

Decoded: Women and the Future of Digital Work in India

Insights on the Landscape, Concepts, and Levers for Deepening Women's Participation



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Acknowledgements

This report presents findings from a study undertaken by the Gender x Digital hub, an initiative of LEAD at Krea University (IFMR), in collaboration with The/Nudge Institute. The study is part of a multi-stakeholder initiative aimed at deepening the understanding of women's participation in data value chains and designing actionable intervention pathways. The initiative is supported by the Gates Foundation.

The report would not have been possible without the partnership of our colleagues at The/Nudge Institute - Kanishka Chatterjee, Chetana Koulagi, Meera Vijay, Priyanshi Toshniwal, Mohit Chelani and Anurag Vaishnav. The team's support from conceptualising to completion has been key in helping us learn and build these insights. We are deeply grateful to Arjun Venkatraman at the Gates Foundation for his continued support and guidance in shaping this initiative. We also thank Swati Agarwal, Aarav Akali, and Shyam Kumar Sudhakar for their support in the ecosystem mapping work, and Nikore Associates for providing key policy insights. We are also grateful to Sharon Buteau for overall strategic guidance and review of the report.

We would like to thank representatives from Anaxee, Apna, Chambal Media, Desh AI Labs, DesiCrew, Digital Empowerment Foundation, Digital Green, Ekitai, Finovaracore, Gram Vaani, iMerit, Nava Data, NextWealth, Pluc.TV, PRADAN, Sajhe Sapne, Sambodhi, Shaip, Treemouse, and Vayam for participating in the stakeholder consultations, facilitating field visits and sharing their valuable insights and on-ground experience. We also wish to acknowledge the community members, workers, and organizational leaders who generously shared their time, experiences, and perspectives with us, their voices are central to this work.

The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the funding or partner organizations.

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Unlocking Opportunities for Women in the Digital Economy: A Shared Commitment

“Digital transformation holds immense promise, but true inclusion demands intent. Women make up only a fifth of India’s digital workforce, and a small fraction hold leadership roles in tech, proof that participation alone does not equal inclusion. Through the Gender x Digital (GxD) hub, LEAD is working to ensure that women’s voices and experiences shape India’s digital future. Our research, spanning data workers, digital platforms, and community-level facilitators, reveals the opportunities and inequities driving this transformation. We have witnessed both the possibilities and the paradoxes of digital change, and while much remains to be learned, the task ahead is clear: to design systems and partnerships that enable women not just to participate, but to thrive and lead.”

Sharon Buteau
Executive Director
LEAD at Krea University

“India’s digital economy contributes 11.7% of GDP and is projected to exceed 20% by 2030 - yet millions of women remain peripheral to this emergent value chain. Studying organizations working with low-access women has been deeply instructive, offering a grounded view of how capability, confidence, and income evolve when digital tools meet India’s gender constraints. Equally, mapping how digital work is distributed across India’s workforce, from urban systems to distributed emerging data value chains, has revealed insights beyond gender.

This report captures those patterns of participation and exclusion, defining where access, recognition, and scale can converge to drive systemic productivity - bold participatory ideas that could tip the equation.”

Kanishka Chatterjee
Ecosystem Partner & Advisor
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“A thriving digital economy must reflect the participation and aspirations of its women, who are central to building an equitable society. The Gates Foundation is committed to advancing gender-intentional solutions through insights, innovation, and partnerships that turn inclusion into meaningful impact.

This report, developed through a dedicated collaboration between the GxD hub and The/Nudge Institute, marks an important step in understanding and strengthening women’s roles across the spectrum of digital work. The knowledge we create together will help guide government and private sector efforts toward more gender-intentional growth.”

Saachi Bhalla
Deputy Director
Gender Equality, Gates Foundation

About Us



The Gender x Digital hub (GxD hub) is a cross-disciplinary platform dedicated to **advancing meaningful digital connectivity among women and girls in India**. GxD hub is an initiative of LEAD at Krea University (IFMR). LEAD at Krea University is an action-oriented research centre housed at the Institute for Financial Management and Research (IFMR), a not-for-profit society which is also the Sponsoring Body of Krea University.

www.gxdhub.org | www.ifmrlead.org



The/Nudge is an action institute building resilient livelihoods to alleviate poverty. We work with social entrepreneurs, women, farmers, tribals and youth on rural development, agriculture, skilling and economic inclusion, along with 15 central and state government partners. Set up with support from 90+ eminent philanthropists, 40+ corporates and 15+ foundations, The/Nudge is contributing towards a **"poverty-free India, within our lifetime"**.

www.thenudge.org



Key Findings



In Salem, Tamil Nadu a young executive working at a BPO logs in to her workstation to annotate data. She values the opportunity to work close to her home and family, while aspiring for the role of a junior team leader.

In the heart of semi-urban Uttar Pradesh, a digital journalist records and edits local news stories on her phone, challenging social norms that once limited her mobility.

Across rural India, frontline workers and last mile agents use mobile apps for nutrition tracking, drone operations, and delivering critical information and advisory services.

These vignettes illustrate the landscape of women's work in India's burgeoning digital economy – one that is unlocking new economic opportunities while addressing systemic barriers and frictions in the labour market.



Three key shifts are driving a significant transformation in the Indian digital economy: **High digital penetration and the rise of digital public infrastructure, rapid growth of platforms and gig economy, and proliferation of AI, microwork and data labelling.** These developments are opening new pathways for women's work, offering flexible, remote opportunities, skill development, and upward mobility. With the infrastructure for inclusion in place, the next step is building an enabling ecosystem through collaboration among industry, platforms, skilling institutions, civil society, and government. As women take on roles as data workers, entrepreneurs, gig workers, and digital intermediaries, understanding this evolving ecosystem, its opportunities and its risks, is vital to shaping equitable and sustainable digital employment. Against this backdrop, the Gender x Digital hub in collaboration with The/Nudge Institute conducted a comprehensive review of the current state of women's digital engagement across existing models, to conceptualise digital work in the Indian context, and identify levers and potential solutions to enhance their participation. The study employed a mixed-methods approach, combining secondary research and ecosystem landscaping with stakeholder consultations (20 organizations across six states) and interviews with women workers, platform operators, and community groups, providing insights into how women, particularly from low-income and rural areas and tier 2/3 towns participate and progress within the digital economy.

Demystifying the Digital Work Landscape



Women's participation currently spans a diverse spectrum of digital work.

An important gateway for women in the digital economy is using digital or ICT tools and platforms to augment some aspects of their current livelihood practices. These include farmers using AI chatbots or online videos to access information, micro entrepreneurs using e-commerce or online trading platforms to sell produce in addition to offline marketplaces, teachers using ICT tools to augment classroom teaching, among others. This is not digital work per se, but can be classified as **digitally-augmented livelihoods**, where using digital/mobile tools is optional. Digital work itself, and women's participation in it, includes three broad categories:

(i) Digitally-enabled Work

This represents a **growing employment avenue** that includes **gig and platform work** (~28% gig workers are women) which is more prominent in metropolitan areas and large cities and **roles in rapidly digitalizing sectors** such as health, education, agriculture, and financial services e.g., ASHAs, Anganwadi workers, SHG bookkeepers, BC Sakhis outside urban centres. Here, digital tools have become essential in how work is accessed, exchanged, or conducted, even as the work output remains physical.

Key challenges: Women's participation is concentrated in low-to-mid skilled roles involving basic digital literacy and routine tasks. Shared device access, poor connectivity, lack of clear skill progression and career pathways, weak incentive structures, the double burden of digital and offline workflows, and fragmented market access complicates this category of work.

(ii) Digitally-engaged Work

This is another important pathway, and constitutes job roles that **help build or maintain the physical infrastructure** necessary for the digital world to function.

Key challenges: Women's participation in this is relatively low. For example, women constitute 12% of the workforce in electronics manufacturing in India, largely concentrated in entry-level positions, such as assembly line workers and operators. Challenges with the traditional manufacturing industry (eg, inadequate labour protection, mobility constraints, skills barrier etc) carry on to these work roles.

(iii) Digitally-embedded Work

This is a third emerging category of employment, buoyed by the social media, data annotation, and AI boom. Opportunities for AI and data value chain microwork are concentrated in Tier-2 and Tier-3 cities; 80% of data annotators are from non-metro regions. Women are well-represented in entry-level roles that require minimal training. Digitally embedded content creation (including vernacular and multilingual formats) and digital entrepreneurship (for example, social e-commerce, YouTube, Instagram) also offer new forms of digital agency and visibility, with over 2 million monetized creators in India that influence USD 350 billion in consumer spending.

Key challenges: Women are concentrated in lower ends of the data value chain work, which are at risk of automation, and characterised by unstable incomes. Skilling and progression pathways are unclear, with women's participation declining sharply in more technical and managerial roles. Other challenges include lack of structural work support and grievance redressal mechanisms, algorithmic management, attrition due to intersectional normative barriers, and exposure to online harms.

Deepening Women's Participation in Digitally-Enabled Work:

- Design **inclusive digital tools and programs** that account for shared device use and intermittent connectivity, by aligning with women's access patterns, offering offline and IVR options, and distributing devices with clear use cases when feasible.
- **Build foundational and job-specific digital skills** through relevant, hands-on, and women-led training methods, supported by peer networks to enhance confidence in using digital tools for traditional livelihoods.
- Adapt national skills and labour frameworks (e.g., NSQF, labour surveys) to include digital task-based competencies across frontline and community roles, **improving visibility, progression, and access to incentives**.
- Develop **dedicated digital market linkages** that promote women-led enterprises through visibility tags, mentorship in digital marketing, and algorithmic transparency for equitable participation in e-commerce.

Scaling up Women's Participation in Digitally-Embedded Work:

- **Leverage domestic digital demand:** Establish mechanisms for aggregating demand from national platforms, startups and other demand generators to provide sustainable and high-quality opportunities.
- Facilitate access to device rentals or **local common centres** such as co-working setups near women's homes to enable access to shared infrastructure, with pooled resources for maintenance, device repair, and

data costs, where women can undertake digital work and complement this with supportive infrastructure such as transportation options and childcare to tackle mobility restrictions and ensure women's safety.

- **Enable career progression** by recognising the diversity of entry-level, intermediate and advanced roles in this category, implementing structured skilling and upskilling programmes, and inter-operable credentials. Complement this with leadership training and promotion pathways to accelerate their movement into managerial and executive roles.

Cross-Cutting Priorities: Moving from Participation to Empowerment

- **Prioritise digital safety and well-being** through awareness and security toolkits, mental health support, and enabling worker collectives or unions to strengthen voice and agency in digital work environments.
- At a broader level, address systemic workplace inequities through a combination of ecosystem and policy efforts to **ensure minimum pay standards** and benefits for this nature of work, and **robust grievance redressal systems**, alongside gender-intentional policies such as **on-site childcare, safe commuting options, and the flexibility to work remotely**.
- Finally, address **normative barriers** around women's workforce participation to **expand the talent pipeline and enable retention**. This can be done through **trust-based mobilisation** by local NGOs (e.g. using referrals), **engaging family members** (e.g. one BPO runs 'family days' to reassure relatives), and **tapping into community influencers and local leaders** builds confidence and uptake in low-resource rural areas.

India's digital economy is at a critical inflection point, with the infrastructure and rails of inclusion in place. Targeted and coordinated efforts by industry, platforms, skilling institutions, civil society and the government can accelerate women's participation and empowerment in this emerging sector, informed by systematic evidence. As the digital and AI economy further grows, we need to ensure that women from different socio-economic segments can leverage emerging opportunities and shape the digital future.

01. Context and Objectives: India's Digital Turn



How is the digital economy reshaping work and what is at stake for women?

India's digital economy, projected to reach **\$1 trillion by 2029** (Mishra et al., ICRIER, 2025), is not just altering markets; it is fundamentally re-shaping the future of work. This is driven by high digital penetration with approximately **1.2 billion mobile connections**, more than **900 million** internet users (TRAI, 2025), and a rapid digitization of traditionally analogue sectors like government services, finance, health, agriculture and education. The scale of this transformation is already significant: in 2022-23, the digital economy accounted for **11.74%** of India's GDP and employed **14.67 million workers (~2.55% of Indian workforce)**. Productivity in this sector is five times higher, with its share projected to reach **20%** of Gross Value Added (GVA) by 2029-30 (Mishra et al., MeitY, 2025).

This Transformation is Shaped by Three Inter-Connected Trends:

A. Rise of Digital Public Infrastructure and an enabling policy environment:

The rollout of digital public infrastructure such as Unified Payments Interface (UPI), Aadhaar, Ayushman Bharat Digital Mission (ABDM), Open Network for Digital Commerce (ONDC), and DigiLocker is a cornerstone of this transformation. These platforms are democratizing digital access, enabling new forms of work, and spurring private sector innovation. Language tools like Bhashini further expand this reach by opening up regional data tasks. Government initiatives and schemes such as the Skill India Digital Hub, Pradhan Mantri Kaushal Vikas Yojana (PMKVY) 4.0, Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) and National Digital Literacy Mission and the IndiaAI Mission are further expanding foundational and vocational digital skills.

B. Platformization and the growth of Gig work: The platform economy has emerged as a major driver of employment, particularly in the gig sector (eg, workers providing services via platforms like Uber, Zomato, Urban Company etc.). As of 2020-21, about 7.7 million workers were engaged in the gig economy, across low-skilled, medium-skilled and high-skilled categories (NITI Aayog, 2022).¹ This number is expected to reach 23.5 million by 2029-30 (ibid), opening up new income streams and flexible work options especially for women.

C. The AI and Automation Boom: AI and automation are set to reshape the Indian job market, with the sector projected to grow at 25–35% annually and create up to one million new jobs (Nasscom, 2023). This growth is associated with the rise of a parallel data economy and new forms of task-based work such as AI microwork and data labelling typically commissioned by tech giants and corporates in the global North, domestic startups and government institutions. India is the largest global supplier for this form of work (ILO, 2021a), with tasks spanning sectors such as E-commerce (cataloging and labeling), Agritech (field data collection), and Healthtech (medical image tagging). This provides new opportunities for labour force participation and supplementary income sources, especially for women from rural areas and Tier 2/3 towns due to low entry barriers and remote work options. Earnings from data work can increase women's confidence, agency and aspirations, encouraging them to explore further work opportunities (Varanasi et al., 2022).

What is at stake for women?

The digital transformation is thus creating new pathways for paid work and livelihoods for women, offering flexible income streams and skill development, especially for those previously excluded from the formal labour market.

However, this rapid growth conceals a dual reality: emerging digital opportunities coexist with structural inequities in the labour market and care economy, such as informality, low pay, and limited social protection.

While female labor force participation (FLFP) in India has increased to 41.7% (Periodic Labour Force Survey, 2023-24), it is largely concentrated in informal and self-employed roles. **Some of the key challenges with respect to FLFP include occupational segregation of the job market and concentration of women in low growth sectors, slow growth in salaried employment (Kapsos et al 2014; Deshpande & Singh 2021), change in demand for nature of jobs (Mehrotra & Sinha 2017) with limited demand for 'moderately educated' women's skilled labour (Chatterjee, Desai & Vanneman, 2019), uneven distribution of unpaid domestic and care work, and women's preference for flexibility and part-time work that is often not met adequately by the traditional labour market (Fletcher et al 2017).** In this context of change in nature of jobs, skills, and preference for different ways of work, the digital economy has the potential to open up new

¹There are varying estimates of gig workers in India. According to some projections, this number grew from 8.5 million to 15 million in 2018-20 (Tiwari, Ram & Roy, 2019))

opportunities for women, through a combination of extensive digital penetration, skilling initiatives, flexible and remote jobs for different skill levels, and a dynamic gig and microwork economy.

However, these new opportunities are saddled with risks and exclusions that reflect the existing gender digital divide. **Despite recent progress, there is a notable gender gap in smartphone ownership (35% women vs 51% men). Only 37% of women use mobile internet in India, compared to 53% of men, and 19% of female mobile internet users access the internet only on someone else's device (GSMA, 2024). The recent Comprehensive Modular Survey: Telecom, 2025 confirms these trends: only 48.4% women (15 years and above) in rural areas own a mobile phone (as opposed to 80.7% men in rural areas).** Yet a slightly higher percentage of women report recent internet use (57.6% in rural areas), indicating that at least part of this use is mediated through shared devices or assisted use. Ensuring meaningful access to digital devices and connectivity is the first step for women to leverage the digital economy transformation. Further, when participating in digital work and app-mediated gig work, women are often concentrated in roles which mirror existing labour market segregation (eg carework, beauty, domestic work) with limited social and legal security (Rani et al. 2021) or in low-paid, monotonous tasks which are at risk of automation (Gurumurthy et al 2021). Women's access to high-value work is hindered by limited training, contextual and language differences, reputational risks, and persistent negotiation of domestic duties with their families (Hada et al., 2024).

There is thus a **need to ensure that these new roles and labour markets serve as an engine for equitable inclusion and do not replicate the exclusions and vulnerabilities of the traditional labour market.** In order to do this, policy makers, private players, and civil society organizations need to address structural challenges that restrict women's mobility and participation in digital systems, and re-imagine inclusive models of digital work that are representative, responsive to women's needs, and capable of creating pathways for recognition, equity and sustainable livelihoods.

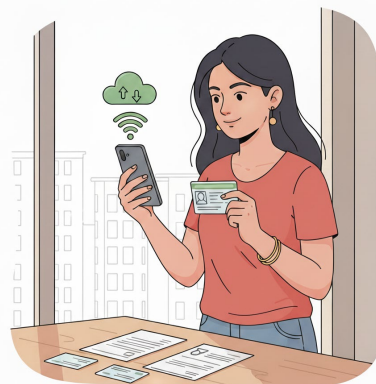


Sanmati 2.0: Landscape Study Objectives

Given the dual nature of opportunity and potential precarity opened up by the digital economy and its rapid evolution, there is a need for deeper evidence and strategic guidance to inform interventions. Against this backdrop, a new research and action initiative - Sanmati 2.0 - by the Gender x Digital hub (an initiative of LEAD at Krea University) and The/Nudge Institute aims to understand and engage with disruptive and scalable models that can increase women's participation across the digital value chain and address barriers to digital connectivity, engagement and work. The first phase of this project focused on deepening our understanding of digital work in India, mapping women's participation through a landscaping study, and identifying opportunities for low-income women workers, especially from tier 2/3 towns and rural areas. Insights from this work are intended to support a broad community of stakeholders, including industry and corporates, digital platforms, civil society organizations, philanthropic organizations and policymakers to design and fund effective interventions for unlocking women's participation in digital work at scale.

Key Learning Questions

1. How is digital work conceptualised? What frameworks and work models exist to categorize digital work and how can they be adapted to the Indian context?
2. What are the opportunities and challenges for women's participation across different categories of digital work?
 - A. How are women, specifically from Tier 2/3 towns and rural areas, navigating the digitalization of traditional sectors?
 - B. How are women participating in new job roles across data and AI value chains?
3. Who are the different actors in the digital work ecosystem (government, workers, platforms, intermediaries, employers) and what roles do they play? Who is shaping women's access to digital work?
4. What are the strategic levers and gender inclusive pathways to expand women's agency and participation in digital work?

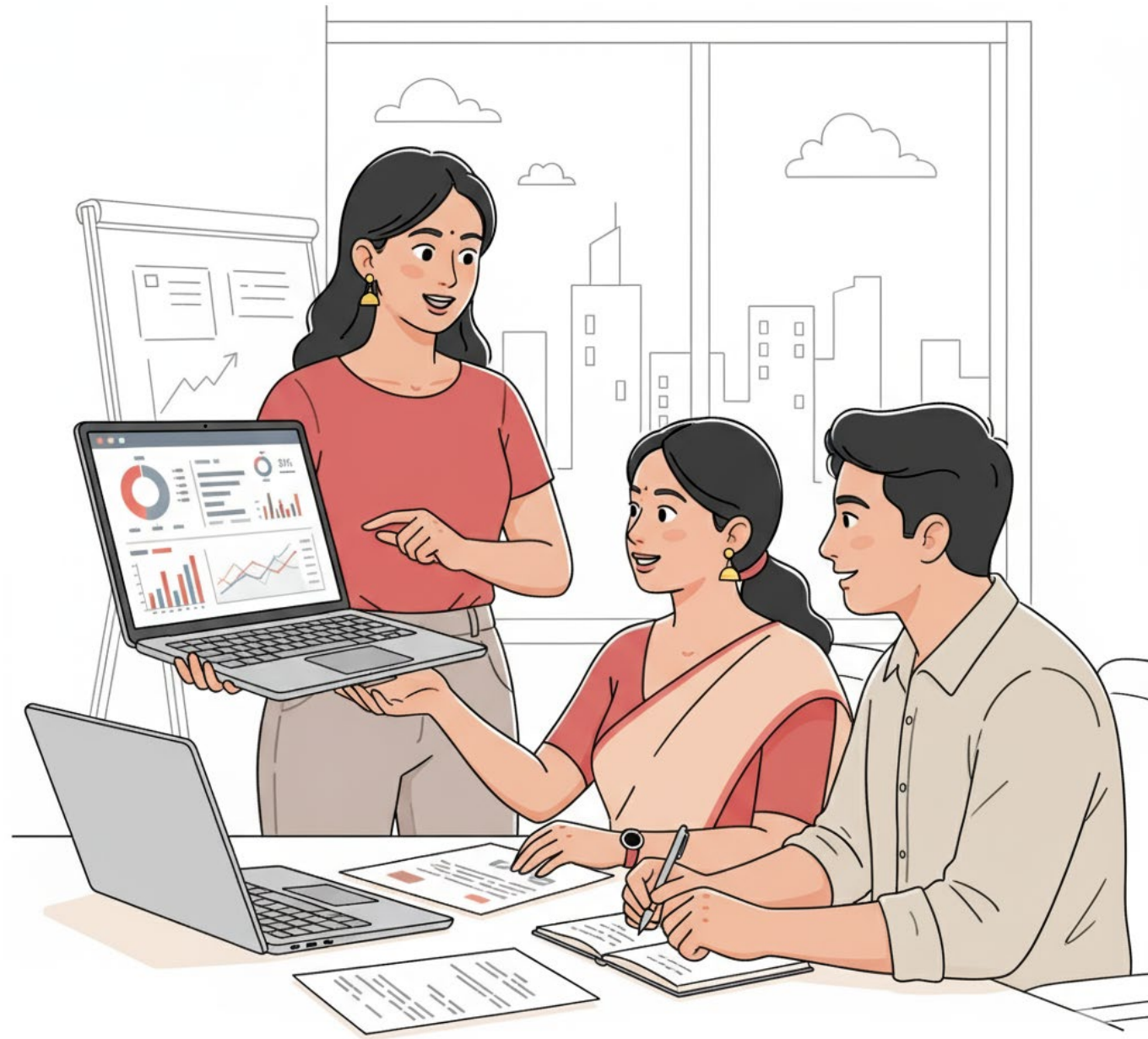


Our Approach and Limitations

This study combines secondary research with primary qualitative methods. We conducted a desk review to identify 70+ organizations, actors, and models active in the digital work ecosystem, and the foundational concepts related to digital work. This included scanning peer-reviewed research, policy documents, grey literature, national and state-level policy initiatives aimed at advancing digital development and skilling, and government initiatives focused on women's empowerment with a focus on digital inclusion. To bring in on-ground and contextual nuances, we conducted consultations and field visits with 20 organizations across India including rural and urban regions of Uttar Pradesh, Bihar, West Bengal, Karnataka, Tamil Nadu, and Delhi. Field visits included in-depth interviews and focus group discussions with community members, workers, and leaders in these organizations. All interviews were documented and recorded with consent and analysed thematically using consolidated field notes.

The scope of the study excludes a comprehensive analysis of the market size and related segmentation within digital work. Existing reports, data and case studies were reviewed but were found to provide fragmented insights, often lacking gender disaggregated data points and detailed demographic profiles of digital workers. The scarcity of robust datasets make in depth analysis challenging. Secondary datasets such as the Periodic Labour Force Survey (PLFS), Online Labour Index and International Labour Organization's ILOSTAT were explored to assess the availability of gender-disaggregated data but excluded from detailed analysis due to limited coverage of digital and platform based work and gender-disaggregated data. Further, generation of large scale quantitative datasets while essential for comprehensive analyses is out of scope for this study. Finally, the organizations and case studies presented in this report, while archetypal, are not exhaustive, and were identified using a snowball method.

02. Making Sense of Digital Work: Concepts & Categories



In this section, we draw from recent literature and frameworks on digital work, largely rooted in the global North context, and contextualize them using the primary field work undertaken as part of this landscaping study. Unpacking and clarifying these boundaries is crucial since the way digital work is defined, recognized, and categorized affects the visibility and value of certain job roles. Without this conceptualization, we risk excluding the digital labour and skills which are shaping the digital economy.

Defining and Categorizing Digital Work

Currently, there is no widely accepted or uniform definition for digital work. Some features that are common across concepts include the use of digital tools to perform tasks, the site of work, the nature of contracts between employers and individuals, and the skills required to perform these tasks.

For instance, Wibowo, Deng and Duan (2022) propose digital work as a ‘work arrangement between individuals and organizations for performing job-related tasks using digital technologies through processing diverse kinds of data from a remote location’ (emphasis added). Orlikowski and Scott (2016) similarly focus on digital platforms, algorithms and data to define digital work practices. Grant & Russell (2020) refer to digital work as ‘work practices undertaken outside the office using digital technologies’. Others like Durward et al. (2016) also bring in digital goods or outputs and define digital work as ‘effort to create digital goods or that makes substantial use of digital tools’. While the **‘use’ of digital and ICT tools remains common across these definitions**, whether it produces digital goods/outputs or not, and the emphasis on data value chains vary. Another important aspect is the **flexibility in digital work and how it is reshaping contractual arrangements between organizations and individual workers** (Kelliher & Anderson, 2009; Galvez et al., 2011; Bader & Kaiser, 2017).

Key Features across Definitions

- Use of digital technology, tools or platforms.
- **Flexible location and timing:** Work is often remote and untethered to traditional offices.
- Changing work relationships between individuals and organizations; use of platforms/apps to organize work
- **Digital skills:** Requirements vary widely from low skill entry to high expertise based on the nature of work.

Given the ubiquitous nature of digital technology today, by focusing on the use of digital tools or work arrangement alone, we risk losing the distinctiveness of digital work. Against this backdrop, how can we draw the boundaries of digital work in ways that help identify emerging opportunities and levers for advancing women’s participation?

Going beyond the use of ICT tools, other categorizations in literature recognize that **digital work exists along a spectrum**, differentiating between the process and outcomes of such work. Ben (2021) identifies three forms of digital work - (1) virtual work i.e. work mediated or enabled via the Internet, with immaterial or digital outputs, (2) digitized work i.e., work that is standardised and partially substituted through digitalisation, and (3) work for digitalisation i.e. work that supports virtual and digitised work e.g., maintenance of physical infrastructures needed for using the internet. This framing further differentiates between digitization as the process of moving information from analogue to digital formats (an example in our case would be Self-Help Group (SHG) members, book-keepers or Bank Sakhis digitizing records of SHG members on National Rural Livelihood Mission’s LoKOS app) and ‘digitalization’ i.e., the process by which digital methods and tools are applied in social, cultural, economic and industrial domains (eg farmers using AI chatbots to access agricultural advisory services). In our context, **both digitization and digitalization are important entry points for women to participate in the digital economy**, even as they are premised on digital access and skills.

Baiyere (2023) similarly categorizes digital work through the dimensions of objective (why does the work exist in its present form), process (how is the work being done) and outcome (what result is the work producing). Using this framework, **he identifies three “shades” of digital work - enabled, engaged, and embedded**, and argues that digital work exists at the intersection of objectives, process, and outcomes, thereby drawing distinctive boundaries around the concept. While these conceptualizations are useful and somewhat complementary, they do not account for the **hybrid and transitional ways in which digital technology is re-shaping work** in, say, the Indian context and the varied and complex ways in which we saw women engaging with digital technologies.

Building on these frameworks and drawing from interviews and consultations conducted under this study with organizations and workers in India, we propose the following categories to understand digital work

Categories

Definition

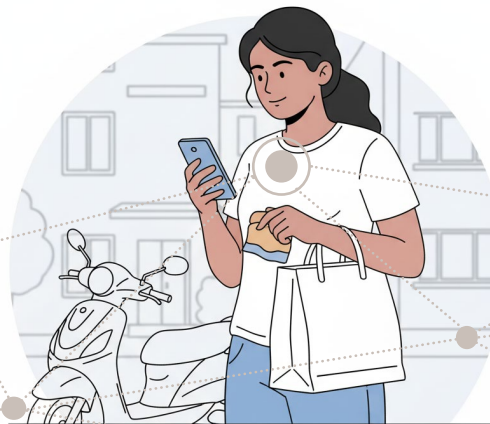
Digitally-enabled Work (digitalized work)

Roles that use digital tools to **access or exchange** traditional work and bring in efficiency or scale.

The digital economy reshapes how work is organized but work output remains physical.

Examples of Roles

- App-based gig workers (eg. Uber)
- Use of digital tools in traditionally analog sectors which are digitalizing - eg frontline health workers (AWW using POSHAN tracker), SHG e-bookkeeping



Digitally-engaged Work

Phygital roles, which involve **creating and maintaining the hardware of digital systems**, through analog processes.

Work exists because of the digital economy, but processes remain physical.

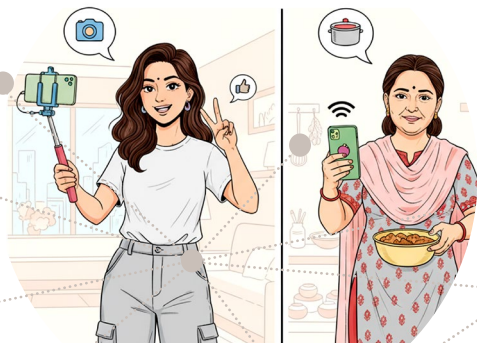
- Hardware engineers creating and maintaining the digital infrastructure
- Agile Coaches UX designers. Chief digital officers
- Assembly line workers and operators in tech & electronics manufacturing



Digitally-embedded Work (purely digital work)

Roles **fully integrated** and performed in **digital environments**, where **both processes and outputs are digital**.

- AI annotation specialists
- GenAI and NLP platforms
microworkers, AI BPO workers
- Software developers (apps, platforms)
- Content creators and influencers



Digitally-augmented Livelihoods (non-digital work)

Roles in which use of digital/ICT tools is **optional** - they **augment livelihoods** but they are **not yet essential** to how work is organized or how tasks are carried out. The final outputs and the work process largely remain unchanged and so the **work itself is non-digital**

-> Entry point to digital economy

- Farmers using AI chatbots to access info/ag-advisory
- Micro entrepreneurs using online platforms to sell produce in addition to offline marketplaces
- Teachers using zoom or Canva in addition to/ to augment classroom teaching



1. **Digitally-enabled or digitalized work:** Digitally-enabled roles involve the use of digital tools to access opportunities for paid work or to improve efficiency and coordination in traditionally physical jobs. The final output that is delivered is not digital. For instance, an Uber driver uses an app to find customers and coordinate rides but their main job still remains physical i.e. driving. The **app improves access, coordination, and efficiency, and has re-organized the way they access work.** Other gig-economy jobs like delivery services or beauty services also fall under this category. Baiyere calls this as digitally-enabled work. However, this example does not fully capture what is happening in some sectors that are rapidly integrating digital tools. In India, for example, community workers such as Anganwadi Workers (AWW) and ASHAs form a significant share of women in India's care economy. While their work output focuses on improving community health and childcare, their workflows now necessitate the use of digital tools such as POSHAN tracker for reporting and monitoring growth metrics and overall program management. This is in addition to their traditional, physical tasks of maintaining registers, conducting door-to-door mobilization, running health campaigns etc. For these workers, digital tools do not replace their usual work but run alongside it. Learning to use new apps and systems means they gain important digital skills, and sometimes, produce digital process outputs (eg, dashboards). **We thus expand digitally-enabled work's boundaries to include job roles within rapidly digitalizing sectors. These roles, which are being re-shaped by use of digital technology, represent critical entry points for women workers to build digital competencies, confidence, and future-readiness.**
2. **Digitally-engaged work or work for digitalization:** This category of work includes job roles that help build or maintain the physical infrastructure necessary for the digital world to function, or oversee digitization processes. Here, on one end of the spectrum are Chief Digital Officers, Agile Coaches, or people overseeing digitization processes. On the other end are blue-collar workers in digital manufacturing, digital waste disposal or server maintenance. In India, for instance, this would include workers who maintain

Graphics Processing Units built under the IndiaAI mission, or engineers working in semi-conductor factories (which are crucial for digital and AI infrastructure) under the semicon India program. Women constitute 12 percent of the workforce in electronics manufacturing in India (PLFS 2022-23), largely concentrated in lower-level positions, such as assembly line workers and operators, with relatively lower wages with less bargaining power as compared to male counterparts. There is potential for women to progress to higher-value jobs in this sector. During our landscaping study, we did not dive into women from low-income or low-resource communities participating in manufacturing or maintenance of digital infrastructure. Nonetheless, these roles could be relevant for moderate to high-skilled women in the future and require further investigation.

3. **Digitally-embedded or Digital work:** In digitally-embedded work (or what we can label as purely digital or virtual work), **objectives, processes, and outputs are all inherently digital.**² For example, roles like software engineers, data annotators, NLP testers, generative AI reviewers and the other forms of “human in the loop” (HITL) work in AI value chains are examples of digitally-embedded or purely digital work as they exist because of the digital economy or technology, use digital tools, and produce digital artifacts.³ Additionally, online content creators and social media influencers, a new category that has emerged in the last decade, is an example of digitally-embedded work as they need social media to do their work (process), produce digital outputs (online content), and the way their work is organized is shaped by digital tools (eg, change in nature of contracts; choice of work and its objective driven by algorithms and logics of virality etc.).

What is non-digital work within digitally-augmented livelihoods?

Some traditional jobs involve the use of digital tools to access information or marketplaces, which are not necessary for getting the work done but serve as a complement. For example, a farmer might use a chatbot or online videos

² Here we actually diverge from Baiyere who distinguishes between digitally-embedded work and purely digital work. He argues that in digitally-embedded work, the ‘objective’ or rationale of the job-role predates digital technology. In our field experience, we saw that even the objective in these digitally-embedded roles and how work is organized is being fundamentally re-shaped by digital technology. And so the distinction between digitally-embedded and purely digital work has collapsed.

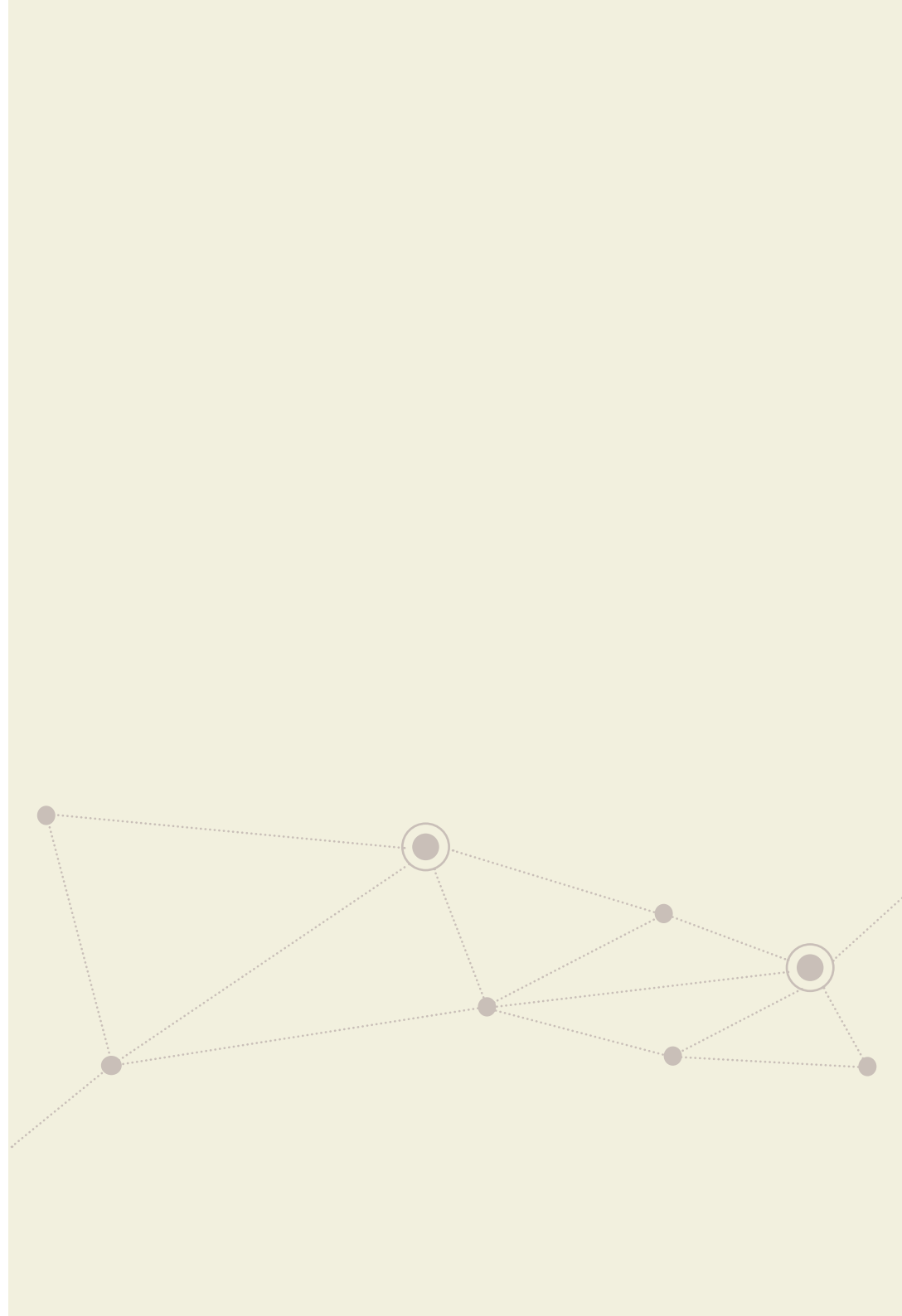
³ Humans in the loop refers to processes that integrate human participation in the operation, supervision or decision-making of an automated system to ensure that digital outputs remain relevant, accurate, and ethically grounded (IBM, 2025).

to access agricultural advisory or an online marketplace to sell part of their produce, but traditional farming itself does not depend on these digital tools; nor does access to advisory and markets. Similarly, a teacher might use digital resources to prepare lesson plans but currently their job largely remains physical or non-digital and can be undertaken without the internet. We call these kinds of jobs **digitally-augmented livelihoods**. Here, using ICT or digital tools is optional. While they help people access information or augment incomes to some extent, they are not yet essential to complete the tasks and are not shaping how work is being organized in its present form. Nonetheless, **they present important gateways for women's engagement with digital tools**.

On the other hand, an AWW using Poshan Tracker to track growth data represents “digitally-enabled” work. In this case, digital skills and tools have become mandatory for her job role, creating digital outputs or artifacts such as MIS dashboard in the process. As digitalization becomes more commonplace in different sectors, more job roles can become ‘digitally enabled’ including teaching and operations, with varying intensity of reliance on digital tools.

The key difference lies in recognising that in digitally-enabled work, digital technology is not optional but has become necessary and a core part of how work is accessed, organised or exchanged, even while the outputs remain physical (Ben, 2021; Baiyere, 2023). What is interesting is that the outputs which are created through digitally-engaged work (e.g. mobile phones, microchips) and digitally-embedded work (LLM models, online content etc.) can feed into existing, traditional livelihood models and augment or enable them digitally. For women to use digital tools effectively, **it is important that tools are built with gender intentionality**, for instance, by accounting for women's language preferences, time constraints, and access to shared devices.

In the subsequent sections, we will dive deeper into women's participation in digitally enabled and embedded categories, with some discussion on digitally-augmented livelihoods as well, as these were the most relevant roles in our field work. However, there is potential for women to participate in digitally engaged roles which should be explored in future studies and interventions.



03. Unpacking Digitally- Enabled Work



KEY TAKEAWAYS

The Landscape: Digitally-enabled Work

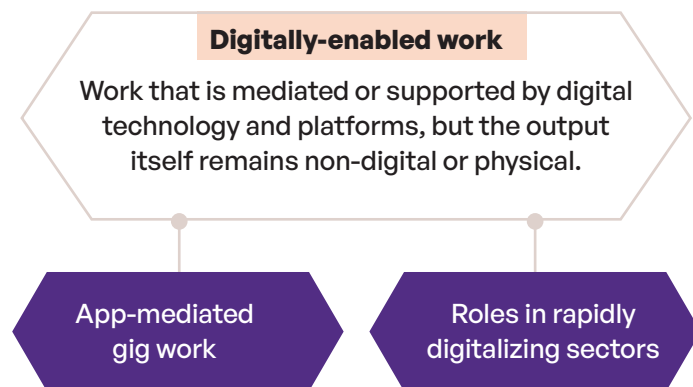
- A growing **employment avenue** that includes **gig and platform work** (~28% gig workers are women) which is more prominent in metropolitan areas and large cities, and **roles in rapidly digitalizing sectors** such as health, education, agriculture, and financial services e.g., ASHAs, Anganwadi workers, SHG bookkeepers, BC Sakhis outside urban centres.
- A **gateway** into the digital economy, offering flexible and accessible work opportunities for women in Tier-2 and Tier-3 towns and rural areas.
- Most women currently participate in low-to-mid skilled roles involving basic digital literacy and routine tasks, or use digital only to access work opportunities. ASHAs for instance have a minimum of 8th std. education.
- **Participation is powered by platforms and markets** (Urban Company, Swiggy, Haqdarshak, ONDC) creating demand for digitally-enabled roles; **large-scale government programmes** (Integrated Child Development Services (ICDS), Ayushman Bharat Digital Mission (ABDM), National Rural Livelihoods Mission (NRLM), NaMo Drone Didi embedding technology into frontline services and livelihoods; and **community institutions** (SHGs, FPOs, cooperatives) that act as bridges. Alongside these, NGOs and private organizations build digital awareness and skills, and connect women to online markets and digital financial services.

Addressing Frictions: Emerging Solutions

- **Targeted smartphone distribution, broadband expansion, and device grants** can be tested to address limited device access and weak connectivity.
- Integrating a broader spectrum of **digital skills into national frameworks** (e.g., NSQF) and expanding **peer-led, job-oriented training with a focus on relevant use-cases** can deepen digital engagement and build career mobility within the digital economy.
- Formally recognising frontline workers as “**digital agents**,” coupled with performance-linked incentives and digital credentials, has the potential to build visibility and address under-compensation of digital labour among ASHAs, Anganwadi workers, and SHG bookkeepers.
- Enhanced **market aggregation, branding, e-commerce support**, and access to digital finance and mentorship can address weak **market linkages** and **build diverse income streams for entrepreneurs and other livelihoods**.

3.1 Women's Participation in Digitally Enabled Work: Opportunities and Trends

As noted in the previous section, digitally-enabled work has often been narrowly associated with app-based gig work in existing literature. **In the Indian context, we expand this category to include rapidly digitalizing sectors where digital tools are becoming integral to how services are delivered, monitored and remunerated.** For many women, especially in tier 2 and tier 3 towns and villages, this is their first and most important entry point into the digital economy. What is also notable is that mobile phones (instead of other digital devices like laptops) are the most important asset required to engage in this work. In this section, we will dive into opportunities and barriers for women in platform-mediated gig work and in digitalizing sectors.



3.1.1. Platform-Mediated Gig Work for Service Provision

- Estimated job potential: 23.5 million jobs by 2029-30, constituting 4.1 percent of India's total workforce and potentially contributing 1.25 percent to GDP (Niti Aayog, 2022)
- Women currently represent ~28% of gig workers, largely concentrated in the low to mid-skilled category (Aggarwal, 2022).

Over the past decade, platform or app-mediated work has seen significant growth in India and globally, driven by digital connectivity, rising demand for flexible work arrangements, and the post-COVID shift in labour markets. This type of work presents an important employment pathway for women in India, by lowering entry barriers: according to one study, 45% of women on platforms had shifted from being outside the labour force to being employed on a platform (IWWAGE, 2025). The flexibility in timing and location accorded by platform-based gig work also allows women to better balance paid work with household responsibilities and address time poverty.

Work opportunities span hub-based and non-hub-based platforms for delivery (Swiggy, Zomato, Dunzo, Porter), transport (Uber, Ola), home and beauty services (Urban Company), and domestic/care work (Babysits, Broomees). However, women are often concentrated in sectors that mirror non-platform

labour segmentation such as care, beauty and are underrepresented in roles involving ride-hailing & food delivery (Aggarwal, 2022). This underrepresentation is shaped by mobility constraints and the requirement of physical assets such as bikes or cars, alongside safety concerns that make such work less accessible for many women (Ghosh et al, 2022). Further, gig work arrangements lack social security and welfare arrangements ILO, 2021; Kathuria et al., 2017; Dewan et al., 2022 Varanasi et al., 2022; Rani et al., 2022; Cook and Rani, 2024). Opaque platform algorithms and performance metrics intensify workloads and penalise women's intermittent connectivity and phone access, availability or mobility constraints, lowering ratings and job visibility (GIZ, 2022; Singh & Murthy, 2023). Policy responses include legal recognition of gig workers through the Code on Social Security, 2020, but more can be done to increase the visibility of gig labour in policymaking (Kar, 2025; Desai & Narayan, 2025, IWWAGE, 2025; Prabhu et al., 2025; Bhargava & Sharma, 2025).

Currently, these opportunities are more prominent in metropolitan areas or bigger cities with higher smartphone penetration, transport infrastructure, and service demand that create the conditions for its expansion. Against this backdrop, our field consultations focused on mapping digitally-enabled roles within traditional sectors in smaller towns and villages, which are otherwise less documented.

3.1.2. Digitalizing Traditionally Analog Sectors

Rapid digitalisation is reshaping sectors such as health, education, and financial services where core tasks remain physical but are coordinated, tracked or transacted via digital tools. Community health workers under ABDM, Anganwadi Workers (AWWs) under Integrated Child Development Services (ICDS) and SHG women are using digital tools (which are increasingly becoming mandatory for data entry, monitoring and decision making), thereby becoming active intermediaries between digital systems and underserved communities, translating technology into accessible services. **Yet the workforce that has made this shift possible remains largely invisible in the discussion of “digital work”.** This includes:

- **Frontline cadres and last mile agents** (ASHAs, ANMs, Anganwadi workers, BC Sakhis, SHG e-bookkeepers, ag-extension workers) who use mobile apps for health reporting, nutrition tracking, financial services, information dissemination, and facilitating entitlement access.

- **Rural women in off-farm or agriculture-allied livelihoods:** Schemes like Namo Drone Didi are training rural women to operate drones for agricultural services, expanding their livelihood options (Gol, 2024; PIB, 2025). Micro-entrepreneurs and SHGs are leveraging whatsapp and social media channels to sell their products. The rise of social commerce and ONDC-linked initiatives has allowed women entrepreneurs to directly sell processed products, seeds, and agri-inputs through WhatsApp Business and other digital storefronts, reducing intermediaries and transaction costs.
- **Public healthcare providers:** Doctors, nurses, and community health workers under ABDM are using digital patient records, teleconsultations, and e-prescriptions to complement in-person services. ABDM dashboard reports ~80.7 crore Ayushman Bharat Health Account (ABHA) IDs and ~71.8 crore linked health records embedding e-records and scheduling into frontline tasks (ABDM, 2025).

A parallel shift is underway in **agriculture**, where women constitute the backbone of India's rural workforce. The ongoing digitization of the sector is progressively expanding access to digital infrastructure, ICT tools, and data-driven advisory systems with national initiatives such as the Digital Agriculture Mission and the National e-Governance Plan in Agriculture (NeGPA), along with several state-level programs. Women farmers are now accessing AI-based crop and weather advisories through platforms such as Kisan Suvidha and Digital Green's FarmerChat, which deliver real-time, localized guidance in regional languages. These applications simplify information flows and support evidence-based decision-making on sowing, pest management, and input use (Digital Green, 2024; FAO, 2023). Insights from user experience studies and process assessments of FarmerChat indicate high satisfaction and strong engagement by smallholder farmers in Bihar owing to utility, convenience, detailed guidance, timely advice, and reliability. Active users reported taking tangible actions based on advisories, primarily in pest and disease management, fertilizer use, livestock care, and organic pesticide preparation (Digital Green Internal Reports, 2025). This digital integration can also redefine women's roles in farming by equipping them with timely information and advisory enhancing providing them with greater agency, confidence, and recognition, and its adoption is currently being piloted with women FPOs in Bihar and Odisha, with early signals of promise (Field consultations). Digitization is also transforming the post-harvest and

market linkage ecosystem. Platforms such as eNAM (Electronic National Agriculture Market), DeHaat, AgroStar, and AgriBazaar are connecting women producers, SHG members, and FPOs with buyers and logistics partners, improving transparency in price discovery and market reach.⁴ Similar patterns are emerging in the **education sector**, where teachers are integrating digital platforms such as DIKSHA (Digital Infrastructure for Knowledge Sharing) to supplement classroom teaching. We categorize these roles as **digitally-augmented livelihoods** since even though digital tools augment some aspect of the livelihood, they remain optional add-ons.⁵ These augmented roles act as **gateways** for women's engagement with technology. The work process is not fully digital or digitally-organized, but repeated exposure to mobile applications, online platforms, and ICT tools builds confidence, digital familiarity, and pathways for women to explore deeper integration of digital tools in their livelihoods or transition into digitally-enabled roles.

3.1.3. Skills and tasks within digitally-enabled work

As traditional sectors digitalize, the skill-sets required for job roles under them are also evolving. The skills required for digitally-augmented and digitally-enabled roles now range from basic smartphone use and navigation to using GPS/maps, cataloguing, filling forms, and compiling and uploading data. The following table provides an indicative mapping of digitally-enabled work opportunities, corresponding digital skills and key organizations under this work category.

Digitally-Augmented Livelihoods

Digitally-augmented livelihoods include traditional or analog work models where digital tools are used as supportive aids, but not essential to completing the core tasks. These roles remain primarily analogue in nature, with technology acting as a supplement rather than an integrated requirement.

⁴ Studies indicate that women-led FPOs integrated with eNAM report 18–25 percent higher price realisation and increased participation in marketing decisions (Samadder et al., 2023; Paul et al., 2024).

⁵ DIKSHA has ~182.3 million enrolments and ~145.7 million completions, entrenching blended teaching and digital content workflows (UNESCO profile, 2025; DIKSHA portal).

Work Streams	Core Tasks (examples)	Digital Skills Needed	Examples
Community Data Capture by Frontline Workers	Household surveys; child nutrition recording; farm plot surveys; beneficiary registrations;	Smartphone basics; form filling; photo/ID capture; GPS/time-stamp; consent & privacy	Government - ICDS/Poshan Tracker, State survey programs
Service Delivery with Apps (Gig work)	Update job status; appointment booking; visit logging; e-prescriptions handover	App navigation; map use; OTP/UPI basics; customer communication; digital payments	Urban Company (beauty/home services), Uber drivers, e-health pilots, Common Service Centers (CSCs)
Market Access & Payments	List products; respond to orders on WhatsApp; deliver and collect payments	Messaging & cataloging; digital payments; basic record-keeping	NRLM, SHGs, WhatsApp Business shops
Onboarding/KYC & Case Processing	Capture ID documents, verify eligibility, process claims	Form filling, document verification, basic compliance	Haqdarshak, BFSI partners, Anaxee (on-ground data)
Reporting & Coordination	Populate dashboards, compile weekly/monthly reports, coordinate updates	Data compilation, formatting, sharing via email/cloud	NGOs, government programs

3.2 Observed Work Models and Organizational Landscape

Our field visits and stakeholder consultations focused on rural and non-metro settings, engaging closely with organizations directly serving low-resource communities, most having a mandate for digital inclusion, often with a strong focus on women. The digitally-enabled work ecosystem can also be understood via demand, supply, and enabler categories:

▲ Demand side: Digital platforms and government programs create demand for digital-enabled services. Examples include ICDS, Urban Company	Supply side: Gig workers, women in SHGs and FPOs, frontline workers, and rural entrepreneurs form the workforce	Enablers: NGOs (Digital Empowerment Foundation, PRADAN, Sajhe Sapne), job platforms (Apna, JobsForHer, Sheroes), and training providers (Gram Vaani) support skilling and inclusion.
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Typically, these organizations operate in sectors which are in a transitional phase i.e. undergoing rapid digitalisation, offering and facilitating both digitally-augmented and digitally-enabled roles, depending on how integral the use of digital tools is to the work.

Key support offered by such organizations includes:

- **Introduction of digital tools into community-led models** to equip SHGs, frontline government and extension workers such as ASHAs, ANMs, and agricultural extension staff with digital tools for livelihood support or work enhancement. For example, community-centered IVR platforms to capture demand or access information (eg, Gram Vaani), AI-powered or video-based advisory (Digital Green), e-bookkeeping for SHGs, etc.
- **Awareness and skill-building trainings**, including foundational digital literacy and new concepts like AI modules within broader programs (Vayam by Sambodhi) and job-oriented digital skills training through partnerships (Anudip Foundation, Calcutta Foundation).
- **Market access, financial services, and entrepreneurship support** for rural women via digital linkages (Gram Vaani, PRADAN) and platforms connecting job seekers to employers (Apna).



Gram Vaani

- an enabling tech platform

Gram Vaani is a social enterprise founded in 2009, known for creating voice-based media platforms that empower underserved communities across India. Its flagship initiative, Mobile Vaani, is a social media platform using a network of IVR services accessible via basic phones, enabling users of varying literacy in rural areas to access, record, and share audio content in local languages. Operating in more than 120 districts across 20 states, Mobile Vaani has reached over 5 million users and supports 12 regional languages.

The platform is enabling a spectrum of digital work:

Digitally-augmented livelihoods: In the field locations we visited in Uttar Pradesh, women are using Gram Vaani's digital and mobile platforms to augment their existing livelihoods by accessing agricultural advice, business queries, seeking and sharing information, and marketing. Coupled with training and community mobilization, use of these platforms is contributing to women's confidence in using digital tools.

Digitally-enabled work: Local facilitators at Gram Vaani help communities navigate welfare programs, connect with frontline service providers, and share verified updates within their networks, access entitlements, and provide contextual information, using Mobile Vaani platform. Gram Vaani has also launched tech-based innovations like Tika-Vaani to bring in efficiency in frontline workers' workflows using digital tools – thereby facilitating digitally-enabled work.

Digitally-embedded work: Mobile Vaani gathers & disseminates information about health, nutrition, agriculture, livelihoods, financial services, and government programs, and fosters dialogue by letting users share experiences, questions, and concerns via voice messages on their community platform. A team of local content moderators and technical staff (can be categorized as digitally-embedded workers) monitors & manages the platform and messages received and publishes them based on relevance.

3.3 Frictions and Emerging Solutions

Digitally-enabled roles and platform-based gig work have created new opportunities for workers, including for women, and there are promising solutions and partnerships that are beginning to emerge on the ground. However, this is accompanied by a set of challenges and risks which need to be addressed:

(i) Addressing Fragmented Device Access and Poor Connectivity: As noted earlier, for digitally-augmented and enabled roles, mobile phones, preferably with internet connectivity, are the devices needed to access information or opportunities opened up by the digital economy. However, even as smartphone use is rising, women lag men in ownership and sustained access, leading to shared access, limited privacy and control. These barriers were validated during our field work as well.

→ **While the national government has been working to improve last mile connectivity (through BharatNet project, Common Service Centres),** some states are **addressing this through targeted smartphone distribution and broadband connectivity initiatives.** For example, the Jharkhand government has distributed smartphones to Anganwadi workers and supervisors. In Bihar, laptops and smartphones have been provided to multiple Bank Sakhi outlets to enhance digital governance and inclusion. Some organizations like Chambal Media (a women-led rural digital media social enterprise) have secured funds for device distribution in rural areas for its journalists and content creators (Field Consultations).⁶

(ii) Defining skill progression and career pathways: In our field work, we found women consistently citing self-doubt with respect to smartphone use. Thus, smartphone ownership on its own is not enough.

Currently, 22 government schemes and initiatives, including flagship schemes like PMGDISHA and PMKVY 4.0 are providing foundational digital literacy skills such as using smartphones, searching on Google, or setting up email. Organizations like PRADAN, Sajhe Sapne, and Gram Vaani are offering **hands-on training on basic digital skills in rural areas to women on navigating apps and using email.** Nava Data and its training arm - Calcutta Foundation, introduces digital training to women by first encouraging practice on paper based prototypes (Field Consultations).

However, women in digitally-enabled work roles handle complex digital tasks as part of their jobs and face significantly **higher skill thresholds:** for example, SHG book-keepers must manage mobile bookkeeping apps, record transactions, and troubleshoot errors. ASHAs and AWWs often report that they input data mechanically without fully understanding the system or benefitting from performance analytics (Thakur et al., 2025; Scott et al., 2021). Drone operator roles under the NaMo Drone Didi scheme aimed at SHG women, require technical training and handholding on flight mapping, safety, and maintenance. And yet, most digitally-enabled roles **only include a foundational digital literacy training.** Moreover, progression pathways to advanced digital skilling and corresponding careers remain fragmented.

The digital skills required for digitally-enabled roles need to be clearly mapped in existing skills frameworks. Current job roles in National Skills Qualification Framework (NSQF) for example do include modules on computer literacy, data entry, customer service, and digital financial literacy, particularly in domains such as IT-ITeS, BFSI, healthcare, and retail.⁷ These provide some overlap with the skills observed in digitally-enabled work, which are task-specific (e.g., using apps for nutrition reporting or logging service visits), digital in nature (e.g., smartphone handling, digital payments, document uploads), and often learned informally on the job. However, **NSQF does not yet systematically capture the breadth of task-based, low-to-mid skill digital competencies that have become essential in frontline services, community data collection, market access, and app-mediated service delivery.** Our consultations also highlighted the necessity of a shared vocabulary to define and recognise different forms of digital work, helping align skills, roles and opportunities within policy and skilling frameworks.

An FPO Director in Bihar for example lamented - “hum thodi na chala paayenge,” (we won’t be able to run it”) despite owning a smartphone.

⁶ The long-term effects of these solutions on narrowing the gender digital divide remain to be seen. According to one study, smartphone distribution without accompanying use cases and digital skilling can offset early gains in the long term (Barboni et al 2024)

⁷ NSQF is a competency-based framework launched by the Ministry of Skill Development and Entrepreneurship, It organises qualifications according to levels of knowledge, skills, and aptitude, ranging from Level 1 to 10. Each level specifies outcomes in terms of learning, professional knowledge, and responsibility. The NSQF serves as a national reference point for curriculum design, skill certification, and career progression pathways, enabling both horizontal and vertical mobility for learners and workers. Designed as a cross-sectoral framework, NSQF can be applied in any sector with the same underlying levels used to classify different roles.

→ **Defining clear skills progression across these roles can help build pathways for women to move deeper into the digital value chain.** Organizations like Vayam (arm of Sambodhi) have piloted an AI module integrated into foundational skills programs in regions like Rajasthan, Uttar Pradesh, Chhattisgarh, and Odisha. A job platform, Apna has developed an AI-based “job prep” tool to offer career guidance, mock interviews, and track-based roles. Media organizations like Chambal Media and Pluc.TV offer focused, job-specific training such as video production or digital journalism. While commendable on their own, how do these modules and initiatives translate into a woman’s digital skills journey and career pathway remains unclear. Learnings and gains from these initiatives need to be documented to understand how this can be scaled up.

(iii) **Formalising and recognising the dual roles played by digital agents:** Current labour surveys (eg PLFS, NSSO) classify workers by industry (e.g., education, agriculture), but do not capture the “digital layer” of their roles. For example, a schoolteacher using DIKSHA, an ANM doing digital health reporting, or SHG women running WhatsApp supply chains all remain statistically invisible. Their digital work is not recognized or counted as a value-add. According to one study, ASHA workers who are mandated to use digital tools to improve efficiency and transparency have to perform extra tasks without commensurate pay or recognition (Sreerupa et al., 2024). These workers are thereby performing dual roles - they continue their core care or service delivery duties while also acting as digital agents, entering data in health apps, managing digital records, facilitating online payments or reporting through various government dashboards. The burden of extra tasks is compounded by low wages and domestic or care responsibilities. This lack of visibility limits access to incentives, future roles, and public recognition—key factors in retention and motivation.

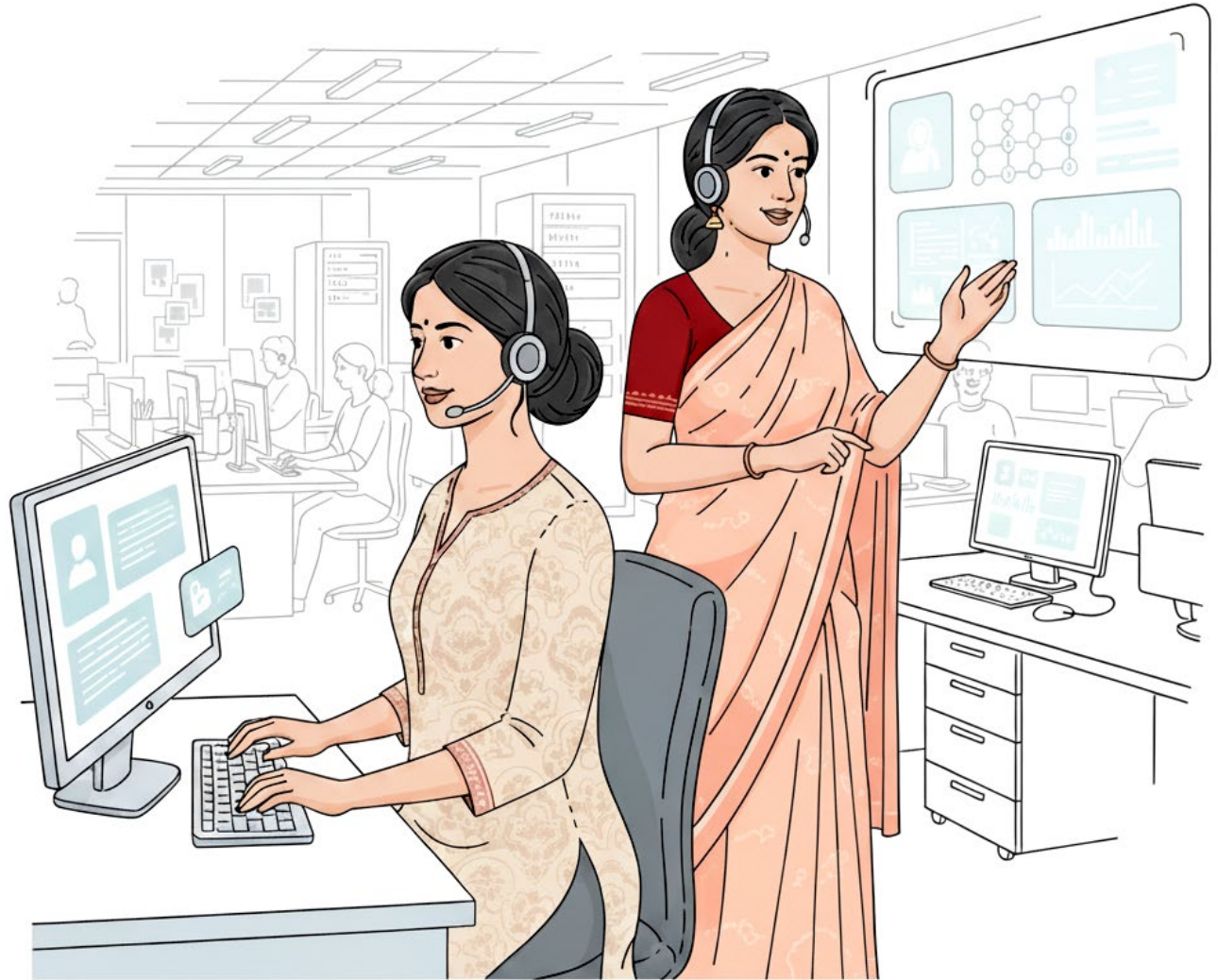
→ **Formal recognition of these roles as digitally-enabled work** (and correspondingly, recognising community care workers as “digital agents” or “smart ASHAs”) **would correct these blind spots and introduce incentive mechanisms such as performance pay and digital credentials.** It could also potentially strengthen the policy case for fair compensation, structured skilling and social protection including health coverage, pensions and minimum wage, ensuring the skills gained from digitalisation are not built on unpaid or underpaid labour (ibid).

(iv) **Building market linkages and enabling economic mobility especially for digitally-augmented livelihoods:** Many digitally skilled women struggle to connect to reliable markets or monetise their work. Women-led enterprises often list products on WhatsApp or ONDC, but struggle with higher-skill tasks such as product photography, cataloguing, packaging, pricing, and customer engagement—leading to low conversions or inconsistent sales (Chakladar, 2025). These entrepreneurial roles sit at the intersection of digitally-augmented and enabled work right now, where digital tools are opening up avenues for digitally mediated opportunities, but are not integral yet.

In one field location in Uttar Pradesh where women kirana shop owners had just begun using digital tools for their businesses (digitally-augmented livelihood), reported only using WhatsApp to share product images with customers or coordinating orders and not being confident to use UPI for financial transactions.

→ **What is needed is investment in branding, aggregation, and digital market navigation, so that women move away from low-value, high-friction tasks.** To achieve this, e-commerce and online trading platforms must build dedicated market linkages and visibility by creating specific tags or categories to spotlight women-led grassroots enterprises, supported by regional non-profits for onboarding. Such platforms could also offer continuous mentoring and follow-up support, establishing dedicated teams to train sellers on advanced skills such as digital marketing, tracking sales, and optimizing visibility algorithms (Chakladar, 2025). This support is critical in agriculture, where women farmers and SHG members need to be equipped with digital fluency and access to pricing tools to engage confidently on platforms like eNAM (Samadder et al., 2023; Paul et al., 2024).

04. Unpacking Digitally- Embedded Work



KEY TAKEAWAYS

The Landscape

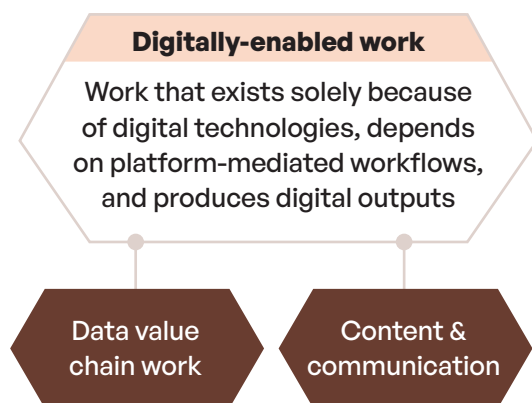
- Digitally embedded work is emerging as a significant employment avenue, given the data annotation and AI boom. Opportunities are concentrated in Tier-2 and Tier-3 cities; 80% of data annotators are from non-metro regions (Nasscom, 2021).
- Women comprise 40-50% of entry-level workers in AI BPOs, and are twice as likely to participate in remote platform work compared to equivalent office jobs. While women are well-represented in entry-level roles that require minimal training, **participation declines sharply in more technical and managerial roles**, with high attrition rates.
- Mapping digital work to NSQF levels** shows potential **career progression** within the data value chain: from entry-level roles such as data collection and basic annotation to intermediate (quality checks, detailed labeling) and advanced roles (data validation, supervision).
- Digitally embedded **content creation** (including vernacular and multilingual formats) or digital entrepreneurship (for example, social e-commerce, YouTube, Instagram) offer new forms of digital agency and visibility. **Over 2 million** monetized content creators in India now influence **USD 350 billion** in consumer spending.
- A fragmented landscape of organizations:** AI-focused Data BPOs (such as iMerit and NextWealth) have built structured annotation pipelines and equitable hiring practices that anchor women in AI data value chains, while generalist BPOs (such as TCS and Genpact) continue to provide entry level roles that act as stepping stones. Managed and open labour platforms such as Taskmo, Shaip AI, Appen, Amazon Mechanical Turk (MTurk) are expanding flexible opportunities but vary in terms of job protections and pay. Several NGOs and intermediary organizations (such as Anudip Foundation) bridge digital literacy and access gaps through localized training and on-ground mobilization. Lastly, creative organizations (such as Pluc.TV and Chambal Media) extend digital work to storytelling and multilingual content creation, enabling women to monetize skills and visibility beyond traditional data tasks.

Addressing Frictions: Emerging Solutions

- Introduce transparent and structured skilling programs and career progression pathways for women workers in data value chain work, guided by a common, validated digital skills framework and interoperable credentialing system
- Ensure minimum pay standards, clear simple contracts with benefits, flexible work, clear and independent systems for reporting and resolving worker grievances, and policy and training measures to combat exposure to online harms, fraud, and unsafe content.
- Ensure a human management layer and transparency in algorithmic management
- Address intersectional, normative barriers and the underlying gender digital divide by leveraging community members and gatekeepers to build trust and building local/community level digital hubs to access digital infrastructure.

4.1 Women's Participation in Digitally Embedded Work: Opportunities and Trends

- The data annotation and labeling market is valued at USD 6.5 billion as of 2025 and projected to reach nearly USD 20 billion by 2030 (Mordor Intelligence, 2025).
- India's AI market is projected to grow from USD 7–9 billion in 2023 to USD 17–22 billion by 2027 (NASSCOM–BCG, 2024).
- As of 2021, India is the largest contributor to online labour globally (ILO, 2021a).

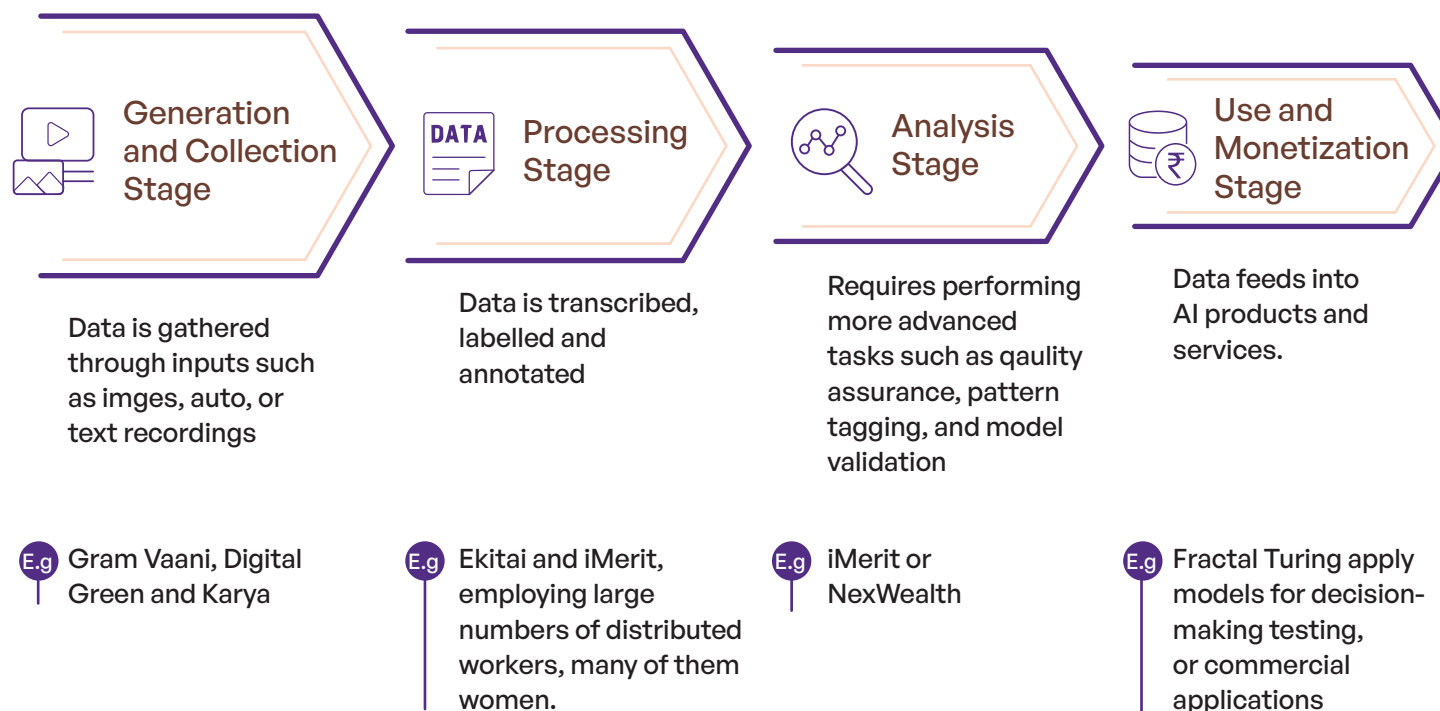


Digitally embedded work is emerging as a significant employment avenue globally, even as estimating the exact number of digitally-embedded workers is a challenge due to non-disclosure by many digital labour platforms. In India, the boom in AI/data value chain-based work is facilitated by a rapidly growing AI ecosystem, buoyed by advancements in computing capacity, innovation centres, India-specific datasets, AI education, and startup funding. Initiatives such as the India AI Mission, have established over 30 AI Labs in Tier 2 and 3 cities to foster technology-driven livelihoods, with varied emphasis on women's participation.

The importance of this category of work was realised in our fieldwork, where a notable share of women were found to be engaged in data value chain related job roles in tier 2 and tier 3 cities. Industry evidence suggests that 80 percent of India's data annotation workforce is drawn from non-metro regions (NASSCOM, 2021), and that women already make up 40–50 percent of entry-level workers in several AI-focused BPOs (Field consultations). This pattern demonstrates both the accessibility and the appeal of digitally embedded work for women from resource-constrained and low-income contexts, as it provides remote or community-centered employment options that align with their mobility constraints and care responsibilities. Some studies show that when offered remote platform work, married women in low-income urban households are more than twice as likely to participate compared to equivalent office-based jobs, even when childcare facilities are provided (Ho & Jalota, 2024).

4.1.1 Data Value Chain Work In Digitally-Embedded Work Models

A significant category of digitally-embedded work undertaken by women involves microtasks performed in the AI/ML chains (i.e. humans training AI models) and in production and processing of data. The data value chain (DVC) provides a framework to understand the life cycle of data, from defining a need to using it for impact. It organizes how raw digital inputs are collected (through various connected devices, platforms, sensors), cleaned, labeled, curated, and transformed into insights for AI models and analytics (Curry, 2016). At each stage of the DVC (generate → collect → process → analyse → use/monetize), human interface or intervention is required:



Entry-Level (High Participation)

Features: Low complexity, low pay, minimal training

Demographic: Women and men in rural/small-town contexts

Education: Minimal or no education or age requirements for data generation

Intermediate-Level (Moderate Participation)

Features: Moderate complexity, better pay, requires digital & problem-solving skills

Demographic: Young graduates mainly from non-metro cities/towns preferred

Education: High school preferred for annotation. Skills Barriers begin to emerge

Advanced-Level (Low Participation)

Features: High complexity, high pay, specialized expertise

Demographic: Experts with technical specialization

Education: Software engineering or equivalent. Barriers in retention and leadership pathway

Women's participation funnels as task complexity and specialisation increases.

Digitally-embedded work is thus integral to data value chains, as it provides the distributed human labor—through BPOs, platforms, and in-house teams—that powers tasks like annotation, curation, and feedback essential for AI/ML systems to function at scale. These roles, often grouped as human-in-the-loop (HITL) work, are central to building robust AI systems (Heeks & Spiesberger, 2024; Gupta et al., 2024). While automation is advancing in some areas, human workers remain indispensable for ensuring accuracy, identifying exceptions, and correcting errors. **Not every stage of the chain strictly qualifies as digitally embedded work, yet most are classified as such because they directly contribute to building deeply digital AI/ML models and require a digital interface or tool.** Consultations and fieldwork also show that tasks frequently overlap, and discrete bucketing is difficult in practice.

Women, especially in rural and small-town areas, have strong entry points in the DVC at entry-level roles like language data generation and basic annotation, which require lower education and training. However, their participation decreases as tasks become more technical and better paid. Intermediate stages, like QA and validation roles need STEM graduates with stronger digital skills, while advanced supervisory and ML engineering roles demand specialised expertise and offer the highest pay but see low female representation due to skill, retention, and leadership barriers. This shows the DVC's accessibility at entry but highlights structural gaps hindering women's progression.

4.1.2. Digitally-embedded Content Creation and Communication Roles:

- There are over 2 million monetised content creators in India, collectively influencing more than USD 350 billion in consumer spending (Jain et al, 2025).

Digital content creation and entrepreneurship roles present another emerging opportunity, with women taking up unconventional roles such as social e-commerce resellers, content creators on YouTube and Instagram and mobile **journalists**. These roles highlight the promise of digital agency, social media, and new forms of visibility and income. While this sector was initially dominated by younger, urban creators, participation is now diversifying across age groups and geographies, with beauty and fashion emerging as leading categories.

Our field consultations revealed women leveraging social media platforms to generate income through authentic, multilingual content. For instance, Pluc. TV supports women to monetise creative content across multiple formats and languages, while Chambal Media has trained women as mobile journalists to report, produce, and disseminate local news, enabling them to independently select storylines that amplify underrepresented voices.



Chambal Media: *From digitally-enabled to digitally-embedded work*

Chambal Media was established in 2015 as a women-led, rural digital media social enterprise, building on its flagship network Khabar Lahariya (founded 2002). It operates across Uttar Pradesh, Madhya Pradesh, Chhattisgarh, and Bihar, with more than 600 women trained and a record of less than 10 percent dropouts (as on Oct 2025).

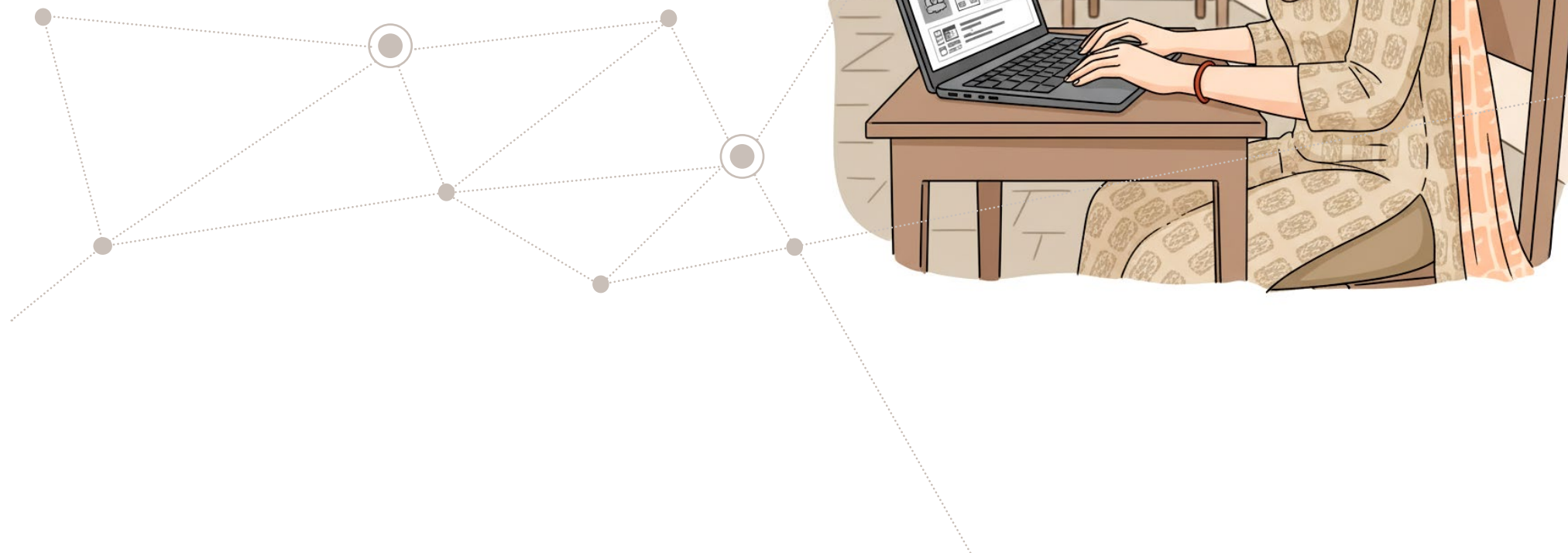
» Chambal Academy trains women and girls in mobile journalism, digital media, and reporting through hybrid courses, offering digitally-enabled work opportunities (i.e. using digital tools to access & execute traditional work like journalism). The academy actively tackles barriers like device affordability, digital safety, and mobility by providing devices, embedding digital safety toolkits, and designing flexible, context sensitive curricula.

» Chambal Media employs a network of women mobile journalists, many of whom are alumni of the Academy. Their primary journalistic role, rooted in the original Khabar Lahariya print model, involves in-person fieldwork including conducting face-to-face interviews and on-ground reporting and research. However, networked digital tools like smartphones have become indispensable to their work to record, edit, and produce stories. The news stories themselves are now distributed through social and digital media platforms such as YouTube and Facebook. The final output (i.e., digital content) shaped by the logics of modern digital media, including virality, social sharing, and subscriber engagement—makes both the process and the product fully digital, exemplifying a fast-evolving digitally-embedded model.

Despite this promise, women content creators continue to face significant risks. Studies highlight high levels of online harms and reputational risks—including harassment, trolling, abuse, and hate speech—that directly affect women’s safety and mental health (Tewari & Mehendale, 2023). These barriers limit their ability to sustain long-term engagement and sustainable growth in the sector.

4.1.3. Skills and Tasks Within Digitally-embedded Work

In India, workers engaged in microtask opportunities across the AI data value chain predominantly consist of young, college-educated individuals who live in non-metro regions of the country (Tapia et al, 2023; field consultations). However, the lower end of the DVC, with lower skills thresholds, is attracting women from smaller towns and rural areas as well. The following table illustrates the spectrum of digitally embedded work profiles, ranging from entry-level microtasks like transcription and annotation to advanced roles in product and engineering. Each step reflects progressively higher skill thresholds, showing how women can move from basic digital tasks toward more complex and rewarding opportunities if clear pathways and sustained skilling support are in place.



Work Streams	Core Tasks (examples)	Digital Skills Needed	Examples
Transcription & Translation	Household surveys; child nutrition recording; farm plot surveys; beneficiary registrations;	Smartphone basics; form filling; photo/ID capture; GPS/time-stamp; consent & privacy	Government - ICDS/Poshan Tracker, State survey programs
Annotation & Labeling	Update job status; appointment booking; visit logging; e-prescriptions handover	App navigation; map use; OTP/UPI basics; customer communication; digital payments	Urban Company (beauty/home services), Uber drivers, e-health pilots, Common Service Centers(CSCs)
AI Output Review & Prompt Testing	Score chatbot/AI answers, test unusual cases	Critical thinking, basic AI tool familiarity	Toloka, Appen
Data QA & Curation	Validate datasets, remove duplicates, enforce labeling rules	Data cleaning tools, guideline interpretation	AI BPOs, internal data teams
Analytics Support	Spot trends, calculate metrics, make simple visuals	Excel/Google Sheets, basic data viz	Fractal Analytics, Tredence
(Advanced) Product & Engineering	Write code, build data pipelines, evaluate models	Python/SQL, version control, ML basics	Tech firms, AI startups

4.2. Observed Work Models and Typologies

We engaged with organizations operating in rural and non-metro areas offering two main types of embedded work: AI data services and online content creation.

• AI Data Services:

- **AI data annotation & labeling:** Workers tag images, audio, or text to train machine learning datasets, with demand from big tech, startups, and educational institutions. Organizations like NextWealth, iMerit, DesiCrew (AI BPOs), and NGOs train women and youth, providing structured annotation pipelines and inclusive entry points.
- **Indic language data generation:** Rural and peri-urban workers contribute speech and text datasets in local languages for AI. AI BPOs and startups (like Ekitai), and data platforms (Karya) actively recruit participants from these regions, while civil society organizations (Digital Green and Vayam (Sambodhi)) and training institutions (Calcutta Foundation, Anudip Foundation) facilitate AI-focused training and information services, and educational institutions employ students for collection work.
- **Content creation in vernacular media:** Small-town and rural content creators, such as fashion and beauty influencers produce and monetize vernacular content. Platforms like Pluc.TV mobilise, train, and connect creators to brands for paid gigs, while social media companies support monetisation and provide digital creation tools.

In terms of geographical location and distribution, our consultations suggest that digitally-embedded workers, especially for AI-based microwork, are largely based in the non-metro areas (tier 2 and tier 3 towns and peri-urban areas) of the country, owing to availability of tech-literate population - a finding consistent with NASSCOM estimates (2021) and global evidence. Some organizations that we consulted have a mandate for gender-equitable hiring as an institutional policy or as a client mandate for training AI systems (See Shaip's case example below). At times, clients require diverse datasets that reflect gender, age, and other demographic variations, driven in part by the growing recognition that AI systems could amplify existing gender biases in society. Language service providers working with the Indic Language LLM models often recruit

women skilled in local languages and dialects from rural areas of the country through established community networks such as SHGs and local NGOs. These partnerships help onboard women from low-resource settings into the digital work ecosystem. AI data services/data value chain work thus offers an important scalable work opportunity for women with moderate levels of education in non-metro towns and rural areas.



Shaip: Providing AI data services

Shaip, established in 2018, has emerged as an equal opportunity leader in AI data services by offering a broad spectrum of data solutions including licensing, collection, annotation, de-identification, and generative AI across sectors like healthcare, automotive, BFSI, retail, and geospatial. What stands out is its commitment to inclusivity and remote first operations in Gujarat, with a workforce of over 600 comprising youth, women returning to work, and gig contributors engaged through both full-time and flexible, task based models. With women representing 49–58% of the staff, Shaip's gender inclusion strategy leverages collaborations with local NGOs such as Mahila Utkarsh Foundation and Grameen Pragati Yojana. These partnerships help onboard women from low resource settings, providing access to essential tools, training (via the Discord-based Shaip Academy), and rental devices for workers facing tech barriers.

Practices such as gender balanced recruitment, referral partnerships with women-focused NGOs, and a mobile-first work environment using tools like the Shaip Work app and Bhasha transcription platform to bridge device access gaps enable an inclusive structure. Women participate extensively in multilingual data collection and annotation processes across various media formats, contributing to the early stages of AI data value chain. While Shaip's hybrid work model and embedded training open up new income streams, certain gaps persist. Norms around female mobility, limited digital literacy, and prevailing attitudes can still make participation challenging, with client mandates for gender balance sometimes difficult to meet. For many women, digital data work is viewed as supplementary income rather than a stable livelihood, indicating the need for more accessible upskilling pathways and attitudinal shifts for sustainable inclusion.

Typology of Organizations Offering Digitally-embedded Work

In India, AI/data value chain work is delivered through a variety of institutional models, each with distinct structures, workforce profiles, and implications for women's participation. These models range from traditional BPOs to newer digital platforms and in-house corporate teams, reflecting both the legacy of India's outsourcing industry and the growing demand for AI data services. Drawing on the insights from literature and our field, we have derived the following typology, based on the type of the institution providing AI work.

Institution Type	Description	Future Potential	Examples
Generalist BPOs	Large firms offering voice, form-filling, admin and documentation work	Expanding WFH formats can boost rural inclusion	TCS, Genpact
AI-specific Data BPOs	Do high-quality AI-related tasks like speech tagging, image labeling, QA	Fast-growing; great opportunity to build inclusive AI supply chains	iMerit, Sama, NextWealth, DesiCrew
Open Platforms	Anyone can join and do basic microtasks like tagging or survey filling	Easy entry; but low pay and little protection	MTurk, Appen
Managed AI Data Platforms	Structured onboarding, slightly better task quality, some training/support	High potential for rural gig inclusion if support improve	Taskmo, Awign, Pluc.TV

- Generalist BPO:** The traditional Generalist BPOs act as a single supplier for batch-based tasks, where processes can be monitored digitally and by human quality assurance agents (examples include Wipro and TCS which provide back-office support). The workers in the BPO model are full-time salaried employees with social security entitlements or contractual labour recruited for specific projects. The youth talent in this model has a gender composition of ~30-40% women (Raghuram, et al., 2017). Industry insights reveal that the Generalist BPO models are under pressure, as labor-intensive roles are rapidly getting automated and shifting to the AI economy. The model could be important for women's entry into the digital economy, but its future depends on adaptability and inclusion efforts.
- AI-specific data BPOs:** AI specific data BPOs are similar to Generalist BPOs but cater to complex AI data needs. The bulk of demand for AI work comes from the Global North supplemented by Indian AI startups and government institutions. Examples include Samasource, Cloud Factory, and Indian BPOs like Nextwealth (see case example 2), iMerit, and DesiCrew. While the core workstreams are primarily AI-focused, 5-10% of the workforce is allocated to non-AI digital roles such as IT service and support, content moderation, and financial services. They are headquartered in metro cities and distribute work through centers in small towns or rural regions to leverage a cost-effective, skilled workforce. In our field work we found that while some AI platforms engage workers with varied educational backgrounds, including high school graduates and students for lower-order tasks such as voice recording and basic annotation, AI BPOs often prefer fresh graduates with proficiency

NextWealth: AI BPO with women workforce

NextWealth, a BPO established in 2009 which has now transformed to an AI BPO operates a decentralized, entrepreneur-led model that focuses on creating employment for graduates in small towns of India with a special emphasis on women. It employs local entrepreneurs to establish delivery centers, fostering community ownership and accountability. The company's approach emphasizes high-quality, efficient, and client-centric AI/ML data services, including data annotation, content moderation, and generative AI tasks.

A key aspect of NextWealth's model is integrating women into their workforce; approximately 52% of employees are women, with efforts aimed at increasing participation further. They provide structured training programs and supportive policies such as transportation, flexible work options, and family engagement activities to enable women's sustained involvement. NextWealth focuses on local hiring, community trust-building, and inclusive work environments which has resulted in high female workforce participation and upward mobility across roles. For more details, See Annexure B.

in English and possibly specific Indian languages. For instance, one AI BPO we consulted with recruited their employees from engineering and science colleges in the vicinity, and required English comprehension skills and system knowledge, which could create barriers for women from low-income backgrounds. Even so, according to some estimates, AI BPO model workforce has at least 50% female employees (Hung, 2024). However, our field interviews reveal that the attrition rates of women workers in AI BPOs are quite high, and the average employment tenure is 2-3 years. An executive member of an AI BPO noted, “although women comprise 40-50% of our workforce, only 25% hold leadership positions.” Career breaks among women post-marriage or maternity were frequently noted, corroborating literature on the underrepresentation of women in leadership positions in this sector

(Raghuram, et al., 2017), and the non-linear ways in which women engage in the workforce. While these firms are critical in building inclusive pipelines for AI work, they need stronger retention and leadership pathways for women.

- **OpenOnline Labour or Open Services platforms:** OpenOnline labour platforms like MTurk that aggregate labour emerged as another predominant labour engagement model. They hire on-demand workers to complete ‘fragmented work’ or ‘micro tasks’. They mediate a range of work, including but not limited to software development, creative work, writing, data entry, sales support, and professional services. Among the estimated 435 million

online gig workforce worldwide, about one-fifth (16.5%) work exclusively on AI-related microtasks (Tapia et al, 2023). The number of such platforms grew from around 80 in 2010 to over 280 in 2020, with an increasing concentration in the United States, India, and the United Kingdom (ILO, 2021). Most of the low-skilled tasks require only basic digital literacy skills such as navigating the app interface. However, this work is often informal and paid per task, with women constituting only 30% of digital workers in freelancing roles that provide substantial income (Kathuria et al., 2017).

- **Managed AI data platforms:** They operate like freelancing models, where specialised data work is advertised and performed by individual skilled workers but only after completing a certain level of training. This differentiates them from the Open Labour platforms (World Bank, 2015; Muldoon et. al., 2024). Examples include Mighty AI, Hive AI and Playment, Indian ones like Shaip AI which focus on AI services such as annotation and computer vision. These platforms attract youth, women returning to work, and freelancers by offering work from home flexibility and upskilling opportunities. Worker performance is evaluated on quality, adaptability, and availability, influencing rehiring and task allocation. However, uninterrupted digital access and ongoing training requirements limit participation among women from low-income backgrounds and those with caregiving responsibilities (Field Consultations).

Apart from these, there are also internal data teams within big tech companies like Google, Microsoft and Fractal Analytics which manage in-house work with proprietary data and models. These are considered premium and specialised jobs and need advanced skill sets.

Digital training and skilling firms are another key intermediary player in the value chain that bridge skill gaps, enhance digital literacy, and foster confidence. Such training could be an extension of the BPO model, where back-office service providers expand their offerings to include data-related services such as the Wipro Digital initiative. This enables employees to transition into data-centric roles. Alternatively, they can operate as a separate entity, eg - NGO models like the Anudip Foundation that recruits people from underserved communities, including women and provides them with digital skills training. The range of training includes basic skills such as digital literacy, navigating the internet; technical skills such as data annotation, quality checking, and basic AI concepts; and soft skills such as English language, comprehension and problem solving. Such trained talent is either directly absorbed through partner BPO models or supported with onboarding assistance for integration into digital labor platforms.

Ecosystem of Key Actors in Digitally-embedded Work



Demand Side Actors

Big tech/Corporates

Require large-scale training datasets for AI/ML systems and real-world usage data

Eg: Amazon, Meta, Google, Microsoft, LTIMindtree, Databricks, Fractal Analytics, TELUS International/Digital

Government projects

Government-led open-source platform.

Eg: Bhashini, AI Kosh

Research institutions

Run studies, need longitudinal rural data sets

Eg: J-PAL, IIIT Delhi, IISc Bangalore, IITs

AI/ML startups, BPOs & specialised AI firms

Indian GenAI startups working with local language models.

Eg: iMerit, Ekitai, NextWealth, Hive AI, Indika AI, Desh AI

Content & local media platforms

Eg. Chambal Media, Pluc.TV



Intermediaries

AI-work platforms/organizations

Offers digital work (annotation, translation) to low-income groups or rural delivery centers/ community led digital platforms

Eg. Ekitai, DesiCrew, Sama AI, Cloudfactory, Appen, Tika Data, IndiVillage Tech Solutions, WeSage BPM, Vindhya e-infomedia, FiveS Digital, iSon Xperiences, Infolks

AI Infrastructure enablers

Develop foundational AI tools, datasets, and models that enhance inclusivity in AI development

Eg: Wadhvani AI, OpenNyAI (EkStep Foundation), SuperAnnotate, LabelStudio, Suntec.ai

Skill building programs and providers

Promote job-readiness and offer pathways to employment

Eg: Wadhvani AI, OpenNyAI (EkStep Foundation), SuperAnnotate, LabelStudio, Suntec.ai

Gig and Open labour platforms

Platforms offering gig-based microwork

Eg. Awign, Gig4u, Taskmo, Populii (Tech Mahindra), Clickworker, Amazon Mechanical Turk

Job matching platforms

Eg. Apna, LinkedIn, SHE, Youth4Work



Supply Side Actors

SHGs and SRLMs

Organize rural women into cooperatives that can be mobilized for work and training.

Eg. JEEVIKA

CBOs and NGOs

Support rural women in digital, financial, and communication skills for job readiness

Eg: Sajhe Sapne, Digital Green

Independent workers and salaried employees

Freelancers, self employed and casual/gig workers, Salaried employees

Educational institutions

Professors and students

4.3. Frictions and Solutions: Empowering Digital Workers

While digitally embedded work models create opportunities for women particularly in AI data services and content creation, with a rich landscape of organizations, there are also emerging risks and challenges:

(i) **Anticipating automation of entry-level microtasks and defining progression pathways:** Women’s contributions to the AI data value chain are largely concentrated in low-skilled, repetitive tasks, such as voice recording, that are increasingly susceptible to automation (Madgavkar et al, 2019; Tubaro et al, 2022), and vulnerable to shocks in global supply and demand chains (Gurumurthy et al, 2021). Further, earnings through online labour platforms appear less predictable or stable, with income likely to fluctuate based on task complexity, time commitment, and frequency of work (Field Consultations). As a result, women often see this type of work as supplementary income and not as a primary livelihood source due to its uncertainty and lack of awareness about progression pathways. Finally, women’s representation in supervisory and leadership roles within AI data value chains remain disproportionately low, reflecting a persistent “leaky pipeline” in STEM careers (Oberai et al., 2023).

→ Some AI BPOs like NextWealth tackle the issue of stagnation in low-order AI work by implementing a formal and transparent pathway for career progression. New employees are integrated into a clear hierarchy that leads to specialised roles such as Team Lead or Manager supported by rigorous and continuous training. Dedicated leadership training for emerging talent and a centralised promotion portal can make way for equitable advancement and upskilling across all roles. Other organizations providing AI services like Shaip partner with local NGOs to bridge digital skills gaps at entry level. Dedicated digital training and skilling organizations are also serving as critical intermediaries for advanced, use-case based skills as HITL tasks in the AI value chain evolve (Field Consultations).

→ Training curricula should be guided by a common, progressive skills framework. Digitally embedded roles can be mapped to standardised international and government frameworks like NSQF. This will allow us to define their current position, recognise how basic digital tasks can evolve into more advanced, specialised functions, and identify **clear progression pathways for upskilling and mobility, ensuring that women workers in particular can move beyond precarious entry-level tasks into stable and recognised positions in the digital economy.** Such a common digital skills framework should be combined with structured skilling programmes and inter-operable credentials.

AI microwork/data value chain tasks	Potential NSQF alignment
Entry Stage tasks: Annotation, transcription, or voice recording	Levels 1–3: basic operational skills & following instructions with little autonomy
Mid level: Quality assurance, content moderation, or structured content creation	Levels 4–5: independent judgment and responsibility for outputs. Digital literacy, problem-solving, and communication skills become critical.
Advanced functions: dataset validation, supervisory oversight, or domain-intensive annotation	Levels 6–7: requires broader knowledge, complex decision-making, and responsibility for teams or processes.

(ii) Introducing structured workplace support: Indian women microworkers on Open Online Labour Platforms accept low-paid tasks aligned with U.S. work cycles to reconcile their domestic and care responsibilities (Gurumurthy et al, 2021). Gender wage gaps persist across all work types - women earn only 82% of male pay for the same tasks on platforms like AMT (ILO, 2021; Gurumurthy et al., 2021). This precarity, coupled with the systemic lack of formal employment status in some work models, means women digital workers are consistently denied basic labour protections, leaving them vulnerable to exploitation and diminishing returns (Jiang et. al, 2024). Gig women workers also face alienation as online platforms hinder collectivisation and worker identity formation.⁸

A woman worker from Bhadoi (Uttar Pradesh) shared how working from home had enabled her to get a job for the first time and earn an income to support her family (“I like that we can work from home and do not have to rely on our husbands”, Samuh Sakhi, Bhadohi, Uttar Pradesh).

→ Addressing these systemic workplace risks requires private employers, NGOs or those **designing programmes to ensure minimum pay standards, clear simple contracts, benefits, flexible work, clear and independent systems for reporting and resolving worker grievances** (Du & Okolo, 2025). Some organizations provide supportive workplace environments such as on-site childcare flexibility, guarded transport for night/early shifts to address safety concerns, and centralized merit-based promotion portal to actively mitigate gender bias in career advancement (See NextWealth Case Study in Annex B). Other AI service BPOs provide laptops on rent, and offer remote-work options. **Conversations with women in a social enterprise, Gram Vaani, revealed that women prefer remote work policies due to mobility restrictions.**

→ Work from home policies have been especially valuable during pregnancy or for non-traditional hours. This preference for flexible work is mirrored across different contexts, from BPO roles in Tamil Nadu to rural work in Uttar Pradesh. Recognising these structural vulnerabilities, key stakeholders are piloting essential policy shifts. For example, Andhra Pradesh has launched an IT & GCC Policy to enhance remote work infrastructure which will have spillover benefits for women workers.

(iv) Negotiating opaque algorithms and work management: AI data value chain work is often based on opaque, top-down algorithms, with workers managed by proprietary metrics and surveillance without human oversight, and platforms denying responsibility in disputes (Gurumurthy et al (2021) . This creates one-sided “take-it-or-leave-it” contracts. Women also reported paying intermediaries in grey markets to obtain accounts, only to be confined to the lowest-paid, most repetitive tasks, while higher-value jobs remain concentrated in the Global North (ibid). A related challenge of online, algorithm driven work is around worker safety and harm. The accelerating demand for human oversight in AI and social media systems is fueling the large-scale outsourcing of content moderation and data annotation work to the Global South, including Africa, South and Southeast Asia (Du & Okolo, 2025). Workers in these digital supply chains are tasked with sifting through vast volumes of graphic, harmful, and hateful content to filter platforms or train algorithms. This exposure, coupled with precarious work conditions can inflict serious psychological injuries, including high risks of stress disorders and vicarious trauma (ibid). However, moderation itself is not a uniform or purely technical process. A study of voice-based participatory platforms in India describes content moderation as a socio-technical process, i.e., one that is shaped by local norms, languages, gender relations, and the social contexts in which speech is produced and received (Jain et al., 2024). Moderation requires interpretive and participatory forms of oversight, raising important questions about how algorithms can be made more accountable and inclusive.

→ Industry partners that prioritize safety principles and put in place workplace protections and policies are more successful in retaining women employees and workers. For example, Chambal Media offers gamified digital security toolkits to introduce legal awareness and safe practices online for women.

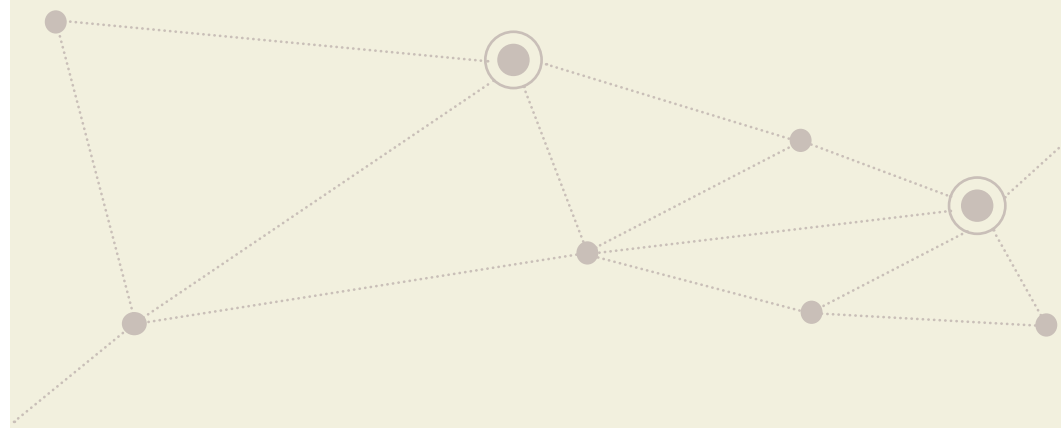
⁸A recent study found that even for app-based gig workers providing traditional services, algorithmic control, tracking and penalties prevent workers from unionising. Further, women have lower levels of awareness and thus membership in unions as compared to men (IWWAGE, 2025).

Continuous mental health support and facilitating the creation of worker collectives and unions are essential to counterbalance online risks and the power of opaque algorithmic management (ibid). Companies like Upwork combine algorithmic task allocation with human supervisors who monitor work quality and address worker grievances, ensuring fair treatment and reducing exploitation. Such hybrid management models help build trust, clarify expectations, and improve worker well-being in digital labor platforms.

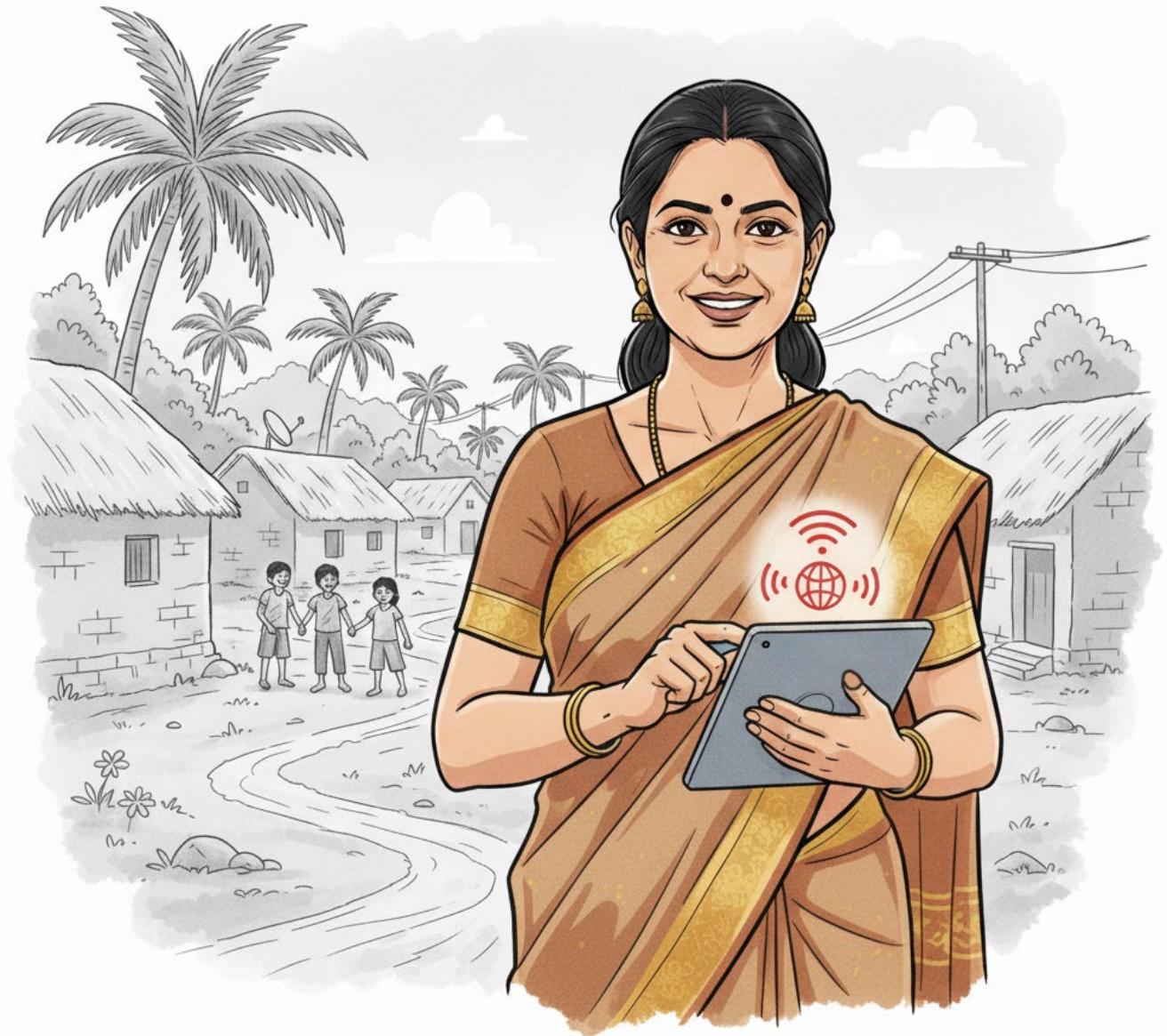
→ Beyond worker protections, there is also a need to integrate participatory approaches in moderation and data governance. Community-led and decentralized moderation models- such as those developed by Gram Vaani highlight that transparent oversight and local contextual awareness can counter algorithmic opacity and bias, making platform governance locally accountable and subsequently, more inclusive (Jain et al., 2024).

(v) Addressing intersectional and normative barriers for rural and low-income women: Finally, women in rural and low-income communities face overlapping structural and normative barriers that limit participation in digital and AI work. Hada et al. (2024) show that limited training, language gaps, and restrictive family norms impede engagement. Annotation studies also highlighted difficulties with virtual training and culturally unfamiliar content, showing how task design and access barriers intersect with social norms. Our field consultations similarly revealed that in dialect recording projects, women's participation was less than half that of men due to discomfort in recording voices, male gatekeeping, and the absence of private spaces. BPOs also noted significant attrition due to marriage and subsequent relocation, household and childcare responsibilities, and mobility restrictions placed by family members.

→ Success in digital careers occurs when women actively negotiate with families and local gatekeepers. NGOs build trust through ongoing community dialogue One BPO runs 'family days' to reassure relatives, but high dropout rates for women persist after marriage due to care burdens and norms. Trust based mobilisation such as using referrals, and engaging with community influencers and local leaders builds confidence and uptake in low-resource rural areas (Varanasi et al., 2022; Rani et al., 2022).



05.
**Enabling Policy
Landscape
for Women's
Digital
Inclusion**



The Indian government has made significant strides towards women's digital inclusion with a wide ecosystem of efforts spanning central and state levels. As part of this study, we identified flagship government programmes, corporate-linked programs, schemes, and initiatives aimed at enhancing women's participation in the digital economy and digital work, across the centre and state level.

At the national level, last mile digital connectivity access, foundational digital literacy and digitally-enabled livelihoods are emphasised as key digital gateway strategies. At the state level, enhancing digital access through device distribution and leveraging community platforms like SHGs for digital trainings and digitally-augmented livelihood is the primary focus of some states, although there is a need for coordinated action across ministries and departments to ensure sustained access. Recent government efforts have also concentrated on prioritizing large scale, inclusive AI adoption through initiatives like the IndiaAI Mission, focusing on India specific large language models, AI enabled applications in critical sectors, AI skilling and innovation.

5.1. Access and Affordability

Digital connectivity and digital public goods and infrastructure: At the central level, the government is broadening and improving last mile access through physical infrastructure to enhance affordable digital connectivity. For instance, the BharatNet project (which aims to connect 2.5 lakh gram panchayats) provides high-speed broadband connectivity to rural areas. Common Service Centres (over 5 lakh CSCs have been established nationwide) serve as affordable access points for digital services and e-governance in rural and remote regions. The PM-WANI (Prime Minister Wi-Fi Access Network Interface) initiative supports the creation of a widespread public Wi-Fi network ecosystem, improving internet availability. This, combined with digital public infrastructure like UPI and Aadhar, financial initiatives like Jan Dhan Yojana and mobile connectivity aim to drive digital financial inclusion, together providing a secure digital access base that supports other skilling and livelihood initiatives.

Access to phones/devices: Some states such as Rajasthan, Chhattisgarh and Jharkhand are enabling access to digital devices, primarily mobile phones helping first-generation users overcome access barriers. For instance, Rajasthan's Mukhyamantri Digital Seva Yojana distributed smartphones to 1.35 crore women.⁹ Chhattisgarh's Sanchar Kranti Yojana aims to provide 50 lakh women with free smartphones, prepaid data, and calling (Upadhyay, 2019).

5.2. Digital Literacy, Skills and Livelihoods: from Foundational to Advanced

Foundational Skilling: At the national level, flagship digital literacy schemes such as PMGDISHA (57% of those certified are women), PMKVY 4.0 (52% women participation), National Digital Literacy Mission and institutes like National Institute of Electronics & Information Technology (NIELIT) have introduced women to foundational digital skills and have achieved high female participation and wide reach, despite a gender neutral scheme design.¹⁰ NIELIT operates 52+ centres and 700+ affiliated institutes offering skill-based digital training including foundational literacy and emerging tech. While 22 government schemes and initiatives analysed cover basic digital literacy, few provide progression pathways or bridges to advanced digital skilling - which are important for women's progression in digital work. A small number of schemes which explicitly target women with advanced programs are still at a nascent stage. Many courses also prioritise computer skills even though mobile devices are the primary digital tools in digitally-enabled and augmented work, especially for women. At the state level, skilling efforts vary widely. NIELIT plays a significant role by providing various digital skill development programs across states, targeting youth and women to enhance their employability in IT and digital sectors. Some state programs create skill-to-employment pathways, providing job-focused digital training and employment support for women with technical backgrounds, such as Haryana's IT Saksham Yuva Scheme.

⁹ Department of Information Technology & Communication, Government of Rajasthan. (n.d.). Mukhyamantri Digital Seva Yojana (MDSY). Retrieved August 28, 2025, from <https://itc.rajasthan.gov.in/pages/department-page/1447>

¹⁰ According to the WHO 5-Level Gender Responsive Assessment Scale, Gender-neutral policies refer to those that treat everyone equally, not taking into account the differences in opportunities and resource allocation based on gender. <https://genderhealthdata.org/resource/introduction-to-gender-responsive-assessment-and-gender-levels/>

Women-specific schemes: A few central government schemes include women-specific components and beneficiary targets. For instance, Women Entrepreneurship Platform (WEP) provides mentorship, digital skills training and supports market linkages for women entrepreneurs; SANKALP targets digital literacy for vulnerable women, and DAY-NULM, emphasizes skill training for urban women. Other women-focused programs like Women Leadership in STEM (selected 20 women in its inaugural cohort) and Women Involvement in Science and Engineering Research (WISER) (awarded 30 Indian women researchers between 2022-2024) have potential to reach a higher scale.

Support for digitally-augmented livelihoods through community-based models: In conjunction with foundational skilling, the government is making efforts to integrate digital tools into existing rural livelihoods by effectively leveraging community platforms. Community platforms like SHGs, FPOs, and Anganwadi Centres are bringing digital tools to women in rural industries like agriculture, crafts, and food processing and micro-enterprises. The “Sanchar Shakti” aims to facilitate SHG members with access to ICT enabled services. Pradhan Mantri Formalisation of Micro Food Processing Enterprises (PMFME) targets women SHG members for digital entrepreneurship training including digital marketing and e-commerce integration, leveraging existing collective structures for program delivery. There are a few initiatives integrating private sector partnerships for women’s digital work. One such program, the Atal Innovation Mission, collaborates with private mentors and industry partners through its incubation centers supporting over 2,000 startups with 625 being women-led.

Advanced Skilling: NIELIT runs programs in AI, blockchain, cloud computing, cybersecurity, and electronics, geared to youth from smaller towns and rural areas. However, existing courses on AI and cloud computing are primarily urban-focused and English-language centric. AI courses are also offered by FutureSkills PRIME (a NASSCOM partnership) and Skill India Digital Hub (SIDH). There are also efforts to move beyond skilling towards AI careers and employment. Programs like Yashoda AI and AI Kiran aim to build foundational AI literacy and mentor women for careers in AI. National collaborations such as the Ministry of Skill Development and Entrepreneurship (MSDE) and Microsoft’s “AI Careers for Women” open direct pathways to the tech workforce. Recent large language

model (LLM) government initiatives such as BHASHINI, BharatGen and Sarvam-1 promote digital inclusion by providing AI-powered language technologies in multiple Indian languages, expanding access for diverse user groups. At the state level, while a few advanced digital training initiatives exist (SAP India and Microsoft’s TechSaksham targeting 62,000 young women students in AI and cloud computing), the bridge between basic and advanced skilling measures requires targeted effort. Some promising initiatives include Jharkhand’s Employability Enhancement and Livelihood Training Program which specifically aims to train 52,300 SC/ST and EWS women in AI skills. State governments across India are investing in AI innovation, research, and application including AI Centres of Excellence (CoEs). For example, Gujarat and Andhra Pradesh host dedicated AI CoEs. Further, Maharashtra and Telangana collaborate with tech companies on applied AI projects; Punjab, Haryana, and Delhi deploy AI-driven public safety systems; and Karnataka, West Bengal, and Assam integrate AI in education. States like Telangana foster innovation ecosystems, for example through the Women Empowerment Hub that supports women’s entrepreneurship and incubation. However, such innovation-led approaches are exceptions and at an early stage. Most states prioritize access over advanced skilling and market linkages. Further, government skilling institutions (like Industrial Training Institutes) and corporate training partnerships are often located in urban centres excluding rural women (eg. IBM SkillsBuild).

5.3. Trust, Safety and Norms

Social Security: At the national level, the government has recently recognised and now provides social security for gig and platform workers in the Code on Social Security, 2020. However, provisions, protections, benefits, and clear grievance procedures are still at early stages (IWWAGE national consultation, 2025; ORF, 2025). At the state level as well, new laws protecting rights of gig workers are emerging - primarily in Rajasthan and Karnataka.

Digital Safety: There is growing recognition for the need for education and awareness efforts. However, comprehensive, gender-intentional digital safety measures and safety and cyber security modules within digital skills training programs remain largely unaddressed at scale. The National Digital Literacy Mission has a module dedicated to “Safety and Security in Digital Technology.”

National efforts also include reporting portals, cyber forensic labs, and training for law enforcement. More efforts are needed to directly address women's context-specific social constraints to digital participation and to build safety initiatives gender-intentionally. A few states offer dedicated digital safety interventions for women. These include Rajasthan's RS-CIT course which combines digital literacy with psychosocial care, and Telangana's CybHER program which directly trains girls and raises community awareness.

Social norms and mobility constraints: A few states address women's vulnerabilities based on intersectional identities such as Jharkhand's Employability Enhancement & Livelihood Training Program (EELTP) for SC/ST and EWS women, Chhattisgarh's Swalamban Yojana targeting widowed, unmarried, divorced and HIV-positive women. Some states are also experimenting with tackling social barriers including mobility, safety, and care work burdens that often restrict women's ability to benefit from digital inclusion. Andhra Pradesh's IT & GCC Policy is enhancing remote work infrastructure which will have spillover benefits for women workers. Rajasthan's Work From Home Job Yojana exemplifies how localised design can address women's lived realities. Yet such responsive design remains uneven and fragmented, leaving the majority of programs still blind to these barriers. To close this gap, more systemic interventions such as safe transport, work from home friendly training, and integrated childcare facilities are needed, ensuring women can not only learn but also apply digital skills in real work contexts.



06.
**Where do we
go from here?**



As the digital economy expands, new frontiers of work are emerging that reshape how women engage in the labour force. **This report provides a comprehensive understanding of these emerging models, conceptualising digital work along a spectrum, using the axes of process, underlying rationale, and output:** from digitally-enabled job roles where digital tools have become essential in how traditional work is accessed, exchanged, or reported (eg, app-mediated gig workers in beauty or domestic work segments; and frontline cadres across healthcare, banking, livelihood etc.) **to digitally-embedded work** - purely digital-born roles with digital processes and outputs such as data labelling and online content creation. It also explores **digitally-augmented livelihoods**, where digital tools enhance existing work and lives without being essential, serving as gateways into deeper digital engagement.

Women's participation in these new forms of work is being facilitated through a rich ecosystem of stakeholders spanning industry players like AI-BPOs, startups, and work platforms; civil society organizations; and community leaders and enabling policy ecosystem. The rise of platform economies, embedded AI and digital work, and digital entrepreneurship is empowering women not only as workers but as solution designers, leaders, and business owners. Community driven models and government initiatives are demonstrating that women in Tier 2 and 3 cities and rural areas can thrive with the right blend of connectivity, skill pathways, and local support. Remote work and hybrid models, often cited in global research, are giving women the leverage to balance care and career, while women-led networks are surfacing as powerful engines for building digital confidence and economic resilience.

Together, these shifts present a historic opportunity to redefine and deepen women's participation in the digital workforce through systemic, evidence-based action. There is now clear evidence that when designed with intentionality, **digital work models can offer flexible entry points to women from different socio-economic segments to participate, lead, and shape the digital future.** Yet, **intersecting barriers** such as fragmented device access and connectivity, low digital literacy and confidence to navigate online risks, and vulnerabilities to fraud and scams further limit women's agency to meaningfully participate in the digital economy. Women workers also face restricting social norms, poor mobility, insufficient private workspaces at home, heavy domestic workloads, informal contracts without protections, and persistent gender wage gaps - barriers which often overlap and reinforce one another.

As the digital and AI economy further grows, we need to make sure women are not left out or concentrated in entry level, low skilled roles across different types of digital work. Women, as digital workers in traditional sectors, electronics and IT manufacturing, and in data value chain work, need to be empowered - not just through increased participation, but through recognition, enhanced agency, gender-intentional design, upskilling, and meaningful workplace support. In order to achieve this, we must tailor solutions to women's lived realities to transform barriers into breakthroughs.

Recommendations



(I) Deepening Women's Participation in Digitally-Augmented Livelihoods and Digitally-Enabled Work



Design programs and digital tools that **account for shared device and intermittent connectivity** contexts (For eg accounting for what times of day or week do women have autonomous access, designing for offline access and IVR options, or distributing devices tied to a clear use case when feasible)

Impact Organizations,
Govt Ministries, Tech Platforms
& App Developers (incl Product
Designers)



Build **women's foundational and job-specific digital skills**, with a focus on relevant use cases to enhance women's confidence to use digital tools in traditional livelihoods. For first-time users, familiar methods like using paper-based prototypes and hands-on, women-led training and peer-support should be explored.

Skilling Organizations;
Govt Initiatives



Build **gender intentional tech design** to create safer online spaces and accessible interfaces, tailored to women's needs to enhance user confidence (eg - simplified or offline functionalities, local language preferences, privacy features to strengthen trust, and optional message blocking or time-sensitive nudges/push notifications). Also **modify app algorithms** to account for women's intermittent connectivity and phone access, availability or mobility constraints (and enhance control by users/transparency in workload assignment and ratings)

App Developers
Product designers and
engineers;
Tech Platforms



Formally recognize the nature of digitally enabled work in traditional service sectors and mandate fundamental protections, including legal recognition, workload rationalization, social security, fair pay, worker rights, and adequate grievance, redressal and safety mechanisms.

Central and State Govt
mandating digital tools;
Gig platforms



Adapt existing frameworks like NSQF and labour surveys to account for the digital layer in traditional jobs and capture the breadth of task-based, low-to-mid skill digital competencies that have become essential in frontline services, community data collection, market access, and app-mediated service delivery. This visibility can enhance access to incentives, future roles, progression to advanced skills, and public recognition

Govt Ministries &
Agencies;
Skilling Organizations;



Build dedicated online market linkages that spotlight women-led enterprises by creating specific visibility tags and **mandate sustained mentoring support** on advanced skills like **digital marketing and visibility algorithms** to women farmers and SHGs for confident and transparent engagement on e-commerce platforms.

E-commerce Platforms
NGOs & Community
Organizations
Skilling Organizations

(ii) Digitally-embedded Work

Tap into Indian digital work demand generators to provide dignified, high-quality opportunities for women. This involves directing demand from major actors like the Govt's BHASHINI language platform, organizations like Karya, and Indian startups toward women workers.



- Govt Ministries & Agencies
- Tech Platforms & Startups
- Education & Research Institutes, NGOs

Focus on formal recognition of women's digital experience and skills through **certifications and a common digital skills framework**, aligned with prevalent frameworks like NSQF. This can ensure protections, formal job pathways, and even lead to increased income. Complement this with **structured skilling programs with nationally recognized, inter-operable credentials** to transition women from precarious entry-level job roles to more stable, advanced positions. Integrate **formal leadership training and promotion pathways** to accelerate their movement into managerial and executive roles.



- Govt Ministries & Agencies
- Skilling Organizations
- Tech Platforms & BPO Demand Aggregators

Ensure all digital employers formalize **supportive labor conditions** by enforcing minimum pay standards and equal wages, providing clear contracts with benefits, accessible grievance redressal mechanisms, adequate workplace protections and offering flexible and remote work options vital for women's retention.



- Digital Employers
- Govt Ministries & Labor
- Regulatory Bodies

Provide **device rentals or local, common centres/hubs** in home-towns/at village level where women can take on digital work and complement this with **supportive infrastructure** such as cabs or bus transportation options to tackle mobility restrictions and ensure women's safety.



- Digital Employers
- NGOs & Community Organizations

Implement a **mandate for continuous mental health support and a worker-first, human management layer** to oversee assignments for content moderators getting exposed to harmful content.



- Tech Platforms BPOs
- Regulatory Bodies
- NGOs

(iii) Cross-cutting Recommendations

Skilling approach:

- » Conduct **hands-on, women-led, and small-batch training** in accessible local settings and assess existing digital skill levels, attitudes, and knowledge before implementing a training programme to tailor interventions effectively. Use multi-dimensional digital metrics to inform program design & targeting.
- » Include comprehensive **digital safety education** including building digital skills for fraud prevention, enabling safety features like passwords for apps



- Industry/demand side actors
- Skilling Organizations & NGOs
- Research Institutions

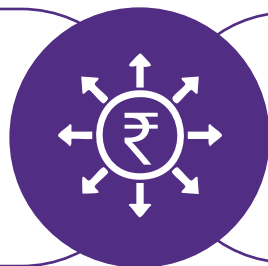
Ecosystem:

- » Leverage **trusted community intermediaries**, local influencers (frontline workers, leaders etc), SHGs, and village-level hubs and platforms like panchayats to facilitate women's entry into digital work, negotiate with gatekeepers, and build their confidence and trust.
- » **Engage families**, specifically men and boys to shift restrictive gender norms around digital access/use and address fears about women's online safety to foster sustained participation



- NGOs & Community Organizations
- Govt (Panchayati Raj & FLWs/community mobilizers)
- Tech Platforms & BPOs

Leverage the **enabling policy ecosystem** (last mile connectivity, digital financial inclusion, and foundational digital skills) to harness the current AI enthusiasm and ensure the outcomes are directly accelerating and increasing women's participation in dignified digital work.



- NGOs & Community Organizations
- Govt (Panchayati Raj & FLWs/community mobilizers)
- Tech Platforms & BPOs

Closing India's digital gender divide thus requires a coordinated, large-scale effort across sectors. Achieving this demands (1) government-led expansion of access, connectivity, and enabling policies (2) private sector creation of competitive, gender-inclusive jobs with responsive training and workplace safeguards (3) civil society's role in awareness-raising, skills alignment, and inclusive program delivery and (4) community organizations engaged in trust based mobilisation of women, especially in rural areas.

As part of the next phase of the action research led by GxD hub and The/Nudge Institute, we will co-design and test scalable digital interventions empowering women in rural and tier 2/3 areas in India. Our priorities for women in digitally-augmented and digitally-enabled livelihoods include piloting gender-sensitive digital and AI tools with gender intentional interface, onboarding and skilling with local language support, and strengthened digital market linkages for different farm and non-farm value chains through e-bookkeeping to improve transparency and market access.

We will also explore piloting common, localised digital hubs with peer support in partnerships with local networks. For women in digitally-embedded roles, we will pilot a common digital skills framework and credentialing pathway, along with complementary online work employability training programs to build foundational and job-specific digital competencies. These interventions will be co-created and tested in partnership with local communities, grassroot partners, and industry leaders to ensure practical relevance and scalability.

Annexures

A. Detailed Methodology

Organizations mapping

As a first step we mapped out and consolidated a list of organizations in India and globally, working in the spaces of digital work, digital tools for development, AI for development, data value chains or closely related sectors. This was a joint effort between the Nudge and GxD hub. This included reviewing websites of known data service providers and tracking their listed partners, scanning for organizations and platforms offering AI data services as well as relevant digital work opportunities, and filtering for those with an Indian presence. We also prioritised organizations that demonstrated a gender focus—such as women’s empowerment, livelihood generation, or inclusive hiring practices.

The data team at IFMR further expanded this list by creating a website scraping tool that enables the identification of relevant organizations based on keyword input.

The scraping process began by reading a CSV file containing keywords and their weightage, representing key phrases linked to target organizations. The top 10 keywords with the highest weightage were selected; in case of ties, keywords were randomly chosen to complete the list. A Google search was then performed using these keywords connected with “OR” to generate a broad set of results. Results were filtered to remove blacklisted or already-processed websites, and a specified number of new, unique websites were selected. These websites were crawled asynchronously using Playwright, with a focus on up to 5 pages per site, prioritising those with “about,” “services,” or “data” in the URL or content. Text content from each page was extracted using BeautifulSoup and saved in a structured format by website and page URL. Each website was scored based on the presence of the input keywords; scores could reflect either single or multiple keyword occurrences per page. The tool is adaptable—by updating the keyword list in the input CSV, it can be reused to identify organizations across different thematic areas. A final list of 70+ organizations was compiled, out of which we conducted online consultations or field visits with 20 (listed below):

Organiza-tion	Year of Est.	Location	Services Offered
NextWealth	2008	Bangalore, Mallasamudram; Chittoor; Hubballi; Bhilai; Mysore; Vellore; Puducherry; Salem; Jaipur; Udaipur; Kumbakonam	Human-in-the-loop AI data solutions for Generative AI, Marketplace Content, Computer Vision, enabling development and deployment of AI in the real world.
DesiCrew	2007 (incorporated)	Chennai, Kaup, Erode, Villupuram, Kollu	Software testing, Computer Vision, IT Automation, LLM support services, finance & accounting
iMerit	2012	Bangalore, Kolkata	Generative AI Data Solutions, Computer Vision, NLP
Ekitai	2014	New Delhi	Translation, e-learning, legal, financial, medical, technical translation, market research, localisation, software app localisation, game localisation, dubbing, voiceover, transcription, annotation, multilingual SEO, etc

NavaData	2003	Kolkata	Data collection & annotation solutions
Desh AI Labs		Remote	Voice agents, LLM applications, speech recognition, speech synthesis, language understanding, translation & transliteration
Gram Vaani	2009	New Delhi Presence in 20+ states	Participatory platform (IVR, SMS, radio, local gov tools) ensuring access for all types of users; largely used in rural, semi-urban and urban areas by low income communities.
Digital Green	2008	New Delhi Presence in Karnataka, Bihar, Jharkhand, Odisha, Andhra Pradesh, and Telangana	AI powered agri solutions such as video based trainings and chatbots
PRADAN	1983	New Delhi, Uttar Pradesh, Madhya Pradesh, Jharkhand, Bihar, Chhattisgarh, West Bengal, Odisha, Rajasthan, Tamil Nadu,	Livelihood initiatives, natural resource projects, financial literacy/ inclusion for underserved communities

Chambal Media	2015	Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Bihar, Haryana, Rajasthan, Uttarakhand, Delhi	Local-language rural content and news (e.g. Khabar Lahariya)
Pluc.TV	2017	New Delhi, Uttar Pradesh, Rajasthan	Offers courses, content creation tools, gig opportunities, and monetization support for digital storytellers
Digital Empowerment Foundation	2002	Presence in 20+ states	Digital/financial literacy, media training, community internet, and ICT solutions
Datamation	2016	Madhya Pradesh Presence in 20+ states	Market Research, Socio-Economic Research, Data Analytics, Digital & Direct Promotion, CRM & Loyalty, Consulting and Training, Mobilization Resource, Application Development, Document & Records Management, Information Processing & Management
Anaxee	2016	Madhya Pradesh	Job matching platform
Apna	2019	Bangalore, Karnataka	Presence in 20+ states

Vayam, Sambodhi	2005	Uttar Pradesh	Customized solutions for monitoring and evaluation, research, and analytics
Treemouse	2016	Gurgaon, Haryana. Work in multiple states	Design-led product and marketing strategists
Finovaracore	2024	Maharashtra, Rajasthan, Uttar Pradesh, Madhya Pradesh, and Jharkhand	Computer programming, consultancy, financial inclusion
Sajhe Sapne	2020	Bihar Draws participation from 7+ states	Entrepreneurship training, digital skills, women's employment & financial empowerment
Shaip	2018	Gujarat, mostly remote presence	Artificial Intelligence, Computer Vision, Natural Language Processing

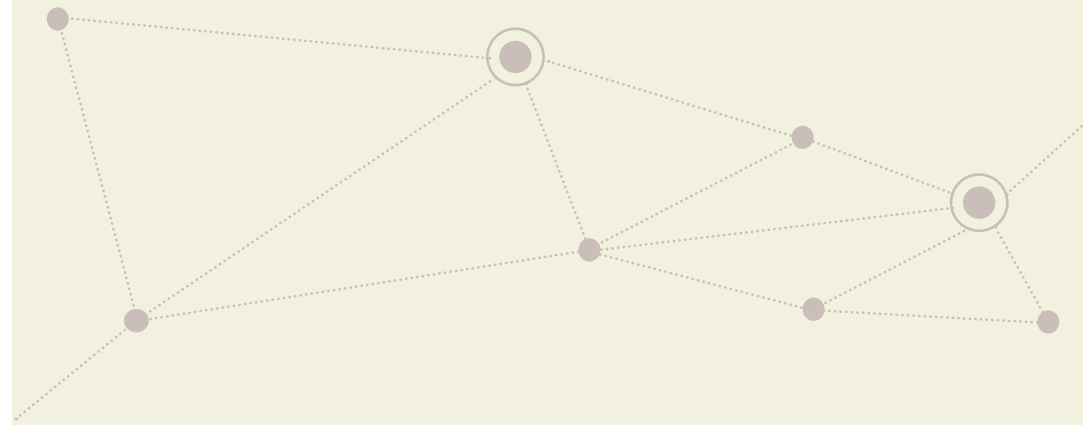
Literature/Desk review: We carried out a literature review to explore digital work globally and then contextualised it to the Indian setting. This exercise began with searches on Google, Google Scholar and Scopus including peer reviewed papers as well as grey literature in the form of reports and white papers from national and international organizations. Three researchers worked on the literature review. Along with the review, we maintained a shared Google sheet for an annotated bibliography and for populating definitions on concepts such as digital economy, digital work, digital literacy, digital infrastructure, digital safety among others. For a glossary of definitions related to digital work and list of micro-tasks in the data value chain, [click here](#).

Policy mapping: The GxD hub partnered with a policy organization, Nikore Associates to map out the policy ecosystem in India both at the state and centre levels as well as government programmes for skills development in India. A detailed policy report was prepared from which key takeaways were extracted, peer-reviewed, verified by the core research team and subsequently included in this report.

Gender gap analysis: We explored secondary datasets to analyse gender based disparities and similarities in digital forms of work. After a search for relevant datasets, we reviewed three prominent ones: The Periodic Labour Force Survey (PLFS), the Online Labour Index (OLI), and ILOSTAT, along with related ILO research publications. PLFS provides detailed labour market data by gender, age, education, and location, but does not specifically identify digital or platform-based work. Freelance and platform workers are usually classified under broad categories like self-employment or casual labour, making it difficult to track digital engagement or online work models. OLI tracks global online gig work by occupation and geography but lacks gender and individual-level data. ILOSTAT offers gender-disaggregated data on employment and ICT skills, but does not distinguish platform-based or digital work from traditional roles,. Thus, while these sources provide valuable labour statistics, none offer the specificity needed to analyse women's participation in diverse digital and AI work.

Primary data collection and analysis: Based on the organizations mapped out, we had two levels of consultations for data collection – the first was an online consultation establishing the purpose of the study and understanding the broad scope of the organization’s work along with projects they are undertaking. Based on mutual interest and scope for further learning, we agreed on field visit dates and locations. Our field visits were with organizations engaged in a variety of digital work, from decision support technology tools and AI powered apps to centres employing full time and contractual staff for work in data capture and analysis. For the IDIs and FGDs on the field, we prepared a discussion guide with exploratory qualitative questions to understand the organization’s work, implementation model, gender inclusion components, impact measurement, challenges faced at different stages, how they solved for them as well as scale and sustainability efforts.

For every field visit, two or more members each from the GxD hub and the Nudge teams spent one day at the organization’s field office interviewing heads/ coordinators, team members of different teams along with interviews with community members part of the project. Field locations were spread across India including rural, peri urban and urban locations of Delhi, Uttar Pradesh, Bihar, West Bengal, Karnataka and Tamil Nadu. We took detailed notes on paper and later populated it on a shared sheet for thematic analysis. The interviews were recorded with consent and served as the basis for the team’s analysis. The recordings will be destroyed within six months of taking them. The documents were only shared with the research team, names and personal details of those interviews were redacted. The field insights, and individual quotes were shared with relevant organizations for feedback and consent for inclusion.



B. Case Study of an AI based BPO in India Engaged in Digitally-embedded Work: *NextWealth*

NextWealth, Salem Centre, Tamil Nadu India | Founded in 2009

Single mother

Lakshmi joined NextWealth as a single mother, nursing her one year old son, and found a supportive work culture that allowed her the flexibility to feed her child during office hours. This support was critical to her growth into a Deputy Manager role. She reflects on how her attitude and dedication align with NextWealth management's emphasis on employee loyalty as a key to success. Despite being an average, reserved student in college with a non STEM degree in communications, Lakshmi gained confidence after joining the centre. Some of her college peers who were batch toppers joined the centre later and now work under her leadership. She values the small-town culture where personal connections with executives are important, and women feel comfortable discussing personal challenges like marriage pressure with their managers. She credits NextWealth's practical skill training as a major factor in her success and feels confident pursuing further upskilling in coding and AI model development.



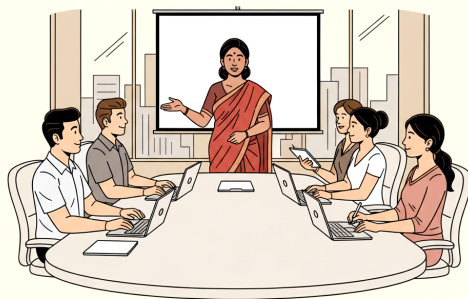
25 year old executive

A lateral hire through a walk-in interview, Sarita aspires to become a junior team leader by the end of this year. Coming from a conservative family where she lives only with her mother, she dreams of working in a software company like her brother in Bangalore but appreciates the advantage of working locally due to her mother's concerns about travel and staying away from home. Although she is not permitted to work night shifts, she values the rigorous process training at NextWealth. Her primary motivation to continue working is to gain financial independence, a mindset she has also encouraged among her female friends. She is aware that many women on her team leave after marriage and hopes to avoid this in the years ahead.



Team Leader

Leading over 60 employees across two teams, Priya is a respected figure whom juniors frequently approach for guidance and technical support. She recalls how she couldn't operate a computer when first hired but has since gained strong domain expertise in AI and ML, boosting her confidence and earning respect within her family. Breaking traditional norms of early marriage, Priya communicated her expectations clearly to her family and discussed with them about wanting financial independence. She insists that her future husband must respect her independence and share her values.



Background

NextWealth is an AI-driven Indian BPO with a social impact mission. The company focuses on creating high-skill opportunities locally, in small towns across India, with a special emphasis on empowering women. Beginning as a traditional BPO, today NextWealth drives Human-in-the-Loop (HITL) solutions, supporting the entire AI lifecycle from data collection, annotation, evaluation to helping to enhance AI/ML model accuracy and performance through fine tuning support. While the company has been active in AI/ML data services for over five years, its work in generative AI data has increased significantly in the past year, involving complex tasks such as analysing large text and coding to ensure natural language quality. NextWealth began operations at the Mallasamudram centre near Salem, Tamil Nadu, which our team had the opportunity to visit. NextWealth, as of June 2025 operates 11 delivery centres in India. They are located across cities and small towns of Bhilai, Chittoor, Hubballi, Jaipur, Mallasamudram, Mysore, Puducherry, Salem, Udaipur, and Vellore across five states and one union territory.

Business and Work Model

NextWealth operates a distributed work model with a “hub to centre to customer” workflow. The company’s entrepreneur led model is central to its story. Local entrepreneurs with a strong social and emotional connection with their communities are carefully selected. They set up delivery centres as separate legal entities, providing infrastructure and leadership. This approach keeps NextWealth capital-light and fosters accountability and local ownership. Additionally, the company employs a “two-in-a-box” operational model in these centres, pairing an expert who manages daily operations with a customer-facing professional responsible for sales and client satisfaction, ensuring both operational quality and strong client relationships. NextWealth defines its model through four important elements: (i) High quality work with strong customer satisfaction, (ii) Leveraging small town India talent, (iii) Entrepreneur led centres, and (iv) Focus on women’s empowerment.

Demand and Supply-Side Factors

Demand side: Today, approximately 85 percent of NextWealth's revenue is generated from AI services including computer vision, generative AI, trust & safety, and catalog, retail (AI and IT workstreams) with the remainder coming from IT services across sectors like BFSI and healthcare. 90 percent of this AI work demand originates from the Global North, primarily from large technology companies. Only 10 percent of demand currently comes from within India, where AI adoption is still nascent and largely limited to a few startups with constrained funding. The top three clients contribute around 60 percent of the revenue, with demand centrally managed through the company's Bangalore office.

Supply side: NextWealth maintains a curated network of local entrepreneurs who set up and run delivery centres in small towns, as mentioned before. The workforce is primarily full-time employees, with some contractual hires at centres outside Salem based on project needs. Lateral hires are less than 5 percent. This model contrasts with larger players in India located in limited metro cities who often struggle to penetrate small towns due to challenges in local management and cost competitiveness.

Work Context

Workstreams and roles: Annotation forms the bedrock of AI related work that NextWealth engages in. Within annotation, the company specialises in text annotation, speech annotation, image/video description and captioning and toxic language identification (content moderation) for industry domain specific machine learning (AI/ML) or for GenAI across different sectors. For instance, labelling of weapons to train airport security machines to detect threats during baggage check or labelling of road signages and vehicles to train navigation systems for autonomous vehicles. Employees typically join as annotators or executives in the organization and then have a pathway for upward mobility in their career across a hierarchy of roles including subject matter expert, team lead, assistant deputy manager, deputy manager, manager, senior manager.

Training: NextWealth primarily recruits employees through campus drives within a 50-kilometer radius of its centres. The company looks for candidates with strong aspirations, English comprehension, and basic systems knowledge.

While most hiring is general, project-specific recruitment for language skills happens occasionally. Referrals and walk-in interviews, mainly involving women, also supplement recruitment. Most employees have STEM educational backgrounds, primarily holding engineering or science degrees such as Mathematics. At NextWealth, training is structured in three layers: Outer, Outer/Inner & Inner. Outer layer covers job-related learnings covering a month-long pre-process training, followed by two weeks of process training, and then on-the-job ramp-up. All employees complete mandatory courses on information security, workplace conduct (POSH), and anti-money laundering (AML), which are periodically refreshed. The Outer/Inner layer focuses on behaviour based leadership skills and Shakti- a women leadership programme which is an important part of the layer. The unique and most popular layer among women employees is the Inner layer. Every woman employee is supported with an Inner Wellbeing programme, a Day with Myself and Maitri (a programme on women's financial planning, navigating family relationships on career, marriage & children, and support group formation). Many employees have progressed to roles in reputed companies. About 90 percent of employees report they are continuously upskilling and learning on the job as measured in the Social Impact Assessment 2024.

Profile of data workers: Women make up 52 percent of the organization's workforce and hold 26 percent of managerial roles, most of which are internally promoted rather than laterally hired. The average employee age is 25 years, and about 80 percent of employees have 2-3 years of experience. Approximately 10-15 percent of employees are married, with attrition among women often occurring after marriage if they relocate, although the average marriage age in the region is gradually increasing based on conversations with management and employees. About 69 percent of employees are from lower income households based in rural areas or tier 2/3 towns, with 17 percent from daily wage labour families and 12 percent from farming households. About 70 percent employees are first-generation graduates and 39 percent sole bread winners, reflecting NextWealth's commitment to local hiring and reducing migration from small towns. Most employees (85 percent) live within 25 kilometres of the centres, and the company provides transportation support in the form of cabs and buses. Nearly all employees live with their families, and all roles are open to everyone except night shifts, which have limited female participation.

Women's participation at NextWealth: During discussions with employees at NextWealth's Salem centre, many women shared challenges stemming from conservative family norms, including restrictions on mobility and work. Several women leave the workforce after marriage due to relocation or family disapproval of continued employment. Childcare and household responsibilities were also commonly cited as barriers to sustained work. Additionally, family imposed restrictions often prevent women from taking on projects involving night or early morning shifts. Despite these constraints, NextWealth has succeeded in maintaining a high level of women's workforce participation. Some of the guiding principles that ensure an enabling environment for women are elaborated below.

Trust and social networks: NextWealth builds trust with employees through open communication and collaboration across hierarchical levels. Juniors look to seniors for guidance, and managers often know employees' families well, with many relatives also working at the center. The company encourages local hiring and supports employees living with their families, hosting a 'family day' to involve relatives in the workplace. This approach fosters camaraderie, eases concerns, and instills pride especially important for many first-generation graduates and salaried employees helping them gain social and financial independence while staying connected to their families.

Comprehensive organizational policies: Nextwealth offers transportation options, work-from-home opportunities around pregnancy, early/late shifts options, along with free food and accommodation at the centre enabling women employees to feel safe and supported. Promotion mechanisms are centralised through a portal requiring formal applications and assessment processes. This ensures equal opportunity for all employees to be considered and reduces risk of biases in promotion cycles. They also provide a benefits package, including maternity leave and insurance.

Training and handholding support: NextWealth provides training and subsequent handholding support to ensure employees are able to carry out the work needed consistently. The company provides leadership training programs focused on building communication, confidence, team management, and customer service skills for emerging leaders. Women employees we interacted with reported having gained confidence and were able to communicate effectively due to this ongoing mentorship. These initiatives are supported by

ongoing feedback and follow-up surveys to measure behavioural and lifestyle improvements ensuring employee's wellbeing and standard of living.

Challenges and constraints: With AI/ML and GenAI workstreams now constituting the majority of NextWealth's operations and standard operating procedures are constantly evolving, often requiring rapid delivery within tight deadlines. This dynamic environment sometimes demands additional resources, placing pressure on the system and workers. With regard to the workforce, while women comprise the majority of entry-level hires, there is a significant drop off at middle and senior management levels. Policies such as limiting women from night shift roles may protect those facing work hour restrictions from families but can also limit opportunities for women who have flexibility and independence. It is important to note that since our field visit was at the Salem centre of NextWealth, our insights into operations at other centres across the country remain limited.

Future of AI work: The future of AI-related work presents both challenges and promising opportunities for organizations and data workers. Unlike traditional, long-term roles such as invoice processing or call centre work, AI projects tend to be short-term and dynamic, continuously evolving with new job roles emerging every day. Despite this, leaders at NextWealth believe that human involvement remains crucial, as AI relies on a blend of algorithmic processing and human judgment ensuring ongoing demand for skilled workers. The fine tuning of large language models and customized AI solutions for individual companies is estimated to generate significant employment, requiring employees to quickly adapt and learn new roles. Organizations like NextWealth function as extended teams of data scientists, prioritising quality over cost by managing complex AI tasks internally. Looking ahead, AI work is increasingly becoming decentralised and those organizations and workers who can adapt quickly, learn new AI roles, and operate flexibly will be at an advantage.

C. References

Academic & Scholarly Sources: Peer-reviewed Papers and Book Chapters

1. Aggarwal, S. C. (2022). The Status of Self-employed, Contract, and Gig Workers in India: Some Recent Changes. 37th IARIW General Conference. <https://iariw.org/wp-content/uploads/2022/07/Aggarwal-IARIW-2022.pdf>
2. B, S., & Pai, R. (2024). Digital Inclusion and Empowerment: Evaluating Key Enablers for Women Entrepreneurs in the Informal Economy through AHP. *Economic Sciences*, 20(2), 287-294. <https://doi.org/10.69889/c2e2ng54>
3. Bader, V., & Kaiser, S. (2017). Autonomy and Control? How Heterogeneous Sociomaterial Assemblages Explain Paradoxical Rationalities in the Digital Workplace. *Management Revue*, 28(3), 338-358. <https://doi.org/10.5771/0935-9915-2017-3-338>
4. Baiyere, A., Schneider, S., & Stein, M.-K. (2023). Digital Work: A Conceptual Clarification. *Proceedings of the 56th Hawaii International Conference on System Sciences*. <https://scholarspace.manoa.hawaii.edu/server/api/core/bitstreams/ada943f5-5d66-4730-b02d-75d7fbb8d59a/content>
5. Ben, E. R. (2021). Varieties of Digital Work. *Global Labour Journal*, 12(2), 177-190. 10.15173/glj.v12i2.3892
6. Bhandari, Y., Das, A., Kumar, P. (2025). Digital Literacy of the Indian Health Workforce: A Core Requirement for Healthcare Delivery in the 21st Century. *Journal of Surgical Specialties and Rural Practice* 6(1): 9-12, Jan-Apr 2025. DOI: 10.4103/jssrp.jssrp_6_25
7. Chatterjee, E., Desai, S., & Vanneman, R. (2019). "INDIAN PARADOX: RISING EDUCATION, DECLINING WOMENS'EMPLOYMENT." *Demographic research* 38 (2018): 855. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6424343/>
8. Cook, S., & Rani, U. (2024). Platform Work in Developing Economies: Can Digitalisation Drive Structural Transformation? *The Indian Journal of Labour Economics*. <https://doi.org/10.1007/s41027-024-00541-1>
9. Curry, E. (2016). The Big Data Value Chain: Definitions, Concepts, and Theoretical Approaches. In J. M. Cavanillas, E. Curry, & W. Wahlster (Eds.), *New Horizons for a Data-Driven Economy: A Roadmap for Usage and Exploitation of Big Data in Europe* (pp. 29-37). Springer International Publishing. https://doi.org/10.1007/978-3-319-21569-3_3
10. Deshpande, A., & Singh, J. (2021). Dropping out, being pushed out or can't get in? Decoding declining labour force participation of Indian women. *Working Papers 65*, Ashoka University, Department of Economics. https://dp.ashoka.edu.in/ash/wpaper/paper65_0.pdf
11. Durward, D., Blohm, I., Leimeister, J.M. (2016). Crowd Work. *Business & Information Systems Engineering*. DOI: 10.1007/s12599-016-0438-0
12. Galvez, A., Martinez, M., & Perez, C. (2012). Telework and work-life balance: Some dimensions of organizational change. *Journal of Workplace Rights*, 16(3-4), 273-297. <https://doi=10.2190%2FWR.16.3-4.b>
13. Grant, C. Russell, E. (2020). *Agile Working and Well-Being in the Digital Age*. Palgrave Macmillan.
14. Gupta, R., Nair, K., Mishra, M., Ibrahim, B., & Bhardwaj, S. (2024). Adoption and impacts of generative artificial intelligence: Theoretical underpinnings and research agenda. *International Journal of Information Management Data Insights*, 4(1), 100232. DOI: <https://doi.org/10.1016/j.ijime.2024.100232>
15. Hada, R., Husain, S., Gumma, V., Diddee, H., Yadavalli, A., Seth, A., Kulkarni, N., Gadiraju, U., Vashistha, A., Seshadri, V., & Bali, K. (2024). Akal Badi ya Bias: An Exploratory Study of Gender Bias in Hindi Language Technology. *The 2024 ACM Conference on Fairness, Accountability, and Transparency (FAccT '24)*, June 3-6, 2024, Rio de Janeiro, Brazil. <https://doi.org/10.1145/3630106.3659017>
16. Jain, S., Panjal, P., Sultan Ahmad, M., Ahmad Siddiqi, R., & Seth, A. (2024, December). Filter-in or Filter-out: Complexities and Implications of Content Moderation Processes in a Voice-based Participatory Media Platform in India. In *Proceedings of the 13th International Conference on Information & Communication Technologies and Development* (pp. 84-109). <https://dl.acm.org/doi/pdf/10.1145/3700794.3700804>
17. Jiang, L., Deng, X. N., & Wagner, C. (2024). Understanding the individual labor supply and wages on digital labor platforms: A microworker perspective. *International Journal of Information Management*, 79, 102823. DOI: <https://doi.org/10.1016/j.ijinfomgt.2024.102823>
18. Kelliher, C., & Anderson, D. (2009). Doing more with less? Flexible working practices and the intensification of work. *Human Relations*, 63(1), 83-106. <http://dx.doi.org/10.1177/0018726709349199>

19. Mehrotra, S., & Sinha, S. (2017), "Explaining falling female employment during a high growth period", *Economic and Political Weekly*. Vol. 52(39) https://www.researchgate.net/publication/352991689_Explaining_Falling_Female_Employment_during_a_High_Growth_Period
20. Muldoon, J., Cant, C., Wu, B., & Graham, M. (2024). A typology of artificial intelligence data work. *Big data & society*, 11(1), 20539517241232632. DOI: <https://doi.org/10.1177/20539517241232632>
21. Orlikowski, W., Scott, S. (2016). Liminal innovation in practice: Understanding the reconfiguration of digital work in crisis. Elsevier. <https://doi.org/10.1016/j.infoandorg.2021.100336>
22. Paul, P. K., Chatterjee, R., Das, N., Saavedra, R., & Jena, S. K. (2024). Digital divide & agricultural sector in Indian context—An overview. *International Journal of Social Sciences*, 13(2), 71–80. <https://ndpublisher.in/admin/issues/IJSSv13n2e.pdf>
23. Rani, U., Castel-Branco, R., Satija, S., & Nayar, M. (2022, December 07). Women, work, and the digital economy. *Gender & Development*, 421-435. <https://doi.org/10.1080/13552074.2022.2151729>
24. Samadder, S., Pandya, S. P., & Lal, S. P. (2023). Bridging the Digital Divide in Agriculture: An Investigation to ICT Adoption for Sustainable Farming Practices in Banaskantha District of Gujarat, India. *Int. J. Environ. Clim. Change*, 13(9), 1376-1384. DOI: 10.9734/IJECC/2023/v13i92367
25. Scott, K., Shinde, A., Ummer, O., Yadav, S., Sharma, M., Purty, N., Jairath, A., Chamberlain, S., LeFevre, E. A. (2021). Freedom within a cage: how patriarchal gender norms limit women's use of mobile phones in rural central India. *BMJ Global Health* 2021;6:e005596. doi:10.1136/bmjgh-2021-005596
26. Tewari, P. & Mehendale, S. G. (2023). Persisting misogyny: a gendered analysis of online harassment of Indian content creators on Instagram and its impact on mental health. *CARDIOMETRY*. 493-501. 10.18137/cardiometry.2022.25.493501. <https://doi.org/10.18137/cardiometry.2022.25.493501>
27. Tubaro, P., Coville, M., Le Ludec, C., & Casilli, A. A. (2022). Hidden inequalities: The gendered labour of women on micro-tasking platforms. *Internet Policy Review*, 11(1), 1-26. <https://doi.org/10.14763/2022.1.1623>
28. Varanasi, R. A., Siddarth, D., Seshadri, V., Bali, K., & Vashistha, A. (2022). Feeling Proud, Feeling Embarrassed: Experiences of Low-income Women with Crowd Work. *ACM Digital Library*. Retrieved June 11, 2025, from <https://dl.acm.org/doi/fullHtml/10.1145/3491102.3501834>
29. Wibowo, S., Deng, H., & Duan, S. (2022). Understanding Digital Work and its Use in Organizations from a Literature Review. *Pacific Asia Journal of the Association of Information Systems*, 14(3), 29-51. <https://doi.org/10.17705/1pais.14302>

Reports and White Papers

1. AMCHAM India & Uber. (2024). Shaping the future of work: How digital platforms are creating sustainable opportunities in the gig economy. AMCHAM India / Uber. <https://amchamindia.com/wp-content/uploads/2024/10/Shaping-the-Future-of-Work-How-Digital-Platforms-are-Creating-Sustainable-Opportunities-in-the-Gig-Economy.pdf>
2. Dewan, S., Krishnamurthy, M., & Taneja, D. (2022). Digitalisation and the Indian labour market: Trends, challenges, and opportunities. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. https://www.bmz-digital.global/wp-content/uploads/2022/09/GIZ_2022_Digitalisation-and-the-Indian-Labour-Market.pdf
3. Digital Futures Society. (2022). Global perspectives on women, work, and digital labour platforms. Digital Futures Society. Retrieved May 21, 2025, from https://digitalfuturesociety.com/app/uploads/2022/11/Global_Perspectives_on_Women_Work_and_Digital_Labour_Platforms.pdf
4. Digital Green. (2024). Annual Report 2024. Retrieved October 29, 2025, from https://digitalgreen.org/wp-content/uploads/2024/07/2024-Annual-Report_1_11zon.pdf
5. Fletcher, E., Pande, R. & Moore, C.T. (2017). Women and work in India: Descriptive evidence and a review of potential policies. Harvard Kennedy School. HKS Faculty Research Working Paper Series HKS Working Paper No. RWPI8-004. <https://www.hks.harvard.edu/publications/women-and-work-india-descriptive-evidence-and-review-potential-policies>
6. Ghosh, A and Ramachandran, R and Zaidi, M. (2022). Women Workers in the Gig Economy in India: An Exploratory Study. Available at SSRN: <https://ssrn.com/abstract=3944205>

7. GSMA. (2024). The Mobile Gender Gap Report 2024. https://www.gsma.com/r/wp-content/uploads/2024/05/The-Mobile-Gender-Gap-Report-2024.pdf?utm_source=website&utm_medium=button&utm_campaign=gender-gap-2024#:~:text=The%20widest%20gender%20gaps%20in,2022%20to%2031%25%20in%202023.
8. Gurumurthy, A., Zainab, K., & Sanjay, S. (2021). The Macro Frames of Microwork. IT for Change. Retrieved June 13, 2025, from <https://itforchange.net/sites/default/files/1739/The-Macro-Frames-of-Microwork-Full-Report-ITfC-2021.pdf>
9. Heeks, R., & Spiesberger, P. (2024). Constructing an AI Value Chain and Ecosystem Model. Manchester Centre for Digital Development Working Paper, 109. DOI: <https://dx.doi.org/10.2139/ssrn.4960510>
10. Ho, L., Jalota, S., & Karandikar, A. (2024, January 1). Bringing Work Home: Flexible Arrangements as Gateway Jobs for Women in West Bengal. Retrieved May 13, 2025, from https://steg.cepr.org/sites/default/files/2024-01/WP080_Ho_BringingWorkHome.pdf
11. Hung, K. H. (2024). A Case of Assessing the Working and Living Conditions of Data Workers in India's Global Artificial Intelligence Value Chains. SSRN. DOI: <https://dx.doi.org/10.2139/ssrn.4983127>.
12. ILO, (2021). The role of digital labour platforms in transforming the world of work. International Labour Organization. Retrieved April 28, 2025, from <https://www.ilo.org/publications/flagship-reports/role-digital-labour-platforms-transforming-world-work>
13. IWWAGE. (2025). The Changing World of Women's Work. IWWAGE. <https://iwwage.org/wp-content/uploads/2025/09/Summary-of-Findings.pdf>
14. Jain, N. Gupta, V. Garg, V. & Mehta, P. (2025). From Content to Commerce: Mapping India's Creator Economy. Boston Consulting Group. Retrieved October 07, 2025, from <https://www.bcg.com/publications/2025/india-from-content-to-commerce-mapping-indias-creator-economy>
15. Kapsos, S., Silbermann, A. & Bourmpoula, E. (2014). Why is female labour force participation declining so sharply in India?. International Labour Office. ILO Research Paper No. 10. https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@dgreports/@inst/documents/publication/wcms_250977.pdf
16. Kar, S. (2025). Social Assistance and Insurance of Gig Workers Under the Code on Social Security, 2020-A Jural Analysis. VSRD INTERNATIONAL JOURNAL OF JUSTICE AND LEGAL STUDIES, VOLUME-XI, ISSUE-III, MARCH, 2025. <https://dx.doi.org/10.2139/ssrn.5231495>
17. Kathuria, R., Kedia, M., Varma, G., Bagchi, K., & Khullar, S. (2017, December). Future of work in a digital era: The potential and challenges for online freelancing and microwork in India. Indian Council for Research on International Economic Relations . https://icrier.org/pdf/Online_Freelancing%20_ICRIER.pdf
18. Madgavkar, A. Manyika, J. Krishnan, M. Ellingrud, K. Yee, L. Woetzel, J. Chui, M. Hunt, V. & Balakrishnan, S. (2019). The future of women at work. In The future of women at work: Transition in the age of automation (Issue June). [https://www.mckinsey.com/~media/McKinsey/Featured Insights/Gender Equality/The future of women at work Transitions in the age of automation/MGI-The-future-of-women-at-work-Exec-summary.ashx](https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Gender%20Equality/The%20future%20of%20women%20at%20work%20Transitions%20in%20the%20age%20of%20automation/MGI-The-future-of-women-at-work-Exec-summary.ashx)
19. Mishra, D., Kedia, M., Reddy, A., Fernandez, C., Ramnath, K., & Vanguri, S. (2025). Estimation and Measurement of India's Digital Economy. Indian Council for Research on International Economic Relations (ICRIER) & Ministry of Electronics & Information Technology (MeitY). <https://www.meity.gov.in/static/uploads/2025/01/5ff397f9e8152d5562ed4cefla6b767b.pdf>
20. Mishra, D., Kedia, M., Reddy, A., Ramnath, K., & Vanguri, S. (2025, February). State of India's Digital Economy (SIDE) Report, 2025. ICRIER. https://icrier.org/pdf/State_of_India_Digital_Economy_Report_2025.pdf
21. NASSCOM & Arthur D. Little. (2024). India's digital public infrastructure: Accelerating India's digital inclusion. NASSCOM. https://community.nasscom.in/sites/default/files/publicreport/Digital%20Public%20Infrastructure%2022-2-2024_compressed.pdf
22. NASSCOM & BCG. (2024). AI Powered Tech Services: A Roadmap for Future Ready Firms. NASSCOM. <https://nasscom.in/knowledge-center/publications/ai-powered-tech-services-roadmap-future-ready-firms>
23. NASSCOM. (2021). Data Annotation: Billion Dollar Potential Driving the AI Revolution. NASSCOM. Retrieved May 15, 2025, from <https://community.nasscom.in/communities/ai/data-annotation-billion-dollar-potential-driving-ai-revolution>

24. NASSCOM. (2023). Advancing India's AI Skills: Interventions and Programmes Needed. NASSCOM. Retrieved September 17, 2025, from <https://community.nasscom.in/communities/data-science-ai-community/advancing-indias-ai-skills-interventions-and-programmes>
25. NextWealth. (2024). Social Impact Report 2024. Retrieved October 16, 2025 from <https://www.nextwealth.com/wp-content/uploads/2024/12/Social-impact-report-Overall-1.pdf>
26. NITI Aayog. (2022). India's Booming Gig and Platform Economy: Perspectives and Recommendations on the Future of Work. NITI Aayog https://www.niti.gov.in/sites/default/files/2022-06/25th_June_Final_Report_27062022.pdf
27. Oberai, D. Sinha, S. Rai, S. (2023). Women in STEM: Challenges and Opportunities in India. Policy brief. IWWAGE, LEAD at Krea University, The Quantum Hub. <https://iwwage.org/wp-content/uploads/2024/02/Women-in-STEM-Challenges-and-Opportunities-in-India-Report.pdf>
28. Rani, U., Castel-Branco, R., Satija, S., & Nayar, M. (2022, December 07). Women, work, and the digital economy. *Gender & Development*, 421-435. <https://doi.org/10.1080/13552074.2022.2151729>
29. Raghuram, P., Ruiz Ben, E., Sondhi, G., & Herman, C. (2017). Women and IT Scorecard—India, A survey of 55 firms. <https://doi.org/10.13140/RG.2.2.10118.98882>
30. Singh, N., & Murthy, G. (2023). On gig platforms, women workers face triple barriers to inclusion. CGAP. <https://www.cgap.org/blog/on-gig-platforms-women-workers-face-triple-barriers-to-inclusion>.
31. Sreerupa., Makkad, S., Rajeev, A. (2024). DIGITALISATION AT THE FRONTLINES: ASHAs' Experiences across Haryana, Rajasthan, Kerala, and Meghalaya. Institute of Social Studies Trust. <https://dx.doi.org/10.2139/ssrn.5169266>
32. Tapia, Catalina, Datta, Namita, R. (2023). Working Without Borders - The Promise and Peril of Online Gig Work: Short Note Series Number Four - From Informality to Inclusion : Harnessing Public-Private Partnerships to Enhance Social Protection Coverage of Online Gig Workers. World Bank. <https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099120623044512726/p17730203bf0350340ab6300f153f5399cc>

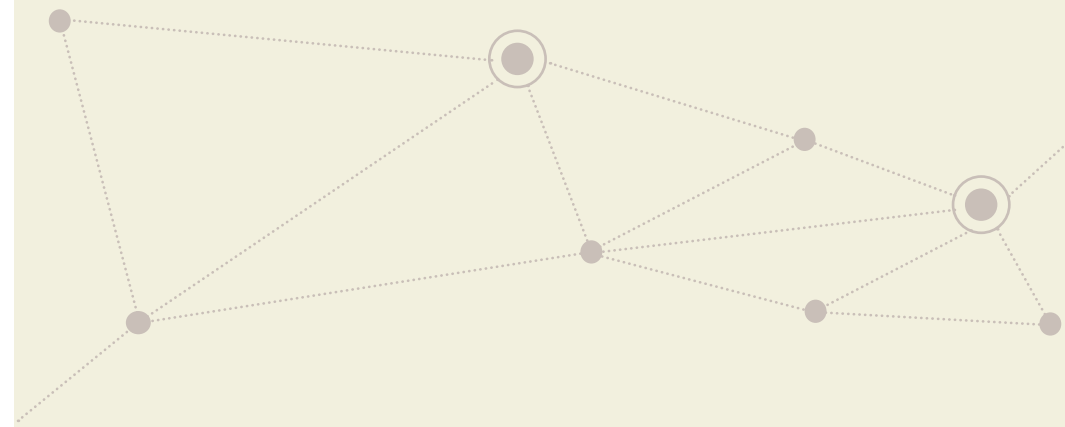
33. World Bank. (2055). The Global Opportunity in Online outsourcing. Retrieved October 07, 2025, from <https://documents1.worldbank.org/curated/en/138371468000900555/pdf/ACS14228-ESW-white-cover-P149016-Box391478B-PUBLIC-World-Bank-Global-OO-Study-WB-Rpt-FinalS.pdf>

Government Sources, Websites, and Survey Reports

1. Employability Enhancement & Livelihood Training Program [EELTP]. National Institute of Electronics & Information Technology (NIELIT). Ministry of Electronics and Information Technology, Government of India. Retrieved October 07, 2025, from <https://www.nielit.gov.in/ranchi/content/employability-enhancement-livelihood-training-program-eeltp-scsst-ewswomen-youth-through>
2. FutureSkills Prime. NASSCOM. Ministry of Electronics and Information Technology, Government of India. Retrieved October 07, 2025, from <https://www.futureskillsprime.in>
3. Mukhyamantri Digital Seva Yojana. Rajasthan Government. Retrieved October 07, 2025, from <https://itc.rajasthan.gov.in/pages/departement-page/1447>
4. National Language Translation Mission. BHASHINI. Retrieved October 07, 2025, from <https://bhashini.gov.in>
5. NIELIT, MeitY, Government of India. (n.d.). Overview of NDLM. NIELIT. Retrieved June 9, 2025, from <https://www.nielit.gov.in/ajmer/content/national-digital-literacy-mission>
6. Pradhan Mantri Formalisation of Micro Food Processing Enterprises Scheme. Ministry of Food Processing Industries, Government of India. Retrieved October 07, 2025, from <https://pmfme.mofpi.gov.in/pmfme/#/Home-Page>
7. Pradhan Mantri Kaushal Vikas Yojana. Ministry of Skill Development and Entrepreneurship, Government of India. Retrieved October 07, 2025, from <https://www.msde.gov.in/offering/schemes-and-services/details/pradhan-mantri-kaushal-vikas-yojana-4-0-pmkvy-4-0-2021-ITO3ATMtQWa>
8. Sanchar Shakti. Digital Bharat Nidhi. Department of Telecommunications. Ministry of Communications, Government of India. Retrieved October 07, 2025, from <https://usof.gov.in/en/sanchar-shakti>

9. Skill India Digital Hub. Ministry of Skill Development and Entrepreneurship, Government of India. Retrieved October 07, 2025, from <https://www.skillindiadigital.gov.in/home>
 10. Women Involvement in Science and Engineering Research (WISER). Retrieved October 07, 2025, from https://www.igstc.org/home/wiser_current_call
 11. Women's Empowerment Hub (WE Hub). Telangana Government. Retrieved October 07, 2025, from <https://it.telangana.gov.in/initiatives/wehub/>
 12. National Sample Survey Office (NSSO), Ministry of Statistics & Programme Implementation (MoSPI). (2024). Periodic Labour Force Survey (PLFS). Government of India.
 13. National Statistics Office (NSO), Ministry of Statistics & Programme Implementation (MoSPI). (2025). Comprehensive Modular Survey on Telecom — NSS 80th Round (January–March 2025). Government of India. https://www.mospi.gov.in/sites/default/files/publication_reports/CMST_report_m.pdf
 14. Telecom Regulatory Authority (TRAI). (2025). Indian Telecom Services Performance Indicator Report: Quarter April–June 2025. https://www.trai.gov.in/sites/default/files/2025-09/QPIR_03092025.pdf
 15. The Code on Social Security, 2020. (2020). The Code on Social Security, 2020. Ministry of Labour & Employment. Retrieved September 17, 2025, from https://labour.gov.in/sites/default/files/ss_code_as_introduced_in_lok_sabha.pdf
 16. Atal Innovation Mission. Government of India. Retrieved October 07, 2025, from <https://aim.gov.in/>
 17. National Sample Survey Office. (2024, October). Comprehensive Annual Modular Survey (CAMS) 2022-2023. National Sample Survey Office, 79th Round. Retrieved May 15, 2025, from https://www.mospi.gov.in/sites/default/files/publication_reports/CAMS%20Report_October_N.pdf
 18. Ayushman Bharat Digital Mission Dashboard. Retrieved October 07, 2025, from <https://abdm.gov.in/>
 19. India AI Mission. Retrieved October 07, 2025, from <https://indiaai.gov.in>
 20. National Digital Literacy Mission. Retrieved October 07, 2025, from <https://www.nielit.gov.in/ajmer/content/national-digital-literacy-mission>
 21. Swavalamban Yojana. Chhattisgarh Government. Retrieved October 07, 2025, from <https://sarangarh-bilaigarh.cg.gov.in/en/scheme/scheme-title-3-will-appear-here/>
 22. Women Entrepreneurship Platform. Retrieved October 07, 2025, from <https://wep.gov.in>
 23. Women Leadership in STEM. Retrieved October 07, 2025, from <https://www.womenlifthealth.org/southasia-india/2024-women-leadership-in-stem-cohort/>
 24. Yashoda AI. Retrieved October 07, 2025, from <https://yashoda.ai>
- Grey Literature: Digital and Media Sources, and Blogs**
1. Bhargava, N., & Sharma, M. (2025, May 01). The Plight of Gig Workers in India. The Wire. <https://thewire.in/labour/the-plight-of-gig-workers-in-india>
 2. Chakladar, S. (2025). 'Everyone's e-commerce': What women's enterprises need from ONDC. India Development Review. Retrieved October 07, 2025, from <https://idronline.org/article/diversity-inclusion/making-ondc-accessible-for-women-led-small-enterprises/>
 3. Chief Minister Work From Home- Job Work Yojana. Rajasthan Government.
 4. Desai, D. Narayan, D. (2025). Informality, Precarity, and Migrants: The Gaps in PLFS 2025. Observer Research Foundation. <https://www.orfonline.org/expert-speak/informality-precarity-and-migrants-the-gaps-in-plfs-2025>
 5. Du, M., & Okolo, C. T. (2025). Reimagining the future of data and AI labor in the Global South. Brookings. <https://www.brookings.edu/articles/reimagining-the-future-of-data-and-ai-labor-in-the-global-south/>
 6. Food and Agriculture Organization of the United Nations (FAO). (2023). World Food Forum: The pivotal role of Artificial Intelligence (AI) and digital tools in making agrifood systems climate resilient. Retrieved October 30, 2025 from [https://www.fao.org/newsroom/detail/world-food-forum--the-pivotal-role-of-artificial-intelligence-\(ai\)-and-digital-tools-in-making-agrifood-systems-climate-resilient/en](https://www.fao.org/newsroom/detail/world-food-forum--the-pivotal-role-of-artificial-intelligence-(ai)-and-digital-tools-in-making-agrifood-systems-climate-resilient/en)
 7. Gender x Digital hub., UCT., Johns Hopkins Bloomberg. & 2X Digital. (2024). Measuring Digital Access in Low- and Middle- Income Countries. Toolkit. Last accessed- 07.10.2025. <https://gxdhub.org/measuring-digital-access-in-low-and-middle-income-countries/>

8. IBM. SkillsBuild. Retrieved October 07, 2025, from <https://skillsbuild.org/>
9. Lehdonvirta, V. (2021, May 20). Introducing the Online Labour Observatory: Data on female participation in the remote gig economy and more. The iLabour Project. Retrieved May 26, 2025, from <https://ilabour.oii.ox.ac.uk/the-online-labour-observatory/>
10. Microsoft. (2021). SAP India and Microsoft launch tech skilling program for underserved young women across India. Retrieved October 07, 2025, from <https://news.microsoft.com/en-in/sap-india-and-microsoft-launch-tech-skilling-program-for-underserved-young-women-across-india/>
11. Mordor Intelligence. Data Labeling Market Size & Share Analysis - Growth Trends & Forecasts (2025 - 2030). Retrieved October 07, 2025, from <https://www.mordorintelligence.com/industry-reports/data-labeling-market>
12. Prabhu, S.& Basu, P. (2025, July 23). India's Gig Workers: Short-Term Contracts, Long-Term Questions. Observer Research Foundation. Retrieved September 16, 2025, from <https://www.orfonline.org/expert-speak/india-s-gig-workers-short-term-contracts-long-term-questions>
13. Press Information Bureau. (2024, December). India's Digital Revolution: Transforming Infrastructure, Governance, and Public Services. PIB. Retrieved June 9, 2025, from <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2024/dec/doc2024128467001.pdf>
14. Press Information Bureau. (2025). AI Careers for Women. Retrieved October 07, 2025, from <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2123510>
15. Press Information Bureau. (2025). Promotion of Agriculture through Artificial Intelligence Technology. PIB Delhi. <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2146922>
16. Stryker, C. What is human-in-the-loop. IBM Think. IBM. Retrieved October 07, 2025, from <https://www.ibm.com/think/topics/human-in-the-loop>
17. Thakur, A., Reshmi, B., & Mithra, P. (2024). Use of digital health applications by Anganwadi Workers in India: A scoping review (OSF Preprint). OSF.
18. Upadhyay, G. (2019). Sanchar Kranti Yojana: An accelerator program to connect rural sector to IT/Telecom sector with reference to Chhattisgarh State. International Journal of Computer Sciences and Engineering, 7(11), 49-53. https://www.ijcseonline.org/spl_pub_paper/NCRISC-11.pdf





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