource-Based View and Institutional Theory, we test how Entrepreneurial Orientation (EO), Institutional Support (IS), Digital Skills (DS), Operational Challenges (CH), and Customer Satisfaction (CS) influence Profitability (PI) and Sustainability (SI). Data were analyzed using SPSS v26: descriptive statistics, reliability analysis, Pearson correlation, principal component analysis (PCA), multiple linear regression, and one-way ANOVA. Results show that EO, IS, DS and CS positively and significantly affect SI, whereas CH negatively impacts sustainability and profitability. The regression model explains approximately 71.7% of the variance in sustainability (Adjusted R² ≈ 0.705). Customer satisfaction emerged as the strongest predictor (standardized β ≈ 0.30), followed by institutional support and entrepreneurial orientation. ANOVA indicates significant district-wise differences in profitability (p < 0.05), with urbanized districts outperforming rural ones. We discuss theoretical implications for extending RBV to hybrid public–private digital enterprises, and practical implications for targeted capacity building, infrastructure investment, and policy design. Recommendations include structured training, performance-linked incentives, and localized infrastructure interventions to ensure CSCs function as sustainable rural entrepreneurship hubs.*

Keywords: Common Service Centre, Village Level Entrepreneur, Entrepreneurial Orientation, Institutional Support, Digital Skills, Sustainability, India.

Introduction
Background and motivation
The digital transformation of public services has been a central policy thrust in India during the past decade. The Digital India initiative and its operational arm, the Common Service Centre (CSC) scheme, aim to provide digital access and e-governance services at the grassroots through Village Level Entrepreneurs (VLEs)**.** CSCs extend services such as government-to-citizen (G2C) transactions, financial

inclusion, telemedicine, and education to rural populations (MeitY, 2023; CSC-SPV, 2023). While coverage has scaled significantly, sustainability concerns remain: many VLEs face low transaction volumes, infrastructural constraints, delayed payments, and limited business diversification (Mishra, 2018; Sahu & Singh, 2021).

This research investigates the **business model** of CSCs by identifying the organizational, institutional, and technological factors that determine their **profitability** and **sustainability**. We focus on Madhya Pradesh-a state with diverse digital readiness across districts-to draw regionally grounded insights for policy and practice.

Research problem

Despite large-scale deployment, CSCs display uneven performance, and a coherent, empirically validated model of their sustainability remains underdeveloped. The central research problem is: Which combination of entrepreneurial behaviour, institutional facilitation, digital competence, operational constraints, and customer satisfaction explains CSC profitability and long-term sustainability?

Objectives : The study addresses the following objectives:
1. Empirically assess relationships between EO, IS, DS, CH, CS and CSC performance (PI, SI).
2. Validate an integrated, SPSS-based model quantifying determinants of CSC sustainability.
3. Analyze district-level differences in profitability to inform localized policy measures.
4. Provide actionable recommendations for CSC-SPV, policymakers, and VLEs.

Research questions

1. How do Entrepreneurial Orientation, Institutional Support and Digital Skills affect CSC profitability and sustainability?
2. To what extent do Operational Challenges and Customer Satisfaction influence CSC performance?
3. Are there significant differences in profitability across districts of Madhya Pradesh?
4. What policy and managerial interventions can improve CSC sustainability?

Literature review and theoretical framework

CSCs, VLEs and rural digital inclusion

CSCs were instituted to deliver a wide array of digital services to citizens through locally owned kiosks. The model is explicitly hybrid — public policy provision (MeitY, CSC-SPV) combined with private entrepreneurial operation by VLEs (Bhatnagar, 2014; Kaushik & Raman, 2018). Scholars emphasize CSCs as instruments of rural digital inclusion and local entrepreneurship; however, the profitability and resilience of the VLE-led business model depend on contextual variables (Chatterjee &Kar, 2020; Mishra, 2018).

Entrepreneurial Orientation (EO)

EO encompasses innovativeness, proactiveness and risk-taking (Lumpkin & Dess, 1996). In rural ICT enterprises, EO translates into service diversification, creative local marketing, and adaptive management (Gupta, 2020). Empirical studies on CSCs indicate that VLEs with higher EO are more likely to expand service portfolios and secure repeat customers, improving profitability (Mishra, 2018).
Hypothesis H1: EO positively influences CSC profitability and sustainability.

Institutional Support (IS)
Institutional support includes training programs, timely payments, access to platforms, and technical assistance from CSC-SPV and MeitY. Institutional Theory suggests that supportive policy environments enhance organizational legitimacy and operational capacity (North, 1990). Studies show that IS enhances VLE performance by reducing transaction costs and uncertainty (Srivastava & Kaushik, 2020; Kumar & Singh, 2022).
Hypothesis H2: Institutional support positively influences CSC sustainability.

Digital Skills (DS) and Customer Satisfaction (CS)
Digital skills reflect the ability to operate ICT platforms, troubleshoot basic technical problems, and integrate new services. Higher DS is associated with faster, more reliable service delivery, increasing customer satisfaction and adoption (Rao, 2020; Verma& Sinha, 2021). Customer satisfaction, in turn, drives repeat usage and community reputation- both crucial for sustainability.
Hypotheses H3 & H5: Digital skills and customer satisfaction positively influence CSC performance and sustainability.

Operational Challenges (CH)
Operational challenges — unstable connectivity, power outages, software downtimes, delayed commissions — are documented impediments to CSC operations (Sahu & Singh, 2021). These constraints lower effective working hours, create customer dissatisfaction and erode profitability.
Hypothesis H4: Operational challenges negatively affect CSC profitability and sustainability.

Integrated framework and expected relationships
We adopt an integrated framework synthesizing the Resource-Based View (RBV)-emphasizing internal capabilities (EO, DS) — and Institutional Theory-emphasizing external enabling conditions (IS). Customer satisfaction is modelled as a mediator between service capability and sustainability, while operational challenges serve as a negative moderator. (See conceptual diagram below.)

Gaps and research contribution
Existing CSC literature tends to be descriptive and fragmented regionally. Few studies integrate entrepreneurial, institutional, and technological variables into a unified statistical model. This paper contributes by (a) using primary survey data from 200 VLEs in Madhya Pradesh, (b) applying robust SPSS techniques (PCA, regression, ANOVA), and (c) producing actionable policy recommendations grounded in empirical evidence.

Research Methodology

Research Design
The study adopts a descriptive–analytical design combining quantitative survey data and inferential statistics. Descriptive analysis captures demographic and operational characteristics of VLEs, while analytical tests (correlation, regression, ANOVA, factor analysis) examine hypothesized relationships among variables.
The design suits the objective of identifying determinants of CSC profitability and sustainability through statistical validation.

Study Area and Sampling
Research was conducted in five districts of Madhya Pradesh-Bhopal, Indore, Gwalior, Ujjain, and Dewas — representing varied levels of infrastructural and digital readiness.

Sampling procedure
- **Stage 1:** Purposive selection of districts;
- **Stage 2:** Random selection of CSCs within each district using CSC-SPV registry;
- **Stage 3:** Administration of structured questionnaire to **200 VLEs**.

The sample satisfies Krejcie & Morgan (1970) guidelines for populations > 1,000.

Variables and Measurement
Each construct was measured on a five-point Likert scale (1 = Strongly Disagree → 5 = Strongly Agree).

Data Collection
Structured questionnaires were distributed via field visits and online forms between **Nov 2024 – Sep 2025**. Ethical approval was granted by the Departmental Research Ethics Committee, JNIBM. Respondent confidentiality and voluntary participation were assured.

Data Processing
Responses were screened, coded, and entered into **SPSS v26**. Invalid entries (< 5 %) were removed; reverse-coded items adjusted. Composite indices were created by averaging item scores per construct.

Analytical Techniques:

Statistical Tool	Purpose
Descriptive Statistics	summarize profile of VLEs
Reliability (Cronbach's α)	test internal consistency
Pearson Correlation	explore inter-relationships
Principal Component Analysis (PCA)	validate construct structure
Multiple Regression	test hypotheses H1–H5
One-Way ANOVA	test district-wise profitability (H6)
Model Summary & Coefficients	assess explanatory power (H7)

Significance level set at **$p < 0.05$**.

Data Analysis and Interpretation

Profile of Respondents
The demographic analysis reveals a predominantly male participation in CSC operations, with 70 percent of the respondents being male and 30 percent female. This gender distribution reflects existing participation trends in rural digital entrepreneurship, where male involvement remains higher due to socio-economic and infrastructural constraints. The age distribution indicates that CSC operations are

largely managed by young and middle-aged entrepreneurs, with nearly 85 percent of respondents falling between 18 and 40 years. This suggests that CSCs are driven by a relatively youthful workforce, which is conducive to technology adoption and service diversification.

Educational attainment among VLEs is moderate to high, with more than 45 percent possessing graduate or postgraduate qualifications. This level of education supports effective engagement with digital platforms and e-governance services. Experience data show that the majority of respondents have between three and ten years of operational experience, indicating a reasonably mature ecosystem rather than a nascent entrepreneurial stage. District-wise representation is balanced, ensuring geographical diversity and strengthening the external validity of the findings.

Descriptive Statistics of Key Variables

Descriptive statistics indicate generally high mean values for core constructs such as Entrepreneurial Orientation, Digital Skills, Customer Satisfaction, and Sustainability. Entrepreneurial Orientation (Mean = 3.87) reflects proactive behavior, innovation, and risk-taking tendencies among VLEs. Digital Skills (Mean = 3.92) suggest strong operational competence in handling CSC platforms and digital services.

Customer Satisfaction records the highest mean value (3.95), highlighting the centrality of service quality and citizen trust in CSC operations. Sustainability also shows a high mean (3.88), indicating that most VLEs perceive their enterprises as viable in the long run. Operational Challenges exhibit a comparatively lower mean score (2.71), implying that while constraints exist, they are moderate rather than overwhelming. Overall, these descriptive results establish a positive baseline for further inferential analysis.

Reliability Analysis

Reliability analysis using Cronbach's Alpha confirms strong internal consistency across all constructs. Alpha values range from 0.789 to 0.843, exceeding the commonly accepted threshold of 0.70. The overall reliability coefficient of 0.861 indicates excellent scale reliability and suggests that the measurement instruments consistently capture the intended constructs.

This high level of reliability strengthens confidence in subsequent analyses, including correlation, factor analysis, and regression modeling. The results affirm that the questionnaire items were well-designed, contextually appropriate, and statistically dependable for examining CSC sustainability.

Correlation Matrix

All independent variables except CH correlate positively with SI ($p < 0.01$). CH shows negative correlation ($r \approx -0.33$), confirming its adverse effect. The correlation matrix demonstrates significant positive relationships between Entrepreneurial Orientation, Institutional Support, Digital Skills, Customer Satisfaction, and Sustainability. These findings suggest that improvements in entrepreneurial behavior, institutional facilitation, and technological competence are associated with enhanced long-term viability of CSCs.

Operational Challenges show a statistically significant negative correlation with sustainability, confirming that infrastructural and operational barriers adversely affect CSC performance. The absence of excessively high inter-correlations among independent variables indicates no serious multi-collinearity issues, validating the suitability of the data for regression analysis.

Principal Component Analysis (PCA)

To validate construct structure, PCA with Varimax rotation was conducted. Sampling adequacy (KMO > 0.8) and significance of Bartlett's test confirm data suitability for factor analysis. Principal Component Analysis was conducted to validate the underlying factor structure of the measurement model. The Kaiser-Meyer-Olkin (KMO) value of 0.832 indicates excellent sampling adequacy, while Bartlett's Test of Sphericity is statistically significant ($p < 0.001$), confirming that the dataset is appropriate for factor analysis.

Six components with eigenvalues greater than one collectively explain 69.7 percent of the total variance. Each extracted factor aligns closely with the theoretical constructs—Entrepreneurial Orientation, Institutional Support, Digital Skills, Operational Challenges, Customer Satisfaction, and Sustainability Orientation. This confirms the multidimensional nature of CSC performance and supports the construct validity of the research framework.

Regression Analysis

Multiple regression was conducted to examine how EO, IS, DS, CH, and CS collectively influence CSC sustainability. Approximately **71.7% of the variance in sustainability** is explained by the independent variables, indicating a strong predictive model. (**$p < 0.01$**)

The regression model is statistically significant ($F = 117.96$, $p < 0.001$), confirming that the predictor variables collectively influence CSC sustainability.

Multiple regression analysis reveals that Entrepreneurial Orientation, Institutional Support, Digital Skills, Operational Challenges, and Customer Satisfaction collectively explain approximately 71.7 percent of the variance in sustainability (Adjusted $R^2 = 0.717$). The model is statistically significant ($F = 117.96$, $p < 0.001$), indicating strong explanatory power.

Customer Satisfaction emerges as the strongest predictor of sustainability ($\beta = 0.301$), underscoring the importance of service quality and citizen trust. Institutional Support ($\beta = 0.241$) and Entrepreneurial Orientation ($\beta = 0.218$) also exert significant positive effects, highlighting the combined role of policy facilitation and entrepreneurial behavior. Operational Challenges negatively influence sustainability ($\beta = -0.176$), confirming that infrastructural inefficiencies undermine long-term viability.

ANOVA: District-wise Profitability Differences

One-way ANOVA results indicate statistically significant differences in profitability across districts ($F = 2.43$, $p < 0.05$). CSCs operating in Indore and Bhopal report higher profitability compared to those in Dewas and Ujjain. These disparities likely reflect variations in urban proximity, infrastructure quality, transaction volume, and institutional reach. The findings emphasize the need for district-specific policy interventions rather than uniform implementation strategies. Strengthening infrastructure and institutional mechanisms in relatively weaker districts could help reduce performance gaps.

Hypothesis-wise Summary

All proposed hypotheses are supported by the empirical results. Entrepreneurial Orientation, Institutional Support, Digital Skills, and Customer Satisfaction positively influence sustainability, while Operational Challenges exert a negative effect. District-wise variations in profitability further validate the contextual nature of CSC performance. The integrated model effectively captures the complex interplay of internal capabilities and external enablers.

H	Statement	Result
H1	EO → SI positive	Supported
H2	IS → SI positive	Supported
H3	DS → SI positive	Supported
H4	CH → SI negative	Supported
H5	CS → SI positive	Supported
H6	District differences in PI	Supported
H7	EO, IS, DS, CH, CS jointly → SI	Supported

Table 1: (Summary of Hypothesis Testing).

Summary of Analytical Findings
1. **EO, IS, DS and CS** significantly improve CSC sustainability; **CH** reduces it.
2. **Customer satisfaction (β ≈ 0.30)** is the most powerful predictor.
3. **District disparities** highlight infrastructural gaps.
4. **Model validity** confirmed by reliability ($\alpha = 0.861$) and PCA (> 69 % variance).

The analysis confirms that CSC sustainability is driven by a combination of entrepreneurial competencies, institutional backing, technological proficiency, and customer-centric service delivery. Customer Satisfaction stands out as the most influential determinant, while operational bottlenecks remain a critical constraint. High reliability, strong factor validity, and robust regression results collectively reinforce the credibility of the proposed sustainability model.

Discussion

The purpose of this research was to evaluate the determinants of profitability and sustainability of Common Service Centres (CSCs) managed by Village Level Entrepreneurs (VLEs) in rural Madhya Pradesh. The study validated an integrated conceptual model linking Entrepreneurial Orientation (EO)**,** Institutional Support (IS)**,** Digital Skills (DS)**,** Operational Challenges (CH)**,** and Customer Satisfaction (CS) with Profitability (PI) and Sustainability (SI)**.**

Findings indicate that CSC performance is multi-dimensionally driven by both internal capabilities (EO, DS) and external enablers (IS)**.** The results substantiate the Resource-Based View (RBV)**,** where internal resources (skills, innovation, risk-taking) produce competitive advantage when coupled with enabling institutional mechanisms (policy, training, infrastructure). The statistically significant β coefficients for EO (0.218), IS (0.241), DS (0.202), and CS (0.301) confirm that sustainable CSCs rely on capable, entrepreneurial VLEs operating within a supportive ecosystem.

Entrepreneurial orientation and innovation capacity

The positive and significant effect of EO on both profitability and sustainability demonstrates that innovative and proactive VLEs can diversify services (such as telemedicine, digital payments, and e-learning) to meet local needs. This finding is consistent with Gupta (2020) and Mishra (2018), who reported that entrepreneurial behavior enhances the viability of rural enterprises.

Institutional support and policy facilitation

Institutional support showed the second-highest standardized coefficient ($\beta = 0.241$), emphasizing that training, timely information, and transparent commission systems strengthen VLE confidence. Bhatnagar (2014) and Srivastava & Kaushik (2020) similarly highlight that structured institutional backing mitigates risks and stabilizes revenue streams. Respondents from Indore and Bhopal—where institutional reach is stronger—reported better performance, affirming the critical role of governance support.

Digital skills and technological competence

Digital Skills significantly influence CSC outcomes ($\beta = 0.202$). Skilled operators troubleshoot software issues, manage service updates, and deliver faster transactions, enhancing efficiency and customer satisfaction. This confirms earlier results by Verma& Sinha (2021), who found digital proficiency to be a vital sustainability determinant in rural ICT ventures.

Operational challenges and infrastructural constraints

Operational Challenges exhibited a negative relationship ($\beta = -0.176$). Connectivity issues, unreliable power supply, and system downtimes hinder service reliability. Sahu & Singh (2021) observed similar impediments in Madhya Pradesh's rural CSCs. Addressing these constraints through better infrastructure and responsive technical support is vital for sustained profitability.

Customer satisfaction as the strongest predictor

Customer satisfaction emerged as the most influential variable ($\beta = 0.301$). This reinforces the service-quality paradigm: citizen trust, speed, and transparency foster repeat transactions and local legitimacy. High CS mediates the link between entrepreneurial inputs and sustainability, confirming findings of Rao (2020).

District-level differences

The ANOVA result ($F = 2.43$, $p < 0.05$) underscores spatial inequalities in infrastructure and economic activity. Indore and Bhopal outperform Dewas and Ujjain. This implies that regionally tailored policies and local capacity building are required for balanced development.

Findings

1.   **EO, IS, DS, and CS positively influence CSC sustainability**, while CH exerts a negative effect.
2.   **Customer satisfaction is the dominant predictor**, accounting for the largest β coefficient (0.301).
3.   **71.7% of sustainability variance** is explained by the integrated model, confirming strong explanatory power.

4.   **Reliability and validity confirmed:** Cronbach's α = 0.861; KMO = 0.832; Bartlett's Test (p < 0.001).

5.   **Significant district-level variations** reflect infrastructural and institutional disparities.

6.   The study empirically validates the **multi-factor sustainability model** for CSCs under India's Digital India initiative.

Policy Recommendations

Strengthen institutional mechanisms
Establish a **State CSC Facilitation Centre** to coordinate payments, training, and policy dissemination. Simplify administrative approvals and automate grievance handling.

Digital and entrepreneurial capacity building
Conduct quarterly **CSC Academy training programs** on ICT innovations, service diversification, financial management, and customer handling.

Infrastructure enhancement
Collaborate with telecom and power companies to ensure stable connectivity and uninterrupted power supply for remote CSCs.

Incentivize performance and innovation
Implement a **"Top Performing VLE Awards"** scheme offering recognition and financial bonuses for outstanding service delivery.

Promote gender inclusion and local customization
Encourage **female VLE participation** and allow localization of service menus according to community needs (e.g., agricultural advisories, telemedicine).

Transparent commission and financial systems
Ensure timely VLE payment settlements and introduce integrated digital dashboards for revenue monitoring.

Managerial and Theoretical Implications

Theoretical implications
This study extends the Resource-Based View (RBV) and Institutional Theory to hybrid digital enterprises, establishing empirical linkages between internal capabilities and external enablers. It introduces a composite sustainability model relevant for other public–private service ecosystems.

Managerial implications
•   CSC-SPV should develop customized performance scorecards linking EO and DS metrics with training modules.

•   VLEs should adopt customer-centric business planning focusing on reliability and transparency.

•   Managers should monitor transaction data analytics to identify growth opportunities in new services.

Limitations and Future Research
1.   The study is limited to five districts of Madhya Pradesh and may not represent national CSC dynamics.

2.   Data are cross-sectional; future longitudinal studies could track performance trends.

3.   Reliance on self-reported measures may introduce perceptual bias.

4.   Future research should integrate qualitative interviews to capture behavioral nuances of VLEs.

5.	Exploration of emerging technologies (AI, IoT, blockchain) in service innovation represents a promising avenue.

Conclusion

This research provides a statistically validated model explaining CSC sustainability in rural India. The study demonstrates that entrepreneurial orientation, institutional support, digital skills, and customer satisfaction significantly contribute to profitability and sustainability, whereas operational challenges act as a major impediment. The integration of SPSS-based quantitative analysis and theoretical reasoning provides a comprehensive understanding of CSC performance dynamics. Policy makers and administrators should prioritize capacity building, infrastructural improvements, and incentive structures to strengthen the rural digital ecosystem.

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