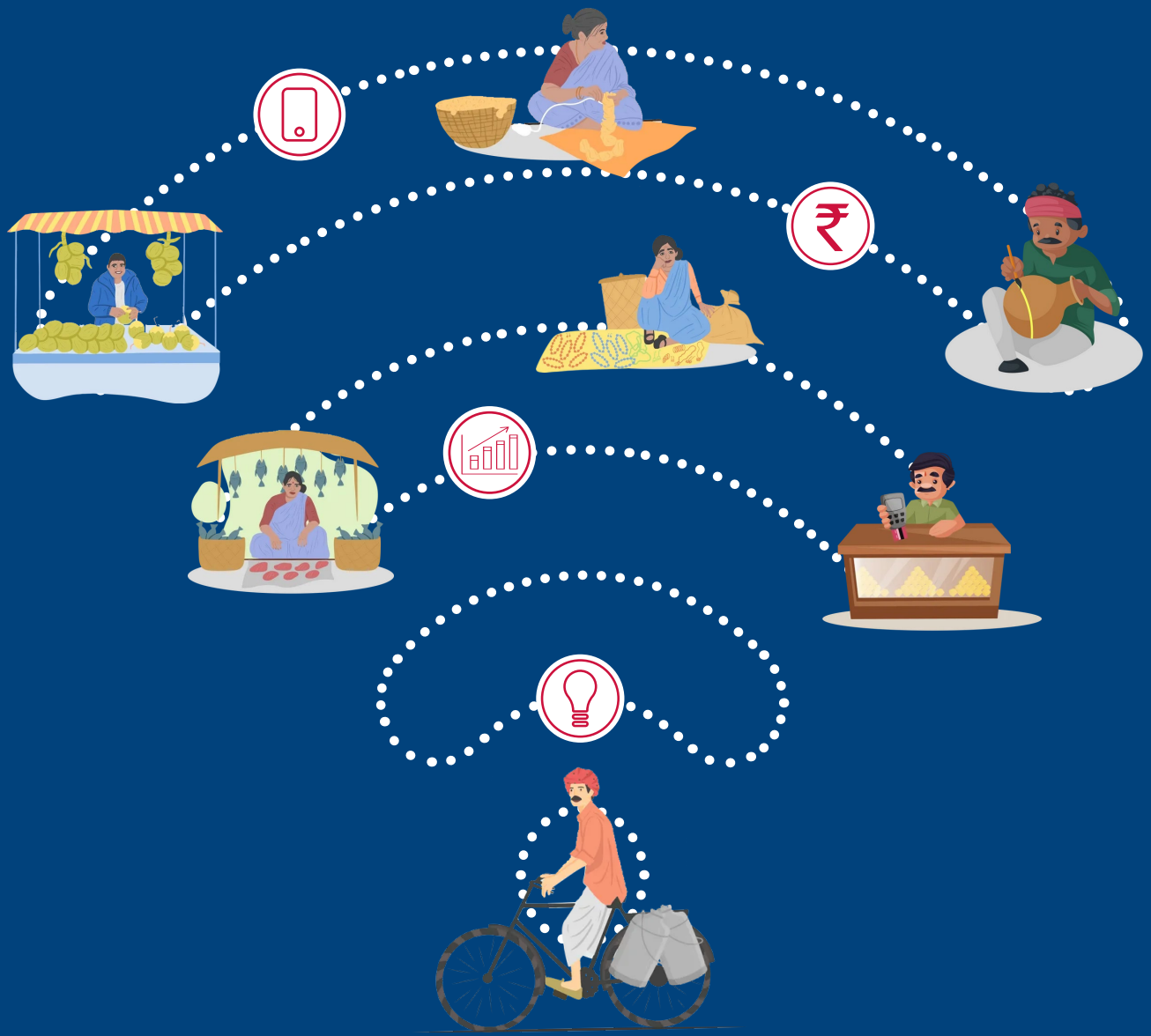
South Asia Regional Digital Initiative (SARDI)

India MSME Tech Policy Fellowship Program: *Synthesis Report*

June 2024



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Abbreviations

AA	Account Aggregator
APEDA	Agricultural and Processed Food Products Export Development Authority
AWS	Amazon Web Services
DCCP	Digital Connectivity and Cybersecurity Partnership (DCCP)
DPI	Digital Public Infrastructure
eNAM	National Agriculture Market
ERP	Enterprise Resource Planning
FPC	Farmer Producer Company
FPO	Farmer Producer Organization
GDP	Gross Domestic Product
GeM	Government e-Marketplace
GST	Goods and Services Tax
GVA	Gross Value Added
ICT	Information and Communication Technology
INR	Indian National Rupee
IT	Information Technology
KII	Key Informant Interview
MCX	Multi Commodity Exchange
MeitY	Ministry of Electronics & Information Technology
MFI	Microfinance Institution
MIS	Management Information Systems
MSME	Micro, Small and Medium Enterprises
NABARD	National Bank for Agriculture and Rural Development
NBFC	Non-Banking Financial Company
NCDEX	National Commodity and Derivatives Exchange
NeGP-A	National e-Governance Plan in Agriculture
NFHS	National Family Health Survey
NGO	Non-governmental Organization
NSIC	National Small Industries Corporation
NSS	National Sample Survey
NSSO	National Sample Survey Organization
OAE	Own Account Enterprises
OCEN	Open Credit Enablement Network
ONDC	Open Network for Digital Commerce
P2M	Peer-to-Merchant
P2P	Peer-to-Peer
P2PM	Peer-to-Peer Merchant
PC	Producer Company
PCA	Principal Component Analysis
PMFBY	Pradhan Mantri Fasal Bima Yojana
PMJDY	Pradhan Mantri Jan-Dhan Yojana
PM-KISAN	Pradhan Mantri Kisan Samman Nidhi
PSP	Payment Service Provider
RBI	Reserve Bank of India
SARDI	South Asia Regional Digital Initiative
SDG	Sustainable Development Goal
SFAC	Small Farmers Agribusiness Consortium
TAM	Technology Acceptance Model
UPI	Unified Payment Interface
USAID	United States Agency for International Development
USD	United States Dollar

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Executive Summary

Recognizing the evolving digital ecosystem in India and its potential to transform micro, small, and medium enterprises (MSMEs), USAID initiated the South Asia Regional Digital Initiative (SARDI) India MSME Tech Policy Fellowship program. The program aimed to conduct policy research at the intersection of digitalization and MSMEs to catalyze sustainable changes in the policy ecosystem. Anchored by LEAD at Krea University (IFMR), the fellowship program sought to provide actionable policy recommendations to enhance digital adoption among India's MSMEs.

There is a paucity of studies assessing digital adoption across various MSME sectors and segments and its impact on business performance, forward and backward linkages, employment, and entrepreneurial mindset. Moreover, depending on various socio-contextual factors and business growth trajectories, the level of digital readiness and requirements among MSMEs can vary significantly across sectors. With this context in mind, LEAD selected three fellowships focusing on distinct underserved segments of India's MSME ecosystem.

The fellows were chosen through a competitive and open application process, and each fellow was linked to a specific topic and one host organization. The fellowship host organizations were chosen through a competitive bidding process based on their reputation, network, and experience of working in their respective sectors. The fellowship program recognized the need for fellows to receive continued guidance and capacity building; and the host organizations were engaged to provide ongoing and regular mentoring by a senior representative, along with LEAD researchers.

The goal of the SARDI India MSME Tech Policy Fellowship Program was to provide a comprehensive overview of digital adoption and challenges across:

- Nano enterprises in the retail and wholesale trade and other service sectors;
- Collective enterprises and weavers in the handloom sector; and
- Farmer Producer Organizations (Agri-MSMEs) and their member farmers.

This report is a synthesis of three research studies conducted as part of the SARDI India MSME Tech Policy Fellowship Program, anchored by LEAD at Krea University. **The financial constraints of MSMEs and entrepreneurs and their limited knowledge of government initiatives designed to address those constraints emerge as significant barriers to digital adoption across all three sectors studied (retail/services, handloom, and agriculture). This highlights a critical gap that needs to be addressed.**

Based on the findings from the three fellowships, we present the following actionable recommendations for policymakers, industry leaders, and support organizations to bridge this gap and empower MSMEs with the digital tools and resources they need to thrive in the digital age.

Recommendation1: Design and offer tailored, customizable solutions that meet the varied requirements of underserved segments.

Recommendation2: A market-driven digital adoption strategy is crucial to effectively promote the digitalization of enterprises and customer engagement.

Recommendation 3: Implement digital initiatives and training programs through deeper engagement with collectives.

Recommendation 4: Conduct digital upskilling specifically for women, and enact gender-sensitive digital policies

Recommendation 5: Redefine and classify MSMEs to address the heterogeneity of business size, sector, and varied nature of business.

This synthesis report underscores the urgent need for a multi-stakeholder approach to bridge the digital divide and empower MSMEs. Collaborative efforts between government, industry leaders, civil society, and educational institutions are crucial to ensure equitable access, capacity building, and the development of a supportive digital ecosystem for all MSMEs in India. By harnessing the potential of India's remarkable digital public infrastructure and digital innovations, India can unlock a future of inclusive growth for its MSME sector.

Photo Credit: Paula Bronstein/Getty Images/Images of Empowerment

01 India MSME Tech Policy Fellowship: Context

India's MSME Landscape

Photo Credit:L EAD at Krea University

> The most recent pan-India data on the estimated number of MSMEs and their characteristics comes from the 73rd round of the National Sample Survey (NSS), which was conducted in 2015-16. The seventh economic census data, which was conducted between 2019-21 and covered all establishments engaged in non-agricultural economic activities including construction (except public administration, defense and compulsory social security), has not yet been published.

India's Micro, Small, and Medium Enterprises (MSMEs), spanning the trade, manufacturing, and service sectors, contribute significantly to both the domestic market and the country's export landscape. According to the NSS 73rd round survey (2015-16) on unincorporated non-agricultural enterprises (excluding construction), India has over 63 million MSMEs. In 2019-20, the share of MSME Gross Value Added (GVA) to India's Gross Domestic Product (GDP) was 30 per cent, and the share of export of MSME related products to all India exports was nearly 50 per cent, according to the estimates of the Central Statistics Office.

Out of India's total estimated 63.4 million unincorporated non-farm MSME enterprises, 51.3 per cent were in rural areas and the remaining 48.7 per cent were in urban areas. At a sector level, 31 per cent were engaged in manufacturing, 36.3 per cent were trading enterprises (both wholesale and retail), and 32.6 per cent were in other services (except construction, NSSO 2017). Approximately 96 per cent of unincorporated non-agricultural

enterprises are owned by a single individual (proprietary enterprises). According to the NSS 73rd round survey (2015- 2016), women-run proprietary enterprises had a share of 45 per cent among the manufacturing enterprises, 8.7 per cent in trading and 7.4 per cent across other services.

Challenges Faced by the MSME Sector

About 84 per cent of the estimated number of enterprises in India are own account enterprises (OAEs), which do not usually hire paid workers, with the owner managing all activities of the enterprise. Among all unincorporated non-farm enterprises, the share of OAEs was 91.4 per cent in the rural areas and 76.6 per cent in the urban areas. On the other hand, OAEs accounted for 62 per cent of the estimated 111.3 million workers employed in the unincorporated non-agricultural sector in India. During 2015-16, nearly half of the OAEs were operating out of the premises of the households that owned them.

Although MSMEs play a significant role in India's economy by virtue of their sheer number, the above-mentioned statistics suggest that for most micro enterprises, their focus is on keeping the business afloat and not on the growth of the business. This business stagnation often do not allow to achieve scale, efficiency, job creation, innovation and quality (Buteau 2021). The Reserve Bank of India (RBI)'s Report of the Expert Committee on MSMEs (RBI 2019) outlined several challenges affecting growth of the MSME sector, such as:

1. Implementation Gap for Policy and Institutional Interventions: Government interventions are often designed from a supply-side perspective and are unable to effectively respond to demands of the market. Formulating targeted policies in the areas of infrastructure development, formalization, technology adoption, backward and forward linkages, credit gap reduction and timely payments to MSMEs and their effective implementation has been a challenge for all the stakeholders.

2. Low-level of Formalization: A lack of formalization and low levels of MSME registration constrains the utilization and reach of various government schemes and credit support.

3. Information Asymmetry: Lack of information about various schemes is one of the key reasons for MSMEs not availing benefits offered by the Government, banks and other agencies. Access to information about market opportunities is suboptimal and unstructured.

4. Lack of Access to Finance: Due to their informal nature, MSMEs often lack access to formal credit. Banks face challenges in assessing MSME credit risk, owing to lack of financial information and historical cash flow data, among others.

5. Absence of a Unified Platform: There is no single interface available for lenders to access, map, or triangulate data from various sources such as income taxes, goods and services taxes (GST), and MSME registration portals. Often, they have to primarily rely upon manual information furnished by borrowers.

6. Limited access to Quality Raw Material and Market for Finished Product: There are government schemes available to overcome the twin challenges faced by MSMEs – limited access to quality raw material and to markets for the finished product. National Small Industries Corporation (NSIC), through its raw material assistance scheme, aims to help MSMEs with credit-based financing of raw material purchases (both indigenous & imported) so that MSMEs can focus on manufacturing quality products. The Government e-Marketplace (GeM) portal has enabled MSMEs to connect with buyers from Public Sector Undertakings and Government Departments. However, the proportion of MSMEs availing benefits under such schemes is very low.

The Need for Technology and Digitalization

Many processes in microenterprises are manual, inefficient, and not scalable (Buteau 2021). Various research articles, policy briefs, and reports have highlighted the need for technology to transform and spur growth in the MSME segment, in particular in the nano and micro enterprise segment (Buteau 2021; Goyal et al. 2022; Pandey and Jaiswal 2023; RBI 2019). Digitalization would enable MSMEs to get better access to credit, expand their market reach, conduct capacity building, more easily avail the benefits of government schemes for MSMEs, and generate useful data for monitoring, evaluation and learning (Buteau 2021; Goyal et al. 2022; Pandey and Jaiswal 2023; RBI 2019). Digitalization also has the potential to make businesses efficient, and streamline their operations that help them stay competitive, and scale their reach. To achieve that potential, it is crucial to conduct physical and virtual training programs to enhance awareness about the significance and utilization of digital technology for business development, particularly at the grassroots level (Pandey and Jaiswal 2023).

India's Ministry of MSME recognized the importance of Information and Communication Technology (ICT) and introduced the "Digital MSME" scheme to digitally empower MSMEs. The scheme was launched in 2017 and subsequently revised in 2019 to meet the diverse digital needs within the sector. The Ministry envisions ICTs to act as a key enabler for competitiveness in national and international market, better quality of service, lower processing costs through automation (Davar 2021).

India's Digital Landscape and Digital Divide

Over the years, India has developed a world-class digital public infrastructure (DPI) consisting of three different layers — biometric enabled unique identity for citizens (Aadhaar), digital payments systems (UPI etc.), and account aggregators (AAs) for data sharing and exchange. Together they enable online, paperless, cashless, and privacy-respecting digital access to a variety of public and private services. This foundational DPI has the potential to support the transformation of the economy and enhance inclusive growth. This can be harnessed to foster innovation and competition, expand markets, close gaps in financial inclusion, boost government revenue collection, and improve public expenditure efficiency (Zhabska 2023).

India's digital landscape is experiencing rapid growth, fueled by a massive and rapidly growing internet user base. In 2022, India had 759 million active internet users, surpassing the number of non-active internet users who have not accessed internet in the last one month (KANTAR and IAMAI 2023; TransUnion CIBIL 2023). This surge is driven by both affordable mobile data plans and government initiatives like Aadhaar and the Goods and Services Tax platform, which have brought millions online.

About 53 per cent of active internet user-base sits in rural India and this will go up to 56 per cent by 2025. Over one-third of Indians own a smartphone with more than 667 million smartphones recorded in 2022 (TransUnion CIBIL 2023). Over 500 million users participated in internet commerce in the last one year, including bill payment, food ordering, online shopping, cab booking, travel ticket and hotel booking. Approximately 258 million people shopped online in 2022 (KANTAR and IAMAI 2023; TransUnion CIBIL 2023).

Figure 1: India's Digital Usage Funnel (numbers are in millions)

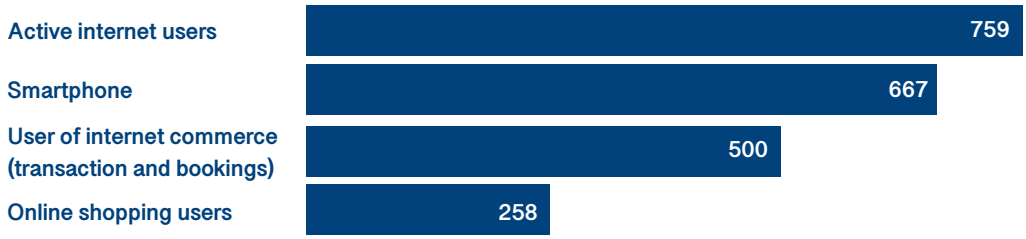


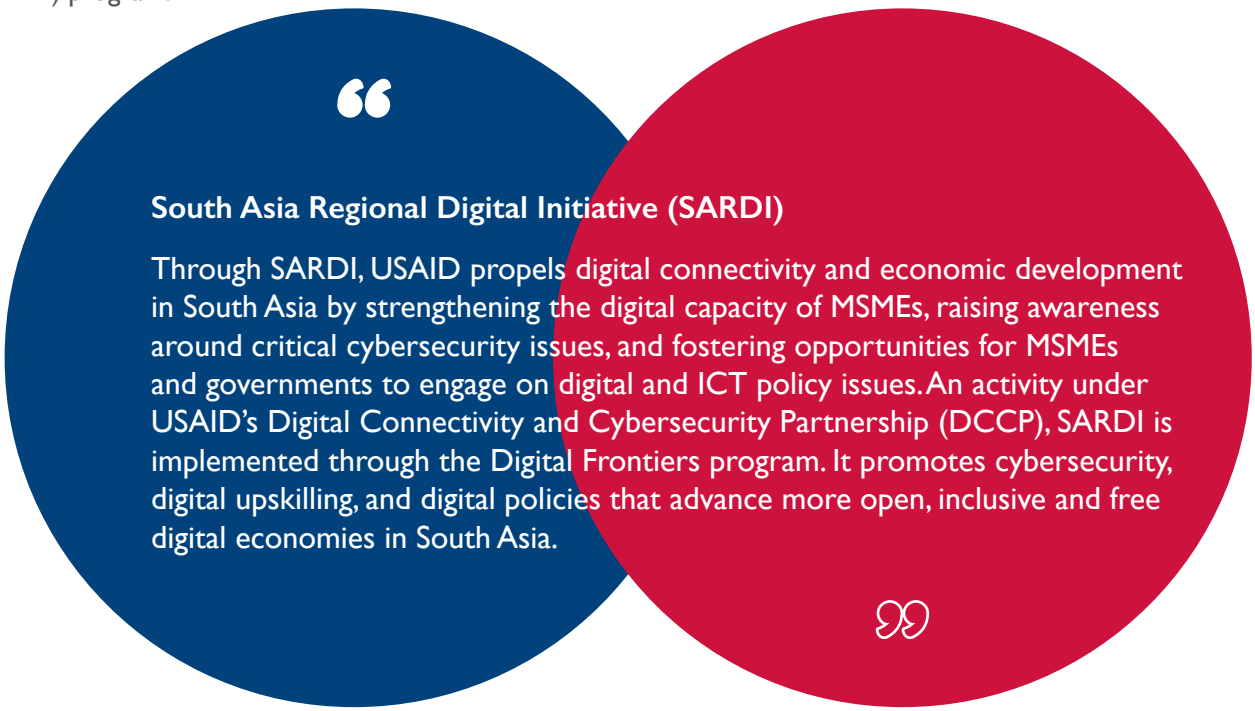
Chart: LEAD at Krea University • Source: Kantar and IAMAI 2023; TransUnion CIBIL 2023 • Created with Datawrapper

How MSMEs can Leverage India's Thriving Digital Landscape?

It is crucial to understand MSME adoption of digital technologies against the backdrop of accelerating digital connectivity in India because it has broader economic, social, and policy implications. MSMEs have an advantage in doing transactions via digital payment methods. UPI is the flagbearer of the digital payment's revolution, constituting over 75 per cent of the overall transactional volume in retail digital payments in India. UPI's popularity has grown to the point that peer-to-merchant (P2M) transactions surpassed peer-to-peer (P2P) transactions in terms of volume. UPI, which was primarily used for P2P transactions, has transitioned towards P2M and peer-to-peer merchant (P2PM) transactions. UPI stakeholders adopted a new initiative in 2019 to bring small merchants or vendors with low value transactions into the digital framework and introduced the new category of P2PM catering to small merchants and unorganized retail sector (NPCI 2019). Growth in mobile app-based payments is another indicator of the preference for digital payments among customers and merchants. This trend underscores the potential of a public-private collaboration approach to formalization, leveraging market-driven registrations to bring small businesses into the formal economy. Embracing such a paradigm shift can significantly enhance formalization efforts.

The 2023 Vodafone India Limited MSME digital maturity assessment study, covering approximately 100,000 MSMEs across 16 industries, highlights that traditional MSME-heavy sectors like retail, education, and hospitality lag in adopting modern solutions, with logistics, media, and manufacturing showing higher levels of digital readiness (Vi Business 2023). A report by McKinsey (2019) also discussed variation in digital adoption across sectors. While core digital sectors like information technology (IT) and electronics manufacturing are projected to see significant growth, areas like agriculture, education, and healthcare are yet to unlock substantial economic value through digital applications (Kaka et al. 2019).

Despite the availability of, and access to, digital tools, their usage remains limited among MSMEs. Based on a survey of workers and employers in the Asia Pacific (APAC) region, a 2023 report by Gallup and Amazon Web Services (AWS) highlighted the substantial skills gaps which impedes digital transformation of MSMEs. It revealed that a concerning 72 per cent of APAC workers lack the basic digital skills required for effective digital operations. This proportion is even higher in India (83 per cent), according to the survey (Gallup and AWS 2023). This knowledge deficit hinders their ability to leverage digital marketing, e-commerce platforms, and other essential digital tools. The requirement extends beyond the owners themselves, as the workforce employed in these MSMEs also need to be skilled accordingly. Equipping MSMEs and their workforce with the necessary digital literacy is paramount for successful digital adoption. Among various initiatives taken by the Indian government, the private sector, and international donors to increase digital adoption among MSMEs is USAID's South Asia Regional Digital Initiative (SARDI) program.

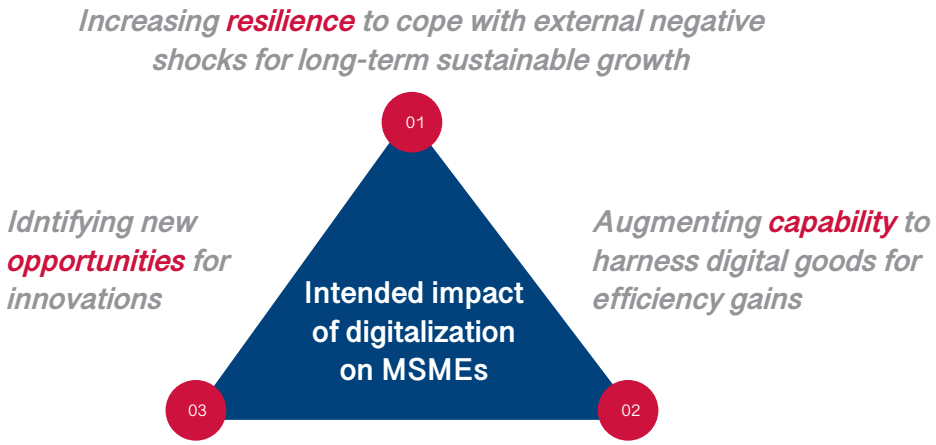


02 SARDI: India MSME Tech Policy Fellowship Program

Recognizing the evolving digital ecosystem in India and its potential to transform micro and nano enterprises, USAID initiated the SARDI India MSME Tech Policy Fellowship program. The program aimed to conduct policy research at the intersection of digitalization and MSMEs to catalyze sustainable changes in the policy ecosystem. Anchored by LEAD at Krea University (IFMR), the fellowship program sought to provide actionable policy recommendations to enhance digital adoption among India's MSMEs.

Using the framework given in Figure 2, the SARDI India MSME Tech Policy Fellowship Program evaluated the impact of digital transformation among MSMEs across three key aspects of resilience, capabilities, and opportunities.

Figure 2: Framework for SARDI India MSME Tech Policy Fellowship Program



There is a paucity of studies assessing digital adoption across various MSME sectors and segments and its impact on business performance, forward and backward linkages, employment, and entrepreneurial mindset. Moreover, depending on various socio-contextual factors and business growth trajectories, the level of digital readiness and requirements among MSMEs can vary significantly across sectors. With this context in mind, LEAD selected three fellowships focusing on distinct underserved segments of India's MSME ecosystem.

The fellows were chosen through a competitive and open application process, and each fellow was linked to a specific topic and one host organization. The fellowship host organizations were chosen through a competitive bidding process based on their reputation, network, and experience of working in their respective sectors. The fellowship program recognized the need for fellows to receive guidance, capacity building, and regular mentoring from a representative of the host organization along with LEAD researchers.

The goal of the SARDI India MSME Tech Policy Fellowship Program was to provide a comprehensive overview of digital adoption and challenges across the following segments and sectors:

Nano Businesses in Retail Trade and Service Sector	Collective Enterprises in India's Handloom Sector	Agri-MSMEs (Farmer Producer Organizations)
Fellowship Host: Gokhale Institute of Politics and Economics Fellow: Vibhanshu Kumar Mentors: Dr. Lalitagauri Kulkarni	Fellowship Host: 200 Million Artisans Fellow: Eisha Choudhury Mentors: Priya Krishnamoorthy	Fellowship Host: Samunnati Pvt Ltd Fellow: Shubhangi Jaiswal Mentors: Sridhar Easwaran, Poorna Pushkala

Rationale behind the Choice of Research Topics

Fellowship 1. Formalization of Nano Enterprises through Digital Platforms: Potential and Challenges

Target Specific Segment within Micro Category: This study focused on a distinct segment within the microenterprise sector – firms with an annual turnover between INR 10 lakhs (~ USD 12,000) and INR one crore (~USD 120,000), defined as 'nano enterprises', for the purposes of this study. Typical examples of nano enterprises, which are characterized by their hyperlocal roots and focus, include small retail or Kirana stores, local businesses and small manufacturing units being run by households or individuals. The "micro" segment of MSMEs comprise a heterogeneous group of businesses, which are at different stages of growth and have different requirements for operating their businesses. For example, credit requirements for nano enterprises are often such that, on one hand, the banks find it difficult to provide credit of such small amounts. On the other hand, this amount is often too large for microfinance institutions (MFIs), as their usual loan ticket size is below INR 50,000 (~USD 600). This problem is commonly known as "the missing middle" in the literature of microenterprise financing (Alibhai et al. 2017; Buteau et al. 2022; GIZ 2013).

Covering the Formalization Spectrum: While existing studies explore the advantages and perceptions of business registration, few capture the extent of formalization through different registrations and documentation held by nano enterprises. In particular, the study focused on the registration status of nano enterprises on at least one of the following digital platforms: Udyam, GST, and Gumasta. Currently, there is a great policy thrust to increase registrations on Udyam, as it is a voluntary registration platform. GST is a registration on the government's tax portal; and Gumasta license is valid mainly for businesses that have brick and mortar shops. Moreover, the units that are registered with Udyam are 'graduated in formality' i.e., they are also registered with GST and Gumasta. Hence, this fellowship focuses on understanding the behavioral intentions of an entrepreneur in adopting the Udyam registration platform.

Focusing on Retail and Trade Sector: The study particularly delves into the retail trade and other service sectors to identify their unique challenges and opportunities, given the rarity of interventions specifically tailored for the retail and trade sector. The revised definition for MSMEs, which came into effect from July 01, 2020, includes retail and wholesale trade enterprises as MSMEs. Retail and wholesale traders have been facing a severe liquidity crunch after sales were hit by the Covid-19 lockdown. Acknowledging this concern, the MSME Ministry of the Government of India issued an order to consider retail and wholesale trade as MSMEs and to extend to them the benefit of priority sector lending under RBI guidelines (GoI 2022). With its focus on the retail and trade sector

nano enterprise segment, this study aimed to contribute to the design of the National Retail and Trade Policy, which was being finalized by the Government of India during the study period.

Focus on Behavioral Traits of Entrepreneurs: While there is evidence on what drives formalization from an institutional and ecosystem perspective, this study aimed to understand the latent factors – such as perceived usefulness, perceived ease of use, perceived trust, and perceived relevance – that drive an individual's adoption of digital platforms for formalization.

Fellowship 2. Rethinking the Digital Shift for Weavers and Handloom Collectives: Opportunities and Challenges in India's Handloom Sector

This fellowship sought to understand the present landscape of collective enterprises in India's handloom sector in response to the government's call for the digitalization of MSMEs across different manufacturing and service sectors.

Recognizing the Importance of Handloom Sector: India sits at the cusp of a creativity and culture-led manufacturing revolution, in large part because its vast and diverse handloom sector offers a ready foundation to build the future of sustainable textile value chains. The sector engages close to 2.6 million weavers, 1 million allied workers, and 3 million families. The sector also supports livelihoods for traditionally underserved and marginalized communities; about 67 per cent handloom weavers belong to Scheduled Castes, Scheduled Tribes and Other Backward Classes. Women make nearly 72 per cent of the total workforce (Handloom Census, GOI, 2019). The handloom sector is not only a key contributor to Indian exports but also presents many opportunities for economic growth, supply chain diversification and a climate-smart future.

Capturing Diverse Experiences of Weavers: The Indian handloom sector, despite its cultural and economic significance, suffers from a scarcity of comprehensive research. Existing studies often lack multi-state representation, failing to capture the diverse experiences of weavers across the country, particularly in the context of digital adoption. This fellowship examined handloom weavers across four Indian states to capture diverse geographical, and political contexts.

Individual Weaver and Collective Level Survey: While handloom textiles are increasingly gaining popularity across the board, the much-needed backend infrastructure such as procurement of raw materials, crafting and innovations which are designed for efficiency, transparency, and inclusion is missing. Weavers and artisans are often located in hard-to-reach rural geographies and lack access to relevant information, networks, design support, and market linkages. This makes it harder for weavers to become market-ready and to demand value for their skills and products. Collectivization in such a context can play a role in organizing an informal and disaggregated weaver workforce. This research study collected data both at individual weaver level and collective level to get a better sense of the challenges and opportunities in the handloom sector.

Evaluating Intended Benefits of Collective Membership: In a cooperative set-up, the collective provides raw materials and design inputs to the weavers who are registered members of the cooperative society. Weavers give the finished product to the cooperatives, which then markets and sells it through different channels – retail shops, apex marketing agencies, and so on. Weavers receive money for the product, and cooperatives' profits are shared among the members. Governments channel subsidies and other welfare schemes through these cooperatives. It is crucial to acknowledge the distinction between individual weavers who are members of the collectives and those who are not. By collecting data from both types of weavers, this study aimed to evaluate the economic and non-economic benefits (or challenges) of collective membership.

Status of Digital Adoption: The Government of India has rolled out various schemes for the welfare of weavers and the handloom sector. However, decentralized governance, restricted access to data, and lack of information on policies targeting digital adoption pose challenges for handloom sector digitalization. This fellowship sought

to provide recommendations on micro and macro-level interventions needed by weavers and their collective enterprises to digitalize. Context-relevant digitalization, delivered via collective and cooperative enterprises, has the potential to break down physical barriers between weavers, sellers, and buyers and bridge the gaps in information and market linkages to build a networked ecosystem (Majumdar et al. 2021).

Fellowship 3. Digital Adoption Among Farmer Collectives and Its Members in India: Status and Opportunities for Intervention

Agriculture Sector and its Challenges: Although the contribution of India's agriculture sector to its economy has substantially decreased over the years due to growth in the manufacturing and service sector, it remains an important sector because it provides 43 per cent of total employment in India. While the share of the agriculture sector in India's GDP has fallen from 34.4 per cent in 1980 by almost half to 16.7 per cent now, emerging technologies and digitalization hold immense potential to boost productivity, minimize environmental impact, and increase farmer income. However, challenges in the agriculture sector hinder the ability to achieve economies of scale. About 86 per cent of India's farming population is made up of smallholder farmers with land holdings less than 2 hectares of land. Due to their small scale, scarcity of resources, and lack of bargaining power, India's smallholder farmers face challenges with access to credit, access to market, government schemes, price discovery and dissemination of knowledge.,.

Farmer Collectives as Agri-MSMEs: Given the challenges faced by smallholder farmers, Farmer Producer Organizations (FPOs) have emerged as an effective solution to collectivizing smallholder farmers and providing solutions to the challenges they face. FPOs are legal entities with a formal structure and are registered as cooperatives or private limited companies. They are entrepreneurial in nature, providing employment, impacting farmers' incomes and well-being, and contribute to India's development and therefore categorized as MSMEs.

FPO Digital Adoption: While access to finance and access to markets are the two most prominent challenges with the sustainability and success of FPOs, these challenges have deeper roots. Two commonly cited solutions to the above challenges include ensuring that FPOs are meticulously maintaining their records and have all compliance-related documents efficiently organized, as well as capacity building of FPO employees and senior management to ensure that the FPO follows due processes. These practices essentially require the FPO to be proficient in managing its own operations, and digital adoption can help FPOs do this to a large extent.

Trickle-down Effect of FPO Digital Adoption on Farmers: It is crucial to understand how FPO digital adoption and operational proficiency trickles down to digital adoption among farmers, as well as their improved wellbeing and enhanced income. To that end, this fellowship designed and implemented two primary surveys, one at the FPO level and another of member farmers for each FPO surveyed. Data from these two primary surveys link FPOs to their farmers on various aspects of digital adoption and services provided by the FPOs. The goal of the fellowship was to identify practices that are effective in promoting digital tool adoption among farmers and improving farmer wellbeing and to identify areas where intervention and rethinking are required.

About the Report

This report is a synthesis of the three research studies conducted as part of the SARDI India MSME Tech Policy Fellowship Program, anchored by LEAD at Krea University. Each of the research studies aimed to examine the impact of digital adoption among individuals and enterprises operating within the three target sectors – retail trade and services, handloom, and agriculture. Digital solutions are upending the Indian economy in numerous ways, and it is important to assess how these solutions are serving the MSMEs sector. To this end, the research studies provided policy recommendations to enable a more inclusive digital transition.

Three fellowships identified areas that exhibit high potential for scale up and contribute to the economy, yet remain relatively underserved. The sectors that the fellowships focused on include:

- **Retail Trade & Services**
- **Handloom**
- **Agriculture**

As India strengthens its position as a global economic powerhouse, ensuring equitable access to technology becomes paramount. The report synthesizes insights from the research on drivers and barriers of digital adoption and maturity landscape among MSMEs in India across three sectors. It investigates ways in which digital tools are enabling citizens to aspire for improved livelihoods, and facilitating inclusive growth for all citizens.

Combined Reach and Coverage of the Three Fellowships

The research employed a mixed-methods approach to gather comprehensive data on MSME digital adoption, across the following categories:

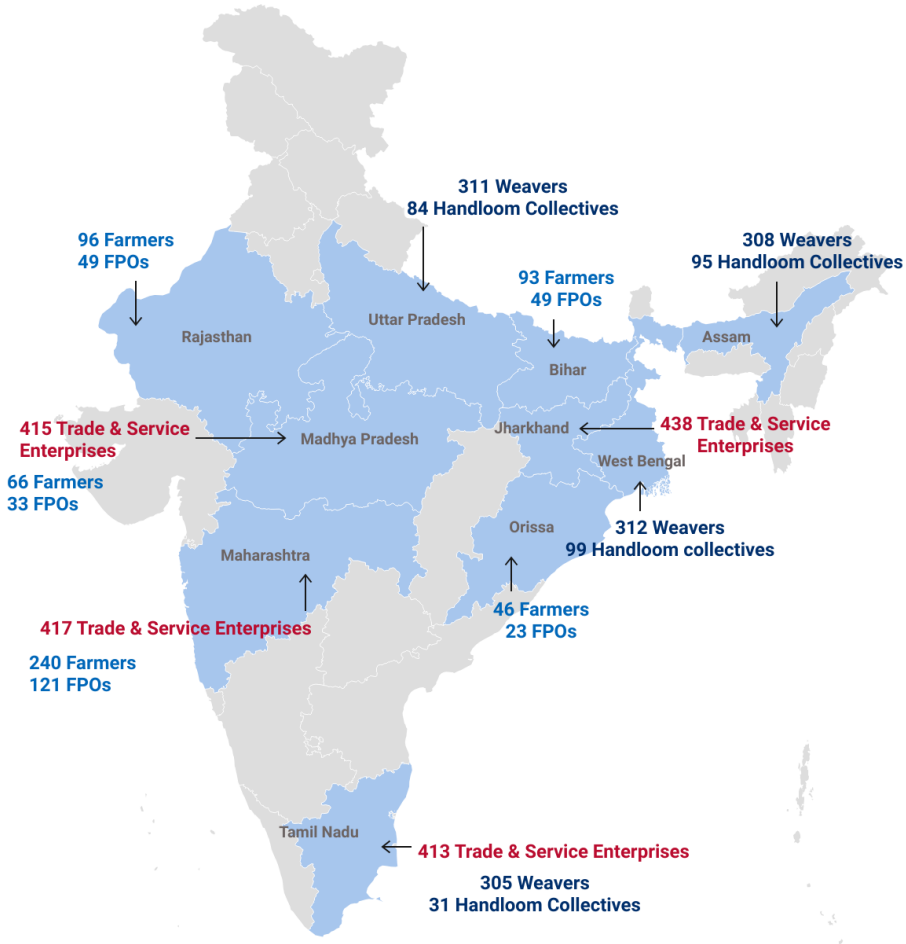
1. **Retail Trade & Service Enterprises (1,683)**
2. **Handloom Weaver Collectives (Cooperatives/Producer Companies) (309)**
3. **Handloom Weavers (1,236)**
4. **Farmer Producer Organizations (FPOs) (275)**
5. **Member Farmers (541)**

The data collection spanned across 10 different states in India, ensuring a representative sample of the diverse MSME landscape across the country.

The geographical distribution across the three studies is presented in the table and the figure below:

Enterprises in Retail Trade & Services	Handloom Weavers & Collectives	FPOs & Member Farmers
Jharkhand	Assam	Bihar
Madhya Pradesh	Tamil Nadu	Madhya Pradesh
Maharashtra	Uttar Pradesh	Maharashtra
Tamil Nadu	West Bengal	Odisha
-	-	Rajasthan

State-wise Coverage of the Fellowships



04

Formalization of Nano Enterprises through Digital Platforms: Potential and Challenges

The Government of India has placed a strong emphasis on increasing Udyam platform registrations. This particular fellowship focused on the characteristics, motivations and decision-making process of entrepreneurs based on their registration status for the following digital platforms: Udyam, GST, and Shop and Establishment Act/Gumasta license. The study covers a sample of 1,683 nano enterprises across four states in different regions of India.

Photo Credit: Paula Bronstein/Getty Images/Images of Empowerment

The importance of the informal sector in the Indian economy is well recognized, in terms of its contribution to GDP and exports as well as employment and livelihood generation (Ghosh 2022; Mehrotra and Giri 2019; Unni 2018). Based on NSS 73rd round (2015-16) survey of unincorporated non-agricultural enterprises and an annual survey of industries (2014-15) involving enterprises registered under the Factory Act, Mehrotra and Giri (2019) estimated that 99.7 per cent of all enterprises in India are in the unorganized sector. Of these unincorporated enterprises, 69 per cent do not have any type of registration- which makes it difficult for policy makers to extend routine services such as training programs, facilitate access to government schemes related to access to credit and market available to them, and provide special assistance packages during difficult times such as COVID-19 pandemic.

Formalization under 1948 Factory Act registration tends to assure safer and better working conditions and social security benefits for workers in these firms. On the other hand, registering unincorporated enterprises into one or the other act or digital platforms does not necessarily equate to formalization (Mehrotra & Giri, 2019). Certain benefits are more likely to reach unincorporated registered enterprises compared to the unregistered cohort, such as participation in government sponsored fairs or exhibitions, access of benefits from any government schemes, and availing credit from financial institutions. However, from an employment viewpoint, better job quality and access to social security benefits may not be available to the workers hired by such enterprises. Hence, registrations can be seen as the first step in the process of formalization (Ghosh 2022). This fellowship focuses on this first step of registrations using digital platforms of Udyam, GST, and Shop and Establishment Act/Gumasta license.

Nano enterprises are defined as a distinct segment within the MSME sector as firms with an annual turnover between INR 10 lakhs and INR one crore (between~USD 12,000 and 120,000). These hyperlocal, individual-run businesses cater to specific community needs and adapt swiftly to local demands. However, their informality hinders growth through limited access to credit, financial tracking difficulties, and lack of employee benefits. This research explored the characteristics of registered (1,247) vs. unregistered (436) enterprises spread across the four states of Jharkhand, Madhya Pradesh, Maharashtra, and Tamil Nadu, motivations for formalization on digital platforms (Udyam, GST, Gumasta), and the behavioral traits of Udyam registrants. For further details on the study methodology, see (Kumar et al. 2024).

Findings from this study can inform efforts to encourage formalization and empower nano enterprises, a vital contributor to the Indian economy. The study particularly delved into the trade and other service sectors to identify their unique challenges and opportunities, given the rarity of interventions specifically tailored for these sectors. The study findings can contribute to the design of the National Retail and Trade Policy that the Government of India was in the process of finalizing during the study period.

Registration Status of Nano Enterprises

Figure3: Registration Status of Nano Enterprises across Various Platforms: LEAD Nano Enterpise Survey on Formalization

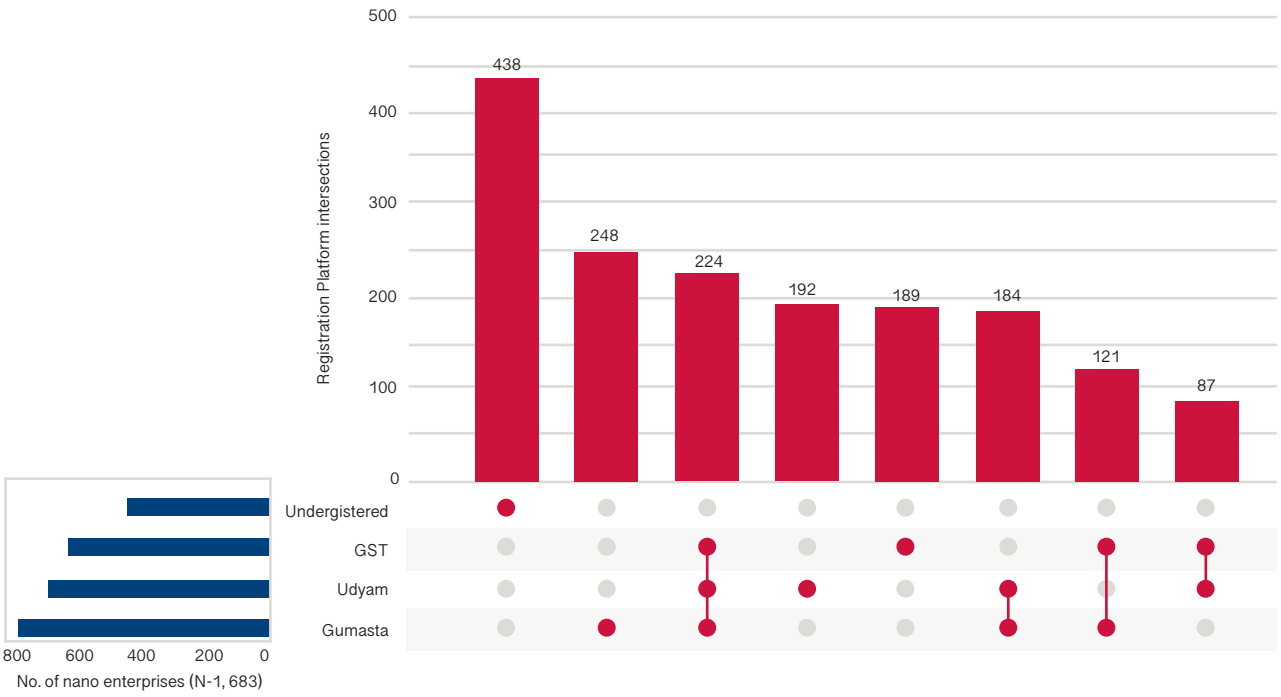


Figure 3 exhibits an UpSet plot to visualize intersections of registration on various platforms among nano enterprises. The plot was created using the UpSetR package in R (Conway et al. 2017; Lex et al. 2014). The count of each type of registration (may or may not be in combination with others) is represented on the left bar plot in blue. Clearly, Gumasta registration is the most prevalent (775 out of 1,683) among the nano enterprises in the sample. Every possible intersection of registration type is represented by the bottom plot, and their occurrence is shown on the top bar plot in red. If a registration platform is not part of the intersection, a light gray circle is shown. So, the vertical line connecting registration platforms indicates the column-wise relationships between them. The size of the bars of every possible intersection is arranged in decreasing order. Among the various combination of registration status, the most likely scenario is to have only Gumasta license; 248 enterprises in our sample belong to this set. The next likely combination among nano enterprises seems to have all three registration together; 224 enterprises have all three.

The least likely combination among enterprises seems to be having only Udyam and GST registration together.

Entrepreneur and Enterprise Sample Characteristics: Comparison between Registered and Unregistered Businesses

The registered enterprise cohort is defined as comprising those enterprises which are registered on at least one of the following digital platforms- Udyam, GST, and Gumasta. Unregistered enterprises are not registered on any of the digital platforms.

Registration Status of Nano Enterprises

Table 1: Distribution of Registered and Non-Registered Nano Enterprises across Entrepreneur Characteristics: LEAD Nano Enterprise Survey on Formalization (Sept-Nov, 2023)

Entrepreneur Characteristics	Registered	Unregistered
Gender		
Male	94%	89%
Female	6%	11%
Age		
18-30 years	16%	20%
31-50 years	72%	69%
above 50 years	12%	11%
Years of Formal Education		
0-5 years	2%	6%
6-10	20%	39%
11-12	23%	32%
Diploma*	16%	9%
Graduate and above	39%	14%

*Eligibility criteria for a professional diploma course, including those at the government diploma/vocational training institutes such as Industrial Training Institutes (ITIs), often is to pass 10th class (for some courses eligibility may be to qualify 12th exam). If after completing the 10th or 12th exam, one opts for a diploma course and gets a diploma degree, we consider them under the diploma category as opposed to their highest level of formal education.

Gender and Registration Status: Among 1,682 nano enterprises surveyed for this study, only 123 (7.3 per cent) are owned by women. This clearly indicates a gender divide in the context of ownership of enterprises. Our findings are similar to the NSS 73rd round (2015-16) estimates which show that female proprietary enterprises had a share of 8.7 per cent in trading and 7.4 per cent in other services. In addition, about 11.2 per cent of surveyed unregistered enterprises are owned by women, compared to only 6 per cent of registered enterprises owned by women (Table 1). This indicates that women-led enterprises are more likely to be informal compared to men-led enterprises.

Age and Registration Status: As shown in Table 1, the proportion of younger entrepreneurs is higher (20 per cent) among non-registered enterprises compared to that of registered enterprises (15.5 per cent). At first glance, it seems counter intuitive as the younger generation is likely to be digital-savvy. This can be explained in conjunction with data on the age of the enterprises. The proportion of newly formed enterprises (set up within the last five years) is much higher among younger entrepreneurs (61.8 per cent), compared to that of entrepreneurs in the 31-50 age group (29 per cent) and 50+ years age group (13.4 per cent). Young entrepreneurs often "test the waters" before officially registering their businesses, taking time to decide whether to continue in the same business.

Education and Registration Status: Table 1 shows that 39 per cent of registered business owners have a formal education of graduation and above, whereas this percentage is significantly lower (14 per cent) among non-registered business owners. The proportion of entrepreneurs having a professional diploma degree is higher among the registered enterprises (16 per cent), relative to only nine per cent among the unregistered enterprises.

Table 2: Distribution of Registered and Non-Registered Nano Enterprises across Enterprise Characteristics: LEAD Nano Enterprise Survey on Formalization (Sept-Nov, 2023)

Enterprise Characteristics	Registered	Unregistered
Turnover		
INR 10 Lakhs - 24.99 Lakhs (~ USD 12,000 – 29,999)	58%	88%
INR 25 Lakhs - 49.99 Lakhs (~ USD 30,000 – 59,999)	23%	7%
INR 50 Lakhs - 74.99 Lakhs (~ USD 60,000 – 89,999)	10%	1%
INR 75 Lakhs - 1 Crore (~ USD 90,000 – 120,000)	9%	3%
Average Employee Size (Excluding owner)		
Total employees	2.7	1.3
Full- time Employees	2.2	1.1
Contractual Employee	0.3	0.1
Family Member	0.2	0.2
Preferred Mode of Payment for Enterprise-related Activities		
Cash	41%	48%
UPI	38%	43%
Net banking	8%	4%
Cheque	13%	5%

Annual Turnover: As presented in Table 2, among the unregistered cohort of enterprises, 88 per cent belong to the lowest turnover bucket (less than INR 25 lakhs; ~USD 30,000) compared to a significantly lower proportion (58 per cent) among registered enterprises. This calls for steering incentives for formalization to nano businesses with lower annual turnover.

Employment Generation: Registered enterprises employ more workers (paid or unpaid, besides owner) than the unregistered cohort. On an average, 2.7 workers are employed within the registered cohort compared to 1.3 workers among the unregistered enterprises.

Adoption of Digital Payments: Adoption of digital payment services for enterprise-related transactions have effectively reached both registered and non-registered enterprises (Table 2). Preference for cash and UPI is higher among surveyed unregistered enterprises in comparison to the registered business. However, adoption of internet banking and check-based payment methods, although low, are relatively higher among surveyed registered businesses.

Information Gap Hinders Formalization of Nano Enterprises

An argument advocating increased formalization of enterprises, especially in the micro and nano segment, is that registration would grant them better access to the benefits of government schemes. This is a crucial incentive mechanism for registration, particularly considering the COVID-19 pandemic-induced losses faced by every business. Therefore, the study inquired about the operational challenges faced by both registered and non-registered units, including their awareness and access to government schemes. Findings from the survey reveal a significant information gap regarding the benefits of formalization among both registered and unregistered nano enterprises in India. Close to a quarter of registered as well as unregistered nano enterprises cited lack of awareness and inability to access government schemes as one of key operational challenges.

Among 998 enterprises unregistered with the Udyam portal, 30 per cent of them mentioned that they need to understand perceived benefits of registration before they register themselves on the Udyam portal. About 20 per cent would require help from someone for registration. Similar trends are observed for GST registration and Gumasta licensing.

Drivers of Formalization: Findings from Logistic Regression

Our outcome or dependent variable for the logistic regression analysis is binary, such as "use" or "non-use" of digital registration. This approach allowed us to identify factors that are associated with a business being registered on any one of the digital platforms (Udyam, GST, or Gumasta) after including an extensive set of explanatory variables in the model, derived from existing literature and key informant interviews. The summary of the findings on the explanatory variables in determining the registration status is given below:

Entrepreneur Characteristics:

- **Age:** Entrepreneurs over the age of 35 are more likely to be registered on at least one of the digital platforms than younger ones in the reference category of 18-35 years. This is because a high proportion of businesses owned by young owners are at a survival stage. Young entrepreneurs often "test the waters" before officially registering their businesses, taking time to decide whether to continue in the same business.
- **Education:** The higher the level of formal education of the entrepreneur (including having a professional diploma degree), the more likely it is that the business is registered.
- **Gender:** Women-owned businesses are less likely to be registered, suggesting that businesses led by women encounter numerous socio-economic barriers when attempting to scale and formalize. This calls for targeted policies to empower women entrepreneurs.

Enterprise Characteristics:

- **Turnover & Profits:** Higher annual turnover and profits are strongly associated with increased formalization.
- **Type of Business:** No significant association is found between registration status and whether the entrepreneur is a first-generation entrepreneur or is running a family business.

Business Environment:

- **Lack of Alternative Employment:** The study inquired with the respondents whether they were engaged in their current business due to the absence of any alternative employment. The finding indicates that nano business owners who have entered the business out of necessity, as salaried employment is unavailable, are not inclined to register and may be waiting to shift once they secure employment.
- **Indirect Cost of Informality:** Unregistered businesses often worry about eviction from their place of business or pay bribes to officials to continue their operations. In other words, the variable "Risk of Eviction and Payment to Officials" is negatively associated with registration status.
- **Customer Awareness:** The survey asked whether customers request a proof of registration of their business. The results show that if a business has higher customer awareness, it is more likely to be registered. So, this indicates that consumer-awareness campaigns can prove very effective to bring about formalization as customers asking for a proof of registration will induce the businesses to formalize.

Behavioral Traits of Udyam Registrants

The Ministry of MSME's objective for launching the Udyam Registration system was to establish a unique identifier system for MSMEs, serving as the foundation for their formal identification. While Udyam is a voluntary registration platform, currently there is a great policy thrust to increase registrations on Udyam. All start-ups and MSMEs are eligible to receive benefits from the various Government schemes by getting themselves registered under Udyam. Lending institutions have further amplified this initiative, and access to priority sector lending (PSL) now requires MSME borrowers to possess Udyam registration. Udyam registration has the potential to bring previously unregistered businesses, particularly nano and microenterprises, into the formal sector. It may also be able to facilitate benefits like easier access to finance and government schemes. This fellowship focused on understanding the behavioral intentions of an entrepreneur in adopting the Udyam registration platform.

The Technology Acceptance Model (TAM) is used to identify the importance of four latent constructs or behavioral factors viz., perceived usefulness, perceived ease of use, perceived trust, perceived relevance, that drive an individual's attitude to adopt digital registration platforms like Udyam.

A structured survey tool was designed with a total of 23 statements to capture respondent perceptions on each of the latent constructs. Each of these 23 statements had five-point Likert-scale response options: 1. Strongly Agree; 2. Agree; 3. Neutral; 4. Disagree; 5. Strongly Disagree. For example, the perceived usefulness of the Udyam portal was captured by responses to "I have accomplished the registration process quickly by using the online Udyam portal." Perceived ease of use was captured with statements like "Learning to use the Udyam portal is easy" and "I remember how to use the Udyam portal." Respondents marked responses to each of these statements on the five-point scale. For further details on the TAM methodology, see (Kumar et al. 2024).

The relationships between latent constructs are influenced by observable characteristics known as moderators. The effects of moderators can be negative, meaning they dampen the relation, and if a moderator is positive, it enhances these relationships between latent constructs. The key findings from the TAM model are summarized below. For further details on the output of the TAM model, see (Kumar et al. 2024):

- Ease of Use and Trust: Though all four latent constructs have statistically significant influences on an individual's attitude to adopt Udyam registration, perceived ease of use and perceived trust have stronger influence on the intention to use the Udyam registration platform.
- Age has a negative moderating effect on the relationship between perceived relevance and attitude to use. For an older entrepreneur, a positive perception on the relevance of the Udyam platform will not always ensure a positive attitude to use the Udyam platform.
- Customer Awareness positively moderates the relationship between attitude and behavioral intent to use the Udyam digital portal.
- Family Business (as opposed to first generation entrepreneur) positively moderates the relationship between perceived relevance and attitude.
- Gender has a negative moderating effect on the relationship between attitude and behavioral intent to use Udyam.

Photo Credit: LEAD at Krea University

> The formalization process should be rolled out on the lines of PMJDY account opening and Aadhar registration in a mission mode. It should be integrated with bank accounts because nano enterprises also should know what benefits they are getting in registering under Udyam.
>
> *- Dr Sumita Kale,*
> *CEO and Senior Fellow, Indicus Foundation*

Given the lack of granular and disaggregated data on the formalization of nano enterprises, this fellowship fills the gap by collecting and documenting representative data on service sector nano enterprises from various regions of India, encompassing both developed and less developed districts. A recurring theme across survey responses and key informant interviews is that Jharkhand, Madhya Pradesh, Maharashtra, and Tamil Nadu all boast good internet connectivity, and that surveyed entrepreneurs do not encounter major barriers to digitalization. However, the study findings indicate that multiple registration platforms for different purposes create confusion and inertia among enterprise owners. Their perception revolves around increased paperwork, bureaucracy, and unnecessary hassle in reporting their business. Consequently, they remain unconvinced about the benefits of formalization. Moreover, those willing to register on these platforms seek human assistance not only for the registration process but also for discussions and debates about registering their business (Kumar et al. 2024).

05

Rethinking the Digital Shift for Weavers and Collectives: Opportunities and Challenges in India's Handloom Sector

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The study employed a mixed methods approach, combining quantitative and qualitative data collection techniques, to comprehensively capture the challenges and opportunities faced by weavers and collectives. The total sample for the quantitative survey included 309 collective enterprises and 1,236 weavers from four states across different regions of India. The quantitative survey was complemented by in-depth qualitative interviews with 20 men and 20 women weavers and a total of 20 key informant interviews (KIIs).

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The Indian handloom sector possesses a rich cultural heritage, with unique weaving skills passed down through generations. According to the 4th Handloom Census (2019-20), India has over 3 million handloom-weaving households, 87 per cent of which are in rural areas. The total number of workers (weavers and allied workers) in these households is 3.5 million. Nearly 72 per cent of the total handloom workforce are women (Ministry of Textiles 2020). However, the sector is faced with a multitude of challenges, including an aging workforce, poor earnings, and overall languishing job quality.

This fellowship sought to understand the present landscape of collective enterprises in India's handloom sector in response to the government's call for the digitalization of MSMEs across different manufacturing and service sectors. Moreover, it investigated the current status of digital technology use or digital adoption among handloom weavers and collectives and the challenges they encounter. 1,236 sampled weavers and 309 handloom collectives were spread across four states of Assam, Tamil Nadu, Uttar Pradesh, and West Bengal. Among the handloom collectives surveyed for the study, most (96 per cent) of them are cooperative societies, as the study could locate only a few producer companies operating in the handloom sector across the mapped states. For more details on the study methodology, see (Choudhary et al. 2024).

Status of Digital Adoption in the Handloom Sector

- While 72 per cent of respondents have access to smartphones, only 33 per cent own a personal smartphone.
- 31 per cent of respondents use WhatsApp; only 15 per cent of surveyed weavers use social media platforms like Facebook and Instagram.
- 6 per cent of the surveyed weavers and 19 per cent of the surveyed handloom collectives use digital payment methods.

Factors Driving Digital Adoption Among Weavers

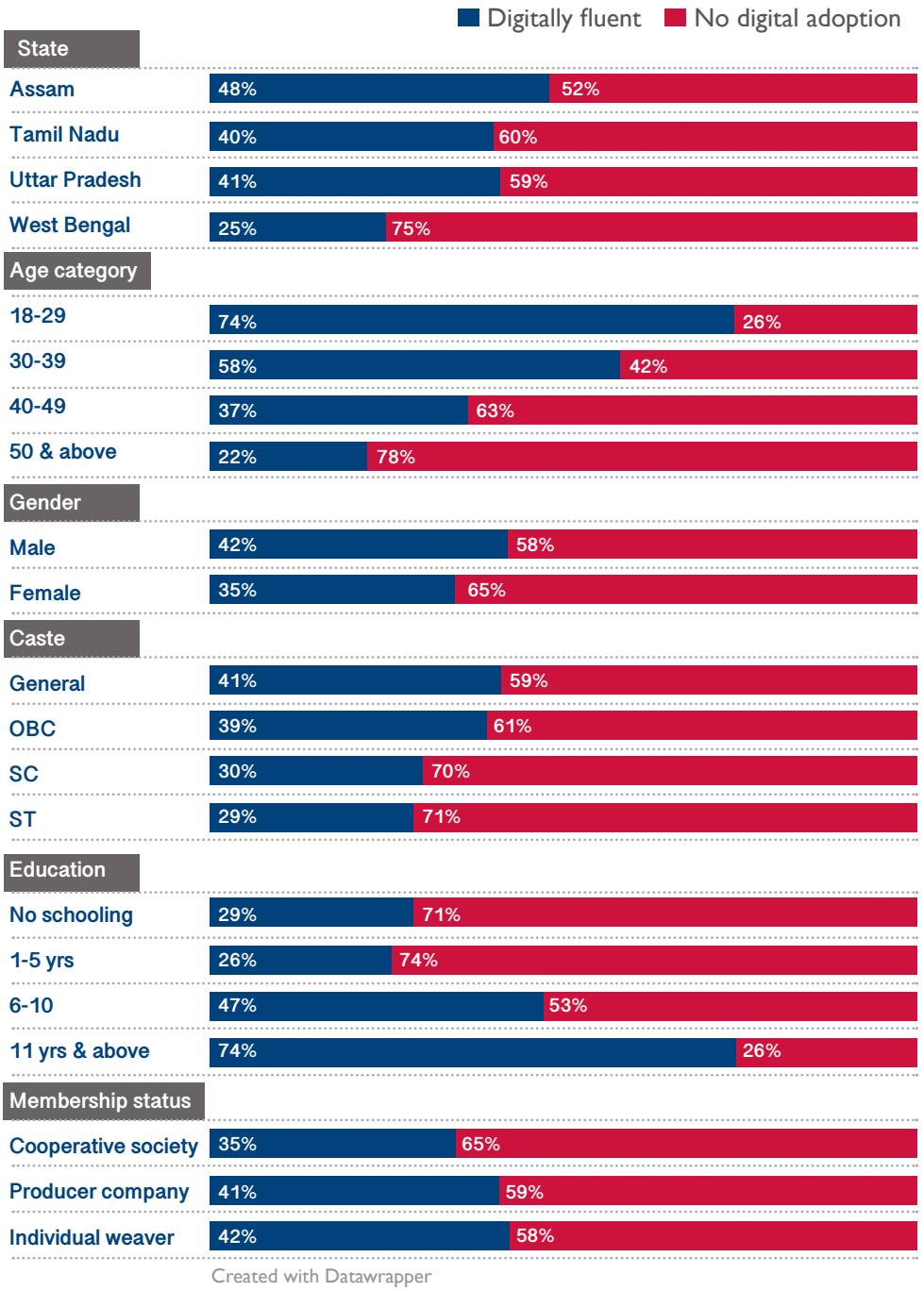
To define digital adoption levels among weavers, a composite index was constructed using principal component analysis (PCA) technique based on eight indicators from the LEAD Handloom Sector Digitalization Survey of Weavers (Oct-Nov, 2023). These eight indicators are:

1. Smartphone ownership (personal)
2. Smartphone access in the house
3. Use of smartphone for work
4. Access to computer
5. Use of digital payments
6. Use of WhatsApp
7. Use of social media platforms such as Facebook, Instagram, Twitter
8. Frequent use of digital tools for work or not. Digital tools include digital payments, WhatsApp, Facebook, YouTube, e-commerce website, any other digital software or website

Multiple studies exploring inequalities in health and education have used the PCA technique to create household or neighborhood socioeconomic indices (Canadian Institute for Health Information 2005; Filmer and Pritchett 2001; Lalloué et al. 2013; Pearce et al. 2006). Based on the index, the weavers were divided into quintiles, having the least,

low, medium, higher, and highest levels of digital adoption behavior. Further, we created a binary variable which takes on value 1 if the index suggests that the weaver belongs to either the higher or highest digital levels; if the weaver belongs to the lowest three categories, the variable takes on value 0. The table below presents the findings from the logistic regression analysis. A composite digital adoption index was used to identify levels of digital adoption across different characteristics of weavers. It was constructed using eight indicators from the LEAD Handloom Sector Digitalization Survey of Weavers (Oct-Nov, 2023) to measure digital adoption. The analysis helped identify weaver characteristics that significantly influence their digital adoption behavior.

Figure 4: Registration Status of Nano Enterprises across Various Platforms: LEAD Nano Enterpise Survey on Formalization



Key Highlights from Figure 4:

- **State-wise Variation:** Assam leads with the highest digital adoption (48 per cent), followed by Uttar Pradesh (41 per cent) and Tamil Nadu (40 per cent) among respondents. West Bengal lags behind with the lowest digital adoption rate (25 per cent).
- **Age Matters:** Surveyed younger weavers (18-29) are more likely to adopt digital tools (74 per cent) compared to older ones aged 50 & above (22 per cent). The limited presence of younger weavers in the sector poses a challenge to digital adoption.
- **Gender Gap Exists:** Surveyed male weavers show higher digital adoption (42 per cent) compared to females (35 per cent).
- **Education Attainment Promotes Adoption:** Higher education levels significantly increase the likelihood of digital adoption (74 per cent for 10+ years of schooling, compared to 26 per cent for 1-5 years of schooling) among respondents.
- **Social Category is a Barrier:** Surveyed weavers belonging to socially marginalized caste groups - SCs and STs- are less likely to adopt digital tools compared to the general category weavers.

Digital Adoption Status of Handloom Collectives

- **State-level Variation in Digital Adoption:** On average, surveyed collectives across the four states are able to leverage a mere two out of 11 digital tools available to them, such as computer use, access to internet, dedicated smartphone for collective, use of digital payments app, use of online inventory management app, maintaining digital accounts, existence of website, having a Facebook page, Use of WhatsApp, use of e-commerce, and use of other online platforms. This average is significantly higher among surveyed collectives in Tamil Nadu (3.68) compared to that of Uttar Pradesh (1.62).

Intersectionality - Gender and Marginalized Communities

Women constitute 72 per cent of the total handloom workers. Yet, their position and status in the sector remains subservient, and their work often invisible (Choudhary et al. 2024). They are isolated from decision making and are treated as subordinates who need supervision from male family members (Pande, 2016). In most states, they work as part-time or allied workers. Women's contribution to the production cycle, while significant, remains undervalued and unrecognized (Krishnamoorthy et al. 2021). Activities like spinning yarn and warping – where the yarn is wrapped around a beam - attaching the yarn to the loom, and final packaging fall within the woman's domain. Typically, women step in to weave only when their husbands get tired or need to prioritize their secondary jobs, either in the farms or at construction sites.

Among 3.5 million total handloom weavers and allied workers, 72 per cent of them are women (Ministry of Textiles 2020). However, the part time and informal nature of women's work in the handloom sector, along with low access to financial resources, is likely to result in slow progress in achieving SDG 5 and SDG 8 by 2030:

Goal 5. Achieve gender equality and empower all women and girls.

Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

To understand the nuanced experiences of women and other marginalized groups involved in weaving, core ideas of the intersectionality framework – social inequality, social context and social justice – are important (Collins and Bilge 2020). Women, in general, experience challenges due to their gender, socio-economic status, and the nature of work and more so among the marginalized communities such as lower caste and minority religion. To ensure that more women are equitably included within the handloom workforce, prioritizing their well-being is critical.

Findings From Regression Analysis of Weaver's Digital Adoption

Using data from the LEAD handloom sector survey (October-November 2023), this fellowship conducted statistical analysis to understand the impact of intersectionality on handloom weavers and its impact on weaver's digital adoption behavior. To define intersectionality, we considered weaver's background characteristics such as age, gender, caste, religion, and education. We used logistic regression methodology to identify the background characteristics of a weaver, which influence weaver's digital adoption behavior. For this purpose, we define our outcome variable as a binary variable which takes on value 1 if the index suggests that the weaver belongs to either the higher or highest level of digital levels; if the weaver belongs to the lowest three categories, the variable takes on value 0.

Figure 5: Digital Adoption by Weaver Background Characteristics: LEAD Handloom Sector Digitalization Survey of Weavers (Oct-Nov, 2023)

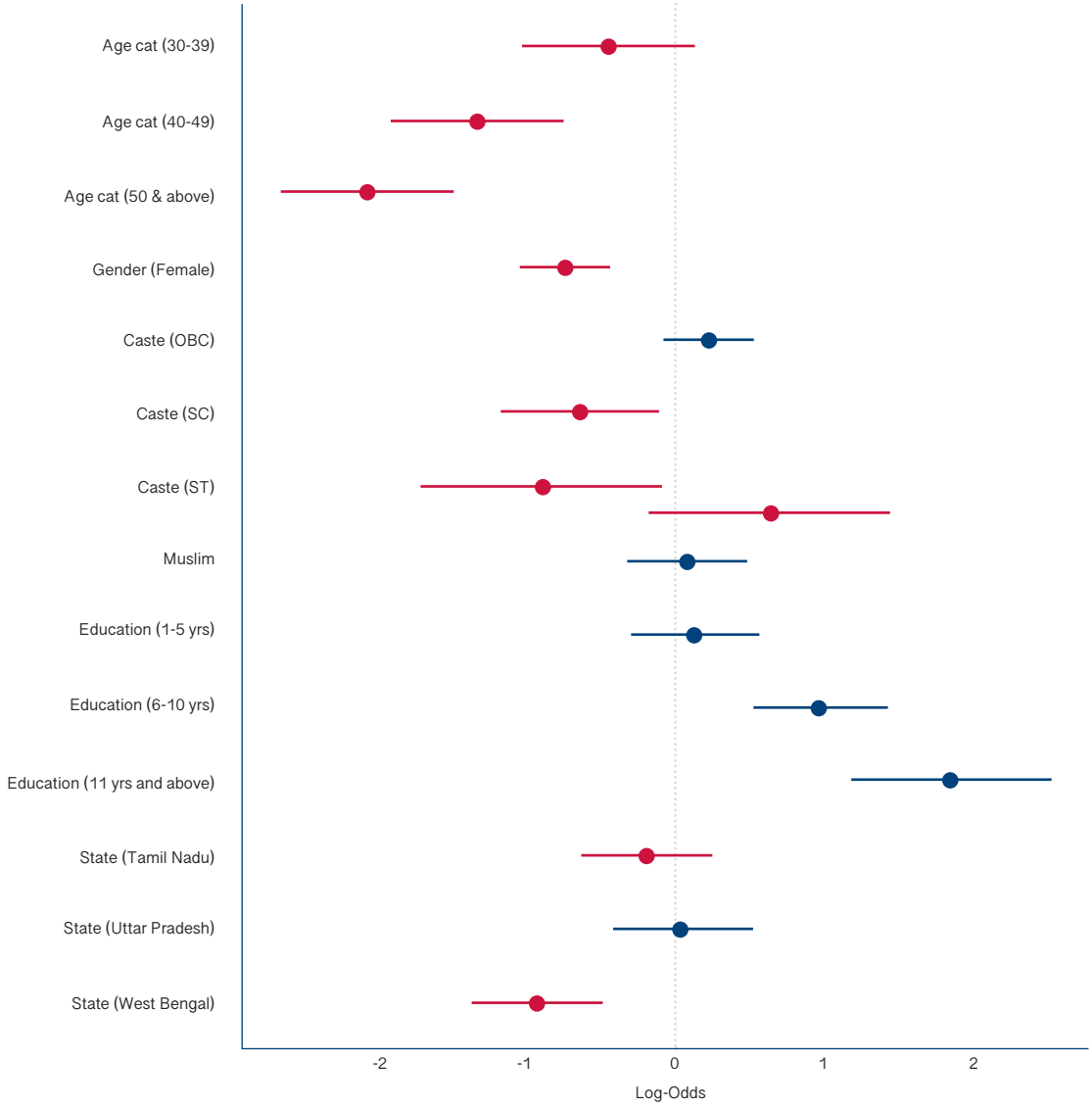


Figure 5 presents the regression coefficients from the logistic regression model with the outcome variable as the weaver's digital adoption. Negative coefficients, which are presented as red dots and appear on the left side of the dotted line, indicate a lower likelihood of weaver's digital adoption relative to the reference category of the respective background characteristics. Similarly, positive coefficients, which are presented as blue dots and appear on the right side of the dotted line, indicate higher likelihood of weaver's digital adoption relative to the reference category of the respective background characteristics. The solid red or blue lines around the dots measure the uncertainty around the estimated regression coefficients, also known as 95 per cent confidence intervals of the regression coefficients. If the solid red or blue lines include zero (dotted line), then the strength of association

between weaver's background characteristics and their digital adoption behavior is not statistically significant. Following these rules, the findings are interpreted as follows:

- Compared to surveyed weavers in the age group 18-29, surveyed weavers in the age group 40-49 and 50 & above are significantly less likely to adopt digital behavior (regression coefficients are negative and the 95 per cent confidence intervals do not include the value 0).
- Similarly, surveyed female weavers are significantly less likely to adopt digital behavior compared to their counterpart male weavers.
- Surveyed weavers having 6-10 years of education and 11 years or higher levels of education are significantly more likely to adopt digital behavior compared to weavers with no education.
- Religion does not seem to have an impact in determining the digital behavior of surveyed weavers, as the regression coefficient is not statistically significant.

Predicted Probabilities of Adopting Digital Behaviors

Based on the logistic regression analysis, we have predicted the probabilities of adopting digital behaviors for different intersections of weaver's background characteristics. Note that there are a total of 1024 possible combinations, given the presence of four age categories, two gender categories, four caste categories, two religion categories, four education levels, and four states of residence. Table 3 presents the lowest and highest 10 predicted probabilities for different intersections of weaver's background characteristics.

Table 3: Predicted Probabilities (in per cent) of Adopting Digital Behaviors for Different Intersections of Weaver's Background Characteristics: LEAD Handloom Sector Digitalization Survey of Weavers (Oct-Nov, 2023)

Combinations	Age	Gender	Caste	Education	State	Predicted probability
1	50 & above	Female	ST	No schooling	West Bengal	2.2
2	50 & above	Female	ST	No schooling	West Bengal	2.4
3	50 & above	Female	ST	1-5 years	West Bengal	2.5
4	50 & above	Female	SC	No schooling	West Bengal	2.7
5	50 & above	Female	ST	1-5 years	West Bengal	2.8
6	50 & above	Female	SC	No schooling	West Bengal	3.0
7	50 & above	Female	SC	1-5 years	West Bengal	3.1
8	50 & above	Female	SC	1-5 years	West Bengal	3.4
9	50 & above	Female	ST	No schooling	Tamil Nadu	4.5
10	40-49	Female	ST	No schooling	West Bengal	4.5
....	....	....	....	....	....	....
1015	18-29	Male	General	11 years and above	Assam	93.4
1016	18-29	Male	OBC	11 years and above	Tamil Nadu	93.6
1017	18-29	Male	General	11 years and above	Uttar Pradesh	93.7
1018	18-29	Male	General	11 years and above	Assam	93.9
1019	18-29	Male	OBC	11 years and above	Tamil Nadu	94.1
1020	18-29	Male	General	11 years and above	Uttar Pradesh	94.2
1021	18-29	Male	OBC	11 years and above	Assam	94.7
1022	18-29	Male	OBC	11 years and above	Uttar Pradesh	94.9
1023	18-29	Male	OBC	11 years and above	Assam	95.1
1024	18-29	Male	OBC	11 years and above	Uttar Pradesh	95.4

Challenges Faced by Weavers

Low Income at the Individual and Collective Level: Survey findings suggest that many handloom weavers in India face a bleak financial reality. Despite being the only source of income for 61 per cent of surveyed weavers, handloom weaving yields very low wages, particularly in some states. Income from weaving and allied activities is significantly higher in Tamil Nadu compared to other states. Surveyed weavers in Tamil Nadu earn a median monthly income of INR 10,000 (~ USD 120) per month. However, a staggering 98 per cent of surveyed weavers from West Bengal and 85 per cent from Assam, earn less than INR 10,000 (~ USD 120) per month from weaving and allied activities, forcing them into financial insecurity.

This situation is further compounded by the financial struggles of weaver cooperatives in states like Assam and Uttar Pradesh. These financially weak collectives are limited in their ability to support weavers, potentially impacting wage distribution. Being a member of a collective, particularly cooperative societies, does not guarantee an increase in income. The median monthly earnings from weaving remain similar (INR 6,000; ~ USD 72) for both members of surveyed cooperative societies and non-members. However, the median income of surveyed weavers of producer companies is higher at INR 8,000 (~ USD 96).

Handloom Weavers Struggle to Access and Avail Benefits From Government Initiatives: Survey findings suggest that collectives lack awareness of the GeM marketplace and other support systems. Surveyed weavers, especially in West Bengal and women, face similar hurdles in accessing government schemes. Even the Weaver Identity Card, meant to ease access, has low ownership in some regions among survey respondents. Despite limited benefits for social security, the card does help with pensions and yarn subsidies. A government push to include weavers in the GeM portal shows promise, but overcoming low awareness and potentially low sales volume of collectives remains crucial. Bridging this gap is essential to empower weavers and revive this traditional Indian craft form.

Opportunities for Digital Adoption in Handloom Collectives: The majority of the collectives demonstrate optimism towards digital adoption. 58 per cent of surveyed handloom collectives believe that digital tools can help in the operations and functioning of the cooperative society. Among those surveyed collectives who perceive the usefulness of digital adoption, 35 per cent thought that digital tools could help them increase their market reach and customer base. This is particularly true for collectives in Uttar Pradesh (62 per cent). Better communication with customers and suppliers emerged as a specific need in Tamil Nadu, with 40 per cent of the collectives seeing value in digital communication tools. Streamlining the backend, particularly inventory management, did not yet emerge as a top priority from the study findings, but it holds future promise. This strong interest in digital solutions highlights the need to promote investment in digital literacy programs to empower the handloom industry.

Photo Credit: Mansi Midha/Getty Images/Images of Empowerment

> E-commerce is only the front end of the business. Many organizations/cooperatives do not even sell online. To drive digitalization of the cooperatives, it is important to focus on strengthening the backend with digital tools. The digitalization at the front end becomes ineffective if the back end is not integrated with digital technology.
>
> *- Siva Devireddy*
> *(Founder, GoCoop)*

With a rich history spanning over 3000 years, handloom textile production and allied activities sit at the heart of the opportunity that 'Handmade in India' presents. Study findings suggest that a lack of awareness and access to information around government-led initiatives impedes digital adoption at scale. Moreover, a lack of partnerships with ecosystem actors and market players disrupts a potential pathway to digital adoption in the handloom sector. By bridging the gaps in governance and resource access through the strategic application of technology, it is possible to create a stronger enabling environment for handloom collectives to professionalize and operate as market-ready enterprises in their own right (Choudhary et al. 2024).

06

Digital Adoption Among Farmer Collectives and Its Members: Status and Opportunities for Intervention

Despite employing 43 per cent of India's workforce, the agriculture sector suffers due to fragmented landholdings and limited resources. About 86 per cent of India's farming population is made up of smallholder farmers with land holdings less than 2 hectares of land. Use of digital technology holds the promise to empower India's agricultural sector and ensure food security and economic growth. This study investigates the digital adoption in the agriculture sector by analyzing data from 275 Farmer Producer Organizations (FPOs) and 541 farmers who are members of the surveyed FPOs, across five states of India, viz., Bihar, Madhya Pradesh, Maharashtra, Odisha, and Rajasthan.

India's agricultural sector struggles with low productivity despite its significant contributions to food security and employment. Small and fragmented landholdings, coupled with lack of data driven decisions lead to agricultural yields that are far lower than the potential. The main impact of this fragmentation has been a reduction of mean plot size below the threshold for mechanization, inefficient land use, and substitution of labour for mechanical and chemical technology, which has, in curtailed agricultural productivity and profitability for smallholder farmers.

Given the challenges faced by smallholder farmers, Farmer Producer Organizations (FPOs) have emerged as an effective solution to collectivizing the smallholder farmers and addressing these challenges. By consolidating farmers into Cooperatives or Producer Companies (FPCs), FPOs in India have ensured that farmers have greater control over their produce. This consolidation fosters economies of scale, enables access to better quality and competitively priced inputs, facilitates knowledge sharing on best practices, and promotes an 'improved' market access and bargaining power leading to higher output prices.

FPOs are legal entities and have a formal structure, registered as cooperatives or private limited companies. They are entrepreneurial in nature, provide employment, impact farmers' incomes and well-being and contribute to India's development by ensuring last mile connectivity. Because of their overlapping characteristics and functional similarities, FPOs can be considered as MSMEs in the context of this fellowship.

While access to finance and market linkage for FPOs are pressing issues and are also most researched and talked about in the discussion forums, FPO operations are at the backdrop of these issues. FPOs often face difficulty in securing credit from banks because of their inability to produce proper documentation and proof of adhering to compliance norms. Similarly, in order to trade with large buyers, FPOs need to be able to do some supply forecasting and show proof for it. Formalizing and improving FPO operations through the use of digital tools therefore is the first step to solving issues of credit access and market linkage.

This fellowship explored ways in which digital adoption can benefit FPOs and their members. The focus is on identifying factors that drive digital adoption among FPOs and their member farmers, understanding the association between FPO digital adoption and digital adoption by farmers, and exploring the link between FPO services, their digital adoption and perceived well-being of member farmers.

In order to identify characteristics of FPO that are associated with greater digital adoption, this study surveyed 275 FPOs across five states: Bihar, Madhya Pradesh, Maharashtra, Odisha, and Rajasthan. Given the lack of a comprehensive database of FPOs across the country, the sampling in this research follows a convenience sampling method. The study relies on proprietary data on FPOs shared largely by Samunnati (~95 per cent), with ACCESS Development Services sharing the remaining sample. Existing studies on collectivization in the agriculture sector focused on how farmers' incomes and socio-economic conditions have improved due to FPO membership. However, studies decoding the FPO digital behavior as a channel for improvement in farmers' digital adoption and their perceived well-being are sparse. This study attempts to explore whether there is a trickle-down effect of FPO digital adoption on farmer digital adoption by surveying 541 farmers who are members of the surveyed FPOs. For further details on the study methodology see (Jaiswal et al. 2024).

Status of Digital Adoption among FPOs

FPO Digital Adoption on Key Indicators

This study assessed the status of digital adoption among FPOs across various access and usage indicators. Indicators like access to computers, having a website, digital record-keeping practices, use of digital tools for FPO operations, digital transactions, registration on FPO portal, online sales of produce, and utilization of WhatsApp for member communication were explored separately and also in the form of a composite index of digital adoption (Jaiswal et al. 2024). Table 4 shows the digital adoption among all surveyed FPOs for key digital adoption indicators and also by state.

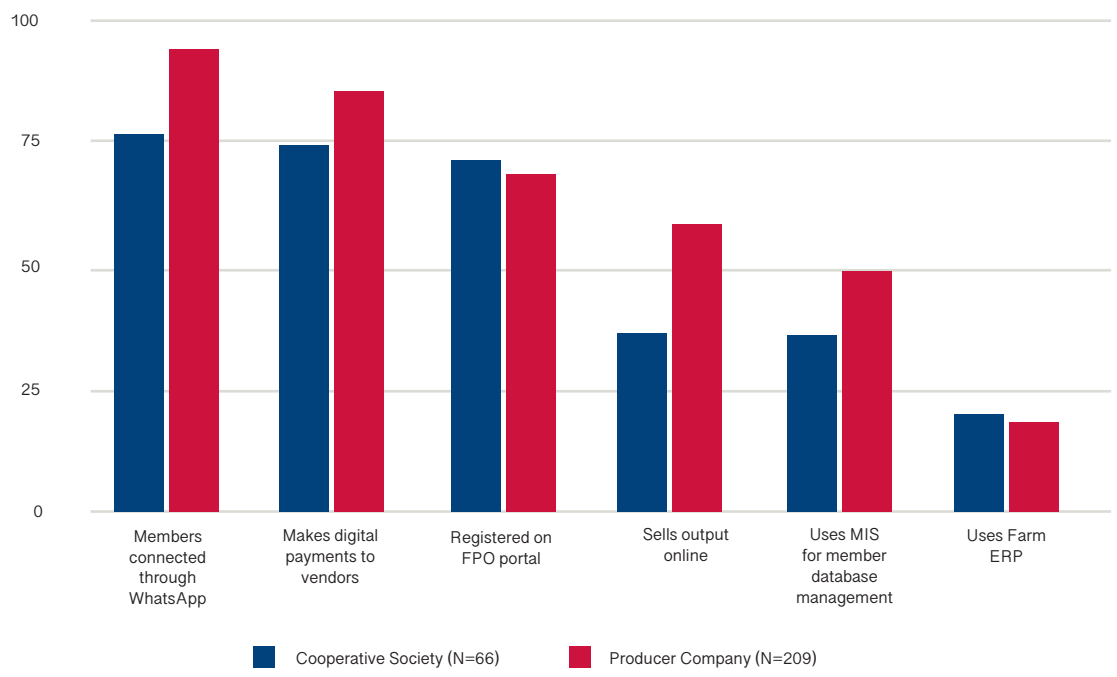
Table 4: Percentage of FPOs Adopting Various Digital Practices by FPO's Location of State: LEAD Survey of FPOs and Member Farmers on Digitalization (Oct-Dec 2023)

	Overall N = 275	Bihar N = 49	Madhya Pradesh N = 33	Maharashtra N = 121	Odisha N = 23	Rajasthan N = 49
Members connected through WhatsApp	90	86	94	98	83	73
Owns a computer	89	69	91	93	100	94
Receives digital payment from customers	87	82	88	94	78	76
Makes digital payments to vendors	82	76	82	97	74	57
Distribute dividends to members digitally	82	78	76	98	74	55
Registered on FPO portal	69	86	64	63	74	69
Sells output online	53	43	55	55	70	51
Uses MIS for member database management	46	39	48	35	87	61
Has a website	35	47	21	38	13	35
Uses Farm ERP	18	29	24	11	52	6

Ownership of a computer seems to be a prevalent phenomenon among surveyed FPOs, as 89 per cent of sampled FPOs reported owning a computer. A relatively smaller proportion (69 per cent) of FPOs in Bihar own a computer compared to other four states Madhya Pradesh, Maharashtra, Odisha, and Rajasthan. However, the proportions of FPOs having a website (47 per cent) or registered on the FPO portal (86 per cent) are significantly higher in Bihar. This may seem counter intuitive, suggesting alternative access methods like resource sharing within cooperatives (which are prevalent in the state). Only 22 per cent of FPOs in Bihar are FPCs, and the remaining 78 per cent are farmer cooperatives.

Use of ERP (Enterprise Resource Planning) software for integrated management of business processes and operations digitally is not commonly used by FPOs, except perhaps in Odisha. However, we have to interpret this finding with caution, given the small number of FPOs (23) surveyed from Odisha.

Figure 6: Factors Associated with Digital Adoption Among Weavers: LEAD Handloom Sector Digitalization Survey of Weavers (Oct-Nov, 2023)



For most of the indicators such as WhatsApp network of members, digital transactions, online selling of outputs, use of MIS for member database management, FPCs seem to have better digital adoption rate compared to that of farmer cooperatives (Figure 6).

Recordkeeping Practices of FPOs

Streamlining operations through digital recordkeeping practices can significantly enhance the efficiency, transparency, and productivity of FPOs. Digital recordkeeping involves using digital tools and platforms to maintain, manage, and analyze records of accounts, inventory, cash book, bank book, share capital, sales and purchases, and member information.

Table 5: Percentage Distribution of FPOs Following Different Methods of Recordkeeping Practices on Various Aspects of FPO Operations (N = 275): LEAD Survey of FPOs and Member Farmers on Digitalization (Oct-Dec 2023)

	Physical + Digital	Digital Only	Physical Only	No recordkeeping	Total
Accounts	61	23	15	0.4	100
Inventory	61	21	16	2.2	100
Cash book	62	21	16	0.7	100
Bank book	60	22	17	0.4	100
Share capital	62	23	15	0.7	100
Sales and purchases	63	21	16	0.4	100
Member records	64	20	16	0.4	100

Table 5 presents the percentage distribution of FPOs following different methods of recordkeeping practices on various aspects of FPO operations. Approximately 60 per cent of FPOs maintain records on both paper and digital format for each of the following: Accounts, Inventory, Cash book, Bank book, Sales & purchases. Approximately 20 per cent of FPOs maintain exclusive digital records for each of the above. In general, digital record keeping is higher among FPCs for Accounts, Inventory, Cash book, Bank book, Sales & purchases.

Training Received by FPOs

Digital adoption by FPOs can help them streamline operations, enhance market reach, and foster collaboration and communication with other FPOs, vendors, customers, and member farmers. Training on digital practices plays a crucial role in fostering this digital adoption. The survey asked the FPOs whether they received training on digital practices in the last two years. Key findings are as follows:

- **Overall Prevalence:** Almost half (49 per cent) the FPOs received training on managing member information, followed by training on digital bookkeeping (42 per cent), digitizing member information (36 per cent), and selling output through e-commerce (33 per cent) (Table 6).
- **State-level Variation:** As presented in Table 6, there is not much state-level variation in terms of training received in the last two years on topics related to digital adoption, as less than half of the FPOs received such training on various digital tools. However, in Odisha the proportion of FPOs receiving training on e-commerce (48 per cent) is relatively high and the proportion of FPOs selling outputs online is also relatively high (70 per cent), see Table 4.

Table 6: Percentage of FPOs Received Training on Digital Practices in the Last Two Years Preceding the Survey by FPO's Location of State: LEAD Survey of FPOs and Member Farmers on Digitalization (Oct-Dec 2023)

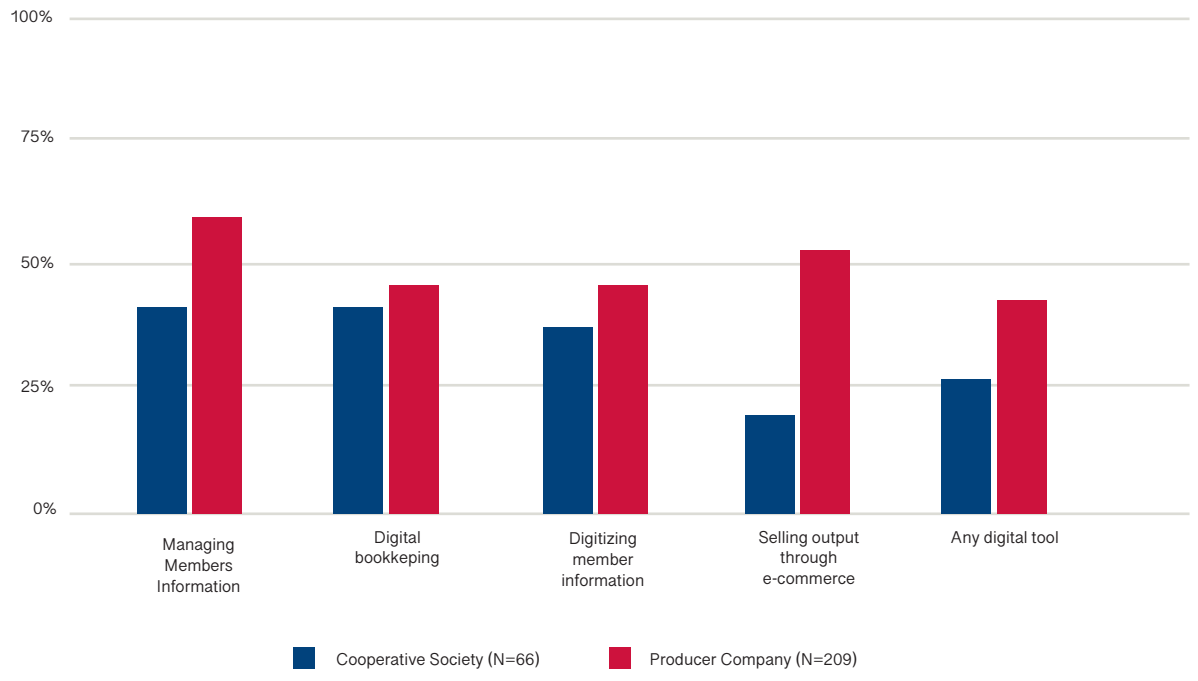
	Overall N = 275	Bihar N = 49	Madhya Pradesh N = 33	Maharashtra N = 121	Odisha N = 23	Rajasthan N = 49
Managing member information	49	41	58	50	61	47
Digital bookkeeping	42	41	45	42	48	37
Digitizing member information	36	37	45	34	43	31
Selling output through e-commerce	33	20	52	31	48	31
Any digital tool	30	27	42	24	52	29

Years in Operation: A smaller proportion of older FPOs, who are in operation for more than ten years, received training on e-commerce (12 per cent) and sell outputs online (27 per cent).

Legal Form: Higher proportions of FPCs received training in the last two years compared to farmer cooperatives (Figure 7).

Shareholding Size: Larger FPOs with more than 500 members are more likely to receive training compared to smaller ones.

Figure 7: Percentage of FPOs Adopting Various Digital Practices by FPO's Legal Form: LEAD Survey of FPOs and Member Farmers on Digitalization (Oct-Dec 2023



Impact of Training on FPO's Digital Adoption

The study findings reveal that a low level of digital training is significantly associated with low levels of digital adoption. Among 85 FPOs who did not receive any training in the last two years (low training category), 46 per cent have a low level of digital adoption. However, in the overall sample, 33 per cent of the FPO falls in the low digital adoption category. Similarly, 58 per cent of the 99 FPOs that scored high on digital training also scored high on overall digital adoption. Comparatively, only 26 per cent of the FPOs that scored low on digital training scored high on digital adoption. These findings build a strong case to train FPOs in digital operations.

Digital Adoption among Farmers

Table 7: Percentage of Member Farmers Adopting Various Digital Practices by Farmer's Location of State: LEAD Survey of FPOs and Member Farmers on Digitalization (Oct-Dec 2023)

	Overall N = 541	Bihar N = 93	Madhya Pradesh N = 66	Maharashtra N = 240	Odisha N = 46	Rajasthan N = 96
Owns a smartphone (personal or household)	97	98	98	99	85	96
Uses digital payments for personal transactions	73	68	71	80	54	69
Receives payments from FPO digitally	67	77	61	79	50	40
Makes payments to FPO digitally	66	61	61	78	43	53
Uses agri-related mobile apps	35	11	42	53	13	21
Took digital loans for agricultural purpose in the last two years	22	6.5	9.1	33	35	16
Took crop insurance in the past two years	53	12	76	73	24	45

Key findings are as follows:

- 67 per cent of farmers received digital payments for the output sold to their FPOs. In Rajasthan, this proportion is as low as 40 per cent.
- 66 per cent of farmers made digital payments for inputs bought from FPOs. These proportions are lower in Odisha (43 per cent) and Rajasthan (40 per cent).
- Only 35 per cent of farmers use agri-apps on their phones. These proportions are significantly lower among FPOs in Bihar (11 per cent) and Odisha (13 per cent).
- Only 22 per cent of farmers reported having taken loans digitally. Digital loans imply that all documentation was processed online.
- About 53 per cent of farmers reported having taken crop insurance digitally. Farmers in Bihar have significantly lower uptake of digital crop insurance. These proportions are significantly higher among farmers in Madhya Pradesh (76 per cent) and Maharashtra (73 per cent).

Factors Determining Farmer's Digital Adoption

Effect of FPO Digital Adoption on Member Farmer's Digital Adoption Diminishes When Adjusted For Other Potential Confounders

The findings from the study suggest a statistically significant positive correlation between FPO digital adoption and digital adoption of member farmers. However, after adjusting for location state of the FPO, farmer background characteristics, and FPO characteristics, the association between the two is no longer statistically significant.

Significant State-Level Variations in Farmer Digital Adoption

The study reveals substantial differences in digital adoption among surveyed farmers across Indian states, even after adjusting for farmer's background and FPO characteristics. Farmers in Madhya Pradesh and Maharashtra exhibit significantly higher levels of digital adoption compared to those in Bihar. On the other hand, farmers in Rajasthan seem to be less likely to adopt digital tools compared to farmers in Bihar. This suggests potential variations in factors influencing farmer digital adoption beyond the data collected on FPOs and farmers themselves. These factors could include variations in efficient policy implementation related to digital adoption, institutional differences across states, or unmeasured characteristics of FPOs and farmers in those regions. Further investigation is needed to understand the specific reasons behind this state-wise variation.

Years of Formal Education of Farmers Play a Significant Role in Their Digital Adoption

Levels of farmer's education, as measured by four categories: primary or below, 6-10 years of schooling, 11-12 years of schooling, and more than 12 years of schooling, seem to have a significant positive association with their digital adoption. The higher the number of years of schooling, the higher the levels of digital adoption.

> Government as well as private players are driving initiatives like the National e-Governance Plan in Agriculture (NeGP-A) and FPO Gateway to provide training and resources for FPOs to access and manage online platforms. Onboarding of FPOs on ONDC is also being promoted by the Government, while they work towards building next generation business analytics services to offer to farmers and collectives.

Photo Credit: M. DeFreese/CIMMYT/Flickr

The Government of India's focus on digitalization reflects a growing consensus among stakeholders that technology can boost agricultural productivity, enhance sustainability, and improve farmer returns. While FPOs have made strides in improving farmer outcomes, credit and market access remain among the biggest challenges towards building a sustainable FPO ecosystem. This study contributes to the existing literature by arguing for digitalization of FPO operations as a potential solution to the gap in credit and market access for FPOs. Digital operations can improve transparency, allowing FPOs to track progress, manage member data, and forecast demand. These streamlined processes improve transparency and governance within FPOs, signaling trustworthiness to external actors, potentially improving credit and market access for FPOs (Jaiswal et al. 2024).

07

Cross-Sectoral Insights: Discussion of Findings on MSME Digital Adoption

> “Through the registration into various platforms, the Governments tend to regulate to its advantage, for example to gain revenue through taxes. This is termed as the capital view of formalization (Unni 2018). The labour view of formalization is that the fundamental right of workers and entrepreneurs must be recognized. Workers need to benefit from moving from informal to formal arrangements.”

This section analyzes findings from three studies to identify the key challenges and drivers influencing digital adoption among MSMEs. **Poor income avenues for individuals and enterprises, coupled with lack of knowhow to access government initiatives emerged as the two key challenges faced by MSMEs across the three sectors.**

Financial Constraints

A significant barrier identified is the limited financial resources available to MSMEs. This manifests in two ways: low individual income and restricted collective turnover. The median monthly income of surveyed weavers from weaving activities, for instance, is a mere INR 6,000 (~USD 73), with a concerning gender disparity (women weavers earn 33 per cent less than male weavers). Furthermore, over 70 per cent of surveyed weavers reported low wages as a major challenge that they experience in their profession (Choudhary et al. 2024). Among 309 handloom collectives, 45 per cent of them have a turnover of less than INR 10 lakhs (~USD 12,000) per annum. Similarly, 66 per cent nano enterprises, in the retail trade and other service sector, have an annual turnover below INR 25 lakhs (~USD 30,000), highlighting their financial limitations (Kumar et al. 2024).

Limited Access to Government Benefits

The studies reveal a concerning lack of awareness and utilization of government programs designed to support MSMEs' digital adoption. Roughly 20 per cent of retail, trade, and service sector nano enterprises reported lack of awareness about government schemes as a major operational challenge they face and the proportions are similar for both registered (22 per cent) and unregistered (24 per cent) nano enterprises.

Similarly, FPOs demonstrate a significant knowledge gap regarding government-initiated digital platforms. Findings suggest that the majority of FPOs (more than 50 per cent) are unaware of digital platforms like Open Network for Digital Commerce (ONDC), Multi Commodity Exchange (MCX), Open Credit Enablement (OCEN), Trade Receivable Discounting System (TReDS), and National Commodity & Derivatives Exchange Limited (NCDEX), let alone avail them (Jaiswal et al. 2024). Awareness about trading platforms like National Agriculture Market (eNAM) and Agricultural and Processed Food Products Export Development Authority (APEDA) Farmer Connect that help bridge the gap between farmer collectives and exporters is relatively better, though that has not translated into higher uptake of these platforms among the FPOs.

This lack of awareness about government schemes extends to the handloom sector as well. Among handloom collectives, awareness about the following schemes are relatively low: scholarship schemes for children of handloom workers to study in textile industry (35 per cent), schemes related to design support (35 per cent) and GeM portal (25 per cent).

The financial constraints of MSMEs and entrepreneurs and their limited knowledge of government initiatives designed to address those constraints emerge as significant barriers to digital adoption across all three sectors studied (retail/services, handloom, and agriculture). This highlights a critical gap that needs to be addressed. In the next section, we present actionable recommendations for policymakers, industry leaders, and support organizations to bridge this gap and empower MSMEs with the digital tools and resources they need to thrive in the digital age..

07 Recommendations: Approach to Bridging the Digital Divide for MSMEs

Based on the findings of the SARDI India MSME Tech Fellowship program, the synthesis report proposes a multi-pronged approach to bridge the digital divide and empower the underserved segments of MSMEs. Each recommendation is followed by a rationale in a tabular form and three columns of the table represent three sectors considered under this fellowship program.

Recommendation 1: Design and Offer Tailored, Customizable Solutions That Meet the Varied Requirements of Underserved Segments.

Rationale for this Recommendation

Retail trade and other service sector nano enterprises	Handloom weavers & collectives	FPOs and their member farmers
Multiple registration platforms for different purposes create confusion and inertia among enterprise owners. It reflects on the lack of perceived trust in the system for MSMEs.	Among weavers, low level of digital literacy is a key barrier to digital adoption.	FPOs often resist new tools due to a lack of awareness and apprehension towards new technology. Supply side innovations lack cultural context and overwhelm small FPOs with complex interfaces (e.g., enterprise resource planning (ERP) solutions).

To ensure inclusion and maximum uptake, digital solutions need to be customized to meet the needs of the vulnerable- women, elderly, and geographically disadvantaged. This involves considering factors like preexisting digital literacy levels and ease of navigating the user interface. Digital solutions should be delivered via user-friendly interfaces that are simple to navigate, available in local languages, and offer voice-enabled options for those who struggle with reading text. They could also be calibrated based on the growth stage of the business. This will increase digital adoption rates and ensure everyone has the opportunity to participate in the digital economy.

Recommendation 2: A Market-Driven Digital Adoption Strategy Is Crucial to Effectively Promote the Digitalization of Enterprises and Customer Engagement.

Rationale for this Recommendation

40 per cent of the registered enterprises stated that the customer asks for proof of registration before availing any goods or services.

The lack of customer trust in informal businesses is a significant factor in driving registration as well as digitalization.

Cooperative societies and producer companies in the sector are working in silos, with only 2% of the surveyed collectives working in partnership with NGOs or other social businesses.

FPOs use digital tools to bridge data gaps, and offer scope to enhance agricultural traceability.

Implementing a market-driven digital adoption strategy enables FPOs to become more competitive, efficient, and transparent.

A market-driven digital adoption strategy is the key to unlocking the full potential of MSME digitization efforts. Understanding the needs and motivations of enterprises who are "ready to digitize" is an important aspect of crafting targeted awareness campaigns that go beyond simply information sharing. The focus of the campaigns should not only educate the businesses owners but also their customers, highlighting the risks of informal businesses and the importance of a digital trail. Awareness programs for customers should further highlight the benefits that come from engaging with formal, digitally driven enterprises. Highlighting aspects like better efficiency will only incentivize business owners to digitize and reap the benefits of a more engaged and informed market.

Recommendation 3: Implement Digital Initiatives and Training Programs Through Deeper Engagement with Collectives.

Rationale for this Recommendation

28% retail, trade enterprises are ready to register with digital handholding support.

A majority (40 per cent) of surveyed weavers reported regular work as the motivation to join collectives.

Only 34 per cent of handloom collective enterprises use computers.

Digital skills are strongly associated with digital skills trainings among FPOs and FPO adoption of digital tools.

FPO digital adoption is not associated with member farmer's digital adoption.

Community groups and collectives have been identified as an effective model to hold institutions accountable and tackle problems faced by groups at large. In recent years, Self Help Groups for collectivizing women in rural India and Farmer Producer Organizations for smallholder farmers in rural India have seen a few major success stories. However, the study findings suggest that farmers and weaver collectives may not be fully successful in delivering on their mandates for better livelihood conditions and access to government schemes and benefits to their members. Another potential avenue is for private sector companies and foundations, civil society organizations, and grassroot organizations to partner with collective organizations to introduce digital upskilling initiatives and implement existing schemes. Leveraging the digital expertise of these organizations in combination with the collectives' deep community roots will enable members of collectives to reap benefits of digital upskilling and other tools.

Recommendation 4: Conduct Digital Upskilling Specifically for Women, and Enact Gender-sensitive Digital Policies.

Rationale for this Recommendation

Women-owned businesses are less likely to be registered.

Women entrepreneurs' attitude toward digitalization is positive but does not translate into getting registered due to socio-cultural barriers.

Women weavers earn 33 per cent less than male weavers.

The median monthly income from weaving is INR 8,000 (~ USD 96) for men and INR 6,000 (~ USD 73) for women.

Female representation in FPOs is poor. The study sample shows a median of two female board members in the FPO. The proportion of female shareholders among member farmers is low, the overall median being 27 per cent.

The digital revolution presents a double-edged sword for women's economic participation. While it offers exciting opportunities like remote work and access to global markets, a growing digital skills gap and lack of gender-sensitive policies can leave women behind. To bridge this divide and unlock the full potential of the female workforce, a multi-pronged approach is needed. The first step is to address the digital skills gap. Upskilling programs should focus on in-demand digital skills relevant to their respective industries, coupled with career guidance and mentorship opportunities. Culturally sensitive and context specific digital literacy programs will also further facilitate women's economic participation, as well as their digital inclusion. This will not only empower women in their current roles but also equip them for future advancements. In parallel, governments and educational institutions should collaborate to offer free or subsidized digital literacy and skills training programs for women.

Governments and technology platforms also have a responsibility to strengthen legal frameworks and regulations to combat online harassment and promote online safety for women. This could involve dedicated cybercrime units within law enforcement agencies, stricter penalties for online abuse, and collaboration with tech platforms to develop robust reporting and moderation systems.

Recommendation 5: Redefine and Classify MSMEs to Address the Heterogeneity Of Business Size, Sector, and Varied Nature of Business.

Rationale for this Recommendation

"Nano enterprises" (a distinct segment of microenterprises) face unique challenges – like informality – that require a distinct and concerted approach.

Incorporating handicrafts and handlooms collectives within the MSME community will help mainstream and offer awareness and access to government schemes, subsidies.

Recognizing and incorporating FPOs within the MSME community will provide them a financial and structural boost.

Current micro-enterprise categories overlook the unique challenges faced by even smaller "nano" businesses. A tax holiday for newly registered nano enterprises could address this gap, while five years of tax exemption would ease the initial burden of running the business. Segmentation will further offer benefits like better credit access, market visibility, and legal standing.

Further, collectives in niche sectors like agriculture and handloom handicrafts require focus to realize their full potential and operate more effectively. FPOs and handloom collectives are governed by legal frameworks that differ from MSMEs, catering to their distinct needs. However, classifying FPOs and handicraft clusters as MSMEs will unlock access to credit for them. Non-Banking Financial Companies (NBFCs) offering credit at high interest rates in the range of 20-30%, the classification of FPOs and handloom collectives as MSMEs will open avenues of institutional credit at affordable rates. In addition, classifying them as MSMEs is likely to grant them access to beneficial programs, such as subsidized power and water rates. This, in turn, would allow them to invest in more activities that add value to their products.

The Promise and Path Forward for MSME Digital Inclusion in India

The Indian government has implemented various policies to address the challenges faced by MSMEs through digital transformation. Initiatives like the Demonetization, GST rollout, UPI, and falling mobile data costs have opened doors for MSMEs to go digital. However, the digitalization of MSMEs has not led to the MSME formalization. Research suggests that even among registered MSMEs, few truly understand the benefits of formalization beyond fulfilling government mandates (Ghosh 2022; Mehrotra and Giri 2019; Unni 2018).

A promising solution lies in linking digital lending avenues with business formalization. This could incentivize a larger number of MSMEs to embrace both digitalization and formalization. Moreover, addressing issues with digital lending can further enhance the perceived benefits of formalization, especially for businesses that are new to credit. As the advantages of formalization – like cheaper and faster credit – become more evident, a significant surge in formalization, especially among nano enterprises, is expected.

While digital solutions offer immense potential, their utilization in India is heavily influenced by socio-economic and demographic factors. Individuals on the privileged side of the digital divide, characterized by higher income and educational attainment, are more likely to embrace digital tools. Similarly, younger individuals (under 30 years) demonstrate a greater propensity for digital adoption compared to older demographics. Furthermore, a concerning gender gap exists across all three sectors, with women consistently exhibiting lower digital adoption rates compared to men.

Because collectives seek to enhance the bargaining power individuals and provide them with access to information and services, they can serve as a model for addressing individual-level socio-demographic barriers. The assumption is that individuals affiliated with collectives tend to do better than those who are not. However, the study findings indicate a less than significant impact of collectives on individuals. For example, membership in handloom co-operative societies does not guarantee higher income for weavers. There is no significant difference in the monthly household income from weaving for weavers who are part of the collectives and those working as an individual weaver, the typical income being INR 6000 (~ USD 73). On the other hand, for handloom producer company members, the median income is typically higher at INR 8,000 (~ USD 96). While co-operative societies give year-round work to the weavers in most places, they fail to provide better prices (Choudhary et al. 2024).

As the stories of ONDC and OCEN unfold, and digital innovation continues to evolve, we can expect even more transformative solutions to emerge at the individual, enterprise, and ecosystem level. An inclusive digital transformation will not only unlock economic benefits but will also empower citizens through financial inclusion, social inclusion, and significant time and cost savings.

This synthesis report underscores the urgent need for a multi-stakeholder approach to bridge the digital divide and empower MSMEs. Collaborative efforts between government, industry leaders, civil society, and educational institutions are crucial to ensure equitable access, capacity building, and the development of a supportive digital ecosystem for all MSMEs in India. By harnessing the potential of DPIs and digital innovations, India can unlock a future of inclusive growth for its MSME sector.

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