

AI versus Metaverse: Which Better Serves Women's Economic Empowerment?

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Abstract: Artificial intelligence (AI) and the metaverse are both promoted as technologies that can accelerate women's economic empowerment in developing economies, yet the two place very different demands on the women they claim to serve. This paper compares AI and the metaverse specifically through the lens of women's livelihoods, enterprise growth, and financial inclusion, using Kabeer's empowerment framework – resources, agency, and achievements – to structure the comparison. Drawing on evidence from self-help-group (SHG) and microfinance-institution (MFI) digitalisation in India, documented AI-based credit-scoring pilots for women vendors, the GSMA Mobile Gender Gap Report, and emerging research on harassment in immersive virtual environments, the paper finds that AI is currently the more accessible and better-evidenced pathway to women's economic empowerment. AI tools run on the mobile phones women already use, are increasingly embedded in SHG-linked digital finance, and have documented pilot outcomes for women's credit access. The metaverse, by contrast, layers a gender-neutral cost barrier (hardware and connectivity) on top of a gender-specific safety barrier (documented, disproportionate harassment of women and girls in virtual reality environments), leaving its pathway to women's empowerment blocked well before the achievement stage. The paper closes with implications for MFIs, SHG federations, and enterprise-development practitioners on sequencing digital investment for women's inclusion.

Keywords: Women's Economic Empowerment; Artificial Intelligence; Metaverse; Microfinance; Self-Help Groups; Financial Inclusion; Gender Digital Divide

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Introduction

Women's economic empowerment – their ability to access, control, and benefit from economic resources and opportunities – remains a central concern of enterprise-development and microfinance practice in developing economies. Microfinance institutions (MFIs) and self-help groups (SHGs) have for decades been among the most effective vehicles for extending credit, savings, and enterprise support to women who are excluded from formal financial systems (Yunus, 2003; Ledgerwood, 2013). As digital technologies reshape how financial and enterprise services are delivered, two candidate technologies are now widely discussed as the next frontier: artificial intelligence (AI) and the metaverse. Much of the commentary on both technologies, however, is written from a gender-neutral or even implicitly male vantage point, and says little about whether either technology can actually reach the women whose economic empowerment is the stated goal.

This paper asks a focused question: of AI and the metaverse, which technology better serves women's livelihoods, enterprise growth, and financial inclusion in developing economies? The analysis is organised around Naila Kabeer's influential framework of empowerment as a process moving from resources, through agency, to achievements (Kabeer, 1999), and draws on documented evidence of AI use inside SHG- and MFI-linked digital finance, the GSMA's data on the persistent mobile gender gap, and a growing body of research on gender-based harassment in virtual-reality environments. The paper first summarises, as background, what AI and the metaverse are and how they relate to one another, before turning to the comparative analysis of relevance to women, and closing with implications for enterprise-development and microfinance policy and practice.

Conceptual Background

2.1 Artificial Intelligence and the Metaverse

Artificial intelligence refers to the process of teaching machines to make judgements from data with reduced human intervention, most commonly through machine learning and, increasingly, generative models capable of producing text, images, and conversation (Pattam, 2022). The metaverse, a term coined by Neal Stephenson, describes a shared virtual environment built on the convergence of the internet, blockchain, augmented reality, and virtual reality, in which users interact through avatars in real time (Rustaggi, 2023). AI functions largely as an enabling layer beneath the metaverse – generating content, powering avatars, and moderating interaction – but, importantly, AI also functions perfectly well on its own, delivered through ordinary smartphone apps, in a way the metaverse cannot (Rustaggi, 2023).

2.2 A Framework for Comparing the Two Technologies for Women

Kabeer (1999) conceptualises empowerment as unfolding across three interrelated dimensions: resources (the pre-conditions, including access to credit, information, and skills), agency (the process of decision-making, negotiation, and exercise of choice), and achievements (the outcomes, such as enterprise growth, income, and asset ownership). This framework is well suited to comparing AI and the metaverse because it asks not merely whether a technology is

powerful, but at which stage of the empowerment process – if any – it actually intervenes for women. Section 4 uses this framework to structure the comparison.

Current Applications: A Brief Background

AI and the metaverse are both being applied across healthcare, manufacturing, smart cities, gaming, e-commerce, and finance (Thien Huynh-The, 2022). Investment in metaverse infrastructure remains concentrated among large technology, gaming, and real-estate firms (Krishnan, 2024), while AI is being distributed far more widely through consumer messaging platforms and enterprise software. This asymmetry in who is building each technology foreshadows the asymmetry in who can use it, developed in Section 4.

AI versus Metaverse for Women's Economic Empowerment

This section compares AI and the metaverse against each stage of Kabeer's empowerment framework, drawing on documented evidence specific to women in developing economies.

4.1 The Gender Digital Divide as the Starting Point

Any comparison of AI and the metaverse for women must begin from the fact that women's baseline digital access is already lower than men's. The GSMA's Mobile Gender Gap Report 2026 finds that the gender gap in mobile ownership stood at 7% and in smartphone ownership at 13% in 2025, while women in low- and middle-income countries (LMICs) remain 12% less likely than men to use mobile internet, leaving 810 million women unconnected against 595 million men (GSMA, 2026). Earlier editions of the same report found that women who do get online are more likely than men to rely exclusively on a mobile phone rather than other devices, and cite affordability, safety, and digital-literacy barriers as reasons for using the internet less intensively than men once connected (GSMA, 2025; FinDev Gateway, 2025). Because this gap already exists at the level of basic mobile access, any technology that additionally requires costlier or more specialised hardware than a mobile phone widens the effective gender gap further.

4.2 AI and the Resources Stage: Credit, Bookkeeping, and Market Access

AI-based tools intervene most directly at Kabeer's resources stage. In India, the SHG-Bank Linkage Programme – the world's largest microfinance programme, covering 17.75 crore households, 83.52% of them exclusively women's groups – is increasingly integrating mobile banking, digital bookkeeping, and AI-enabled credit scoring into its delivery (Gender Studies, 2026; SRG-IJEMS, 2025). A documented pilot integrating AI-based credit scoring for microloans to informal women vendors in Karnataka improved loan access, though researchers also cautioned that algorithmic bias and uneven platform literacy can create new forms of exclusion alongside these gains, and called for digital-literacy bootcamps and SHG-based technology mentorship to accompany such tools (SRG-IJEMS, 2025). More broadly, gender disparities in the digitalisation of financial services in India have been shown to shape which women can benefit from fintech-enabled microfinance and which are left behind (Kulkarni & Ghosh, 2021). AI-enabled WhatsApp-based business assistants, now being extended to small businesses in India, offer a similarly low-cost channel through which women-led micro-

enterprises can automate customer engagement without new hardware investment (Meta, 2026).

4.3 The Metaverse and the Resources Stage: Where the Pathway Is Blocked

The metaverse has yet to demonstrate an equivalent, documented channel into women's resources at scale. The barrier is twofold. First, cost: entry-level VR headsets (around USD 300) and newer AR devices (upward of USD 3,000) sit far outside what a woman in an SHG or informal micro-enterprise could justify against the gender gap in mobile ownership already described (Trilligent, 2025; GSMA, 2026). Second, and specific to women, is safety. A systematic review of harassment in virtual reality found that marginalised users, including women, face disproportionate harm, with harassment witnessed by a large share of social VR users (CHI, 2026). Legal analyses of gender-based harassment in VR note that a large majority of female game players report having experienced online toxicity, some of it escalating to sexual harassment within immersive platforms, and argue that current safety tools remain inadequate to protect women and girls (The Verdict, 2024). Research on younger users similarly finds that girls are more likely than boys to be sexually harassed or targeted specifically because of their gender in metaverse environments (Hinduja & Patchin, 2026). For a woman entrepreneur or SHG member, these safety risks compound the cost barrier, further reducing the likelihood that the metaverse reaches her at the resources stage at all.

4.4 Agency and Achievements: Divergent Trajectories

At the agency stage – the exercise of financial decision-making and bargaining power – evidence on microfinance more broadly suggests that access to credit and income shifts women's household bargaining position, though this effect is context-specific and can be blunted where microfinance delivery itself reproduces existing gendered constraints (Radhakrishnan, 2018, as cited in *Advances in Consumer Research*, 2025). Where AI-enabled tools are layered onto existing SHG and MFI credit relationships, they inherit this documented, if uneven, pathway to agency. The metaverse has no equivalent documented pathway to agency for women in developing economies at present; its promised applications – virtual storefronts, immersive training – remain largely undocumented at the scale and population relevant to SHG and MFI clients (DBiM Insight, 2025). At the achievements stage, this means AI-enabled interventions already have a measurable, if partial, evidence base in enterprise growth and credit access for women, while the metaverse's contribution to women's achievements remains, on current evidence, largely prospective rather than realised.

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Figure 1. Comparative Pathways from Digital Access to Women's Economic Empowerment: AI (Resources → Agency → Achievements) versus the Metaverse (Constrained by Cost and Safety Barriers)

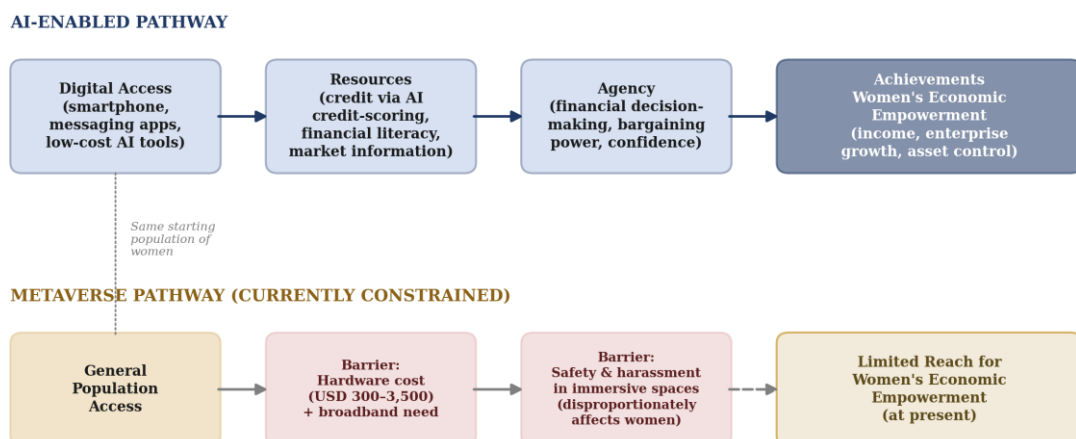


Figure 1. Comparative pathways from digital access to women's economic empowerment. AI-enabled tools move through Kabeer's resources – agency – achievements sequence via existing SHG/MFI and mobile channels; the metaverse pathway is presently constrained at the resources stage by cost and by documented safety risks that affect women disproportionately.

4.5 Comparative Summary

Table 1 summarises the comparison across the dimensions most relevant to women's economic empowerment specifically, rather than to common users in general.

Dimension	AI-Based Tools	Metaverse Platforms
Minimum hardware for a woman user	Basic smartphone or feature phone already used for messaging	VR/AR headset (USD 300–3,500) rarely owned by women in low-income households
Gender gap in access	Mobile ownership gap of 7% and mobile-internet-use gap of 12% globally in LMICs – real but narrowing	No large-scale ownership data yet, but cost and safety barriers compound the existing mobile gender gap
Documented use in women's economic empowerment	AI-based credit scoring for women vendors and SHG members; mobile bookkeeping; WhatsApp-based customer engagement for women-led MSMEs	Virtual storefronts and training pilots exist but remain small-scale and largely undocumented for low-income women

Dimension	AI-Based Tools	Metaverse Platforms
Institutional channel	Integrates with existing SHG-Bank Linkage and MFI digital infrastructure	No equivalent large-scale institutional channel for women's groups at present
Principal risk to women	Algorithmic bias in credit models; data privacy; digital literacy gap	Safety and harassment risks in immersive spaces; high cost may exclude women more than men within a household
Empowerment stage most affected (Kabeer framework)	Resources and Agency – direct, near-term effect on credit access and decision-making	Achievements – potential long-term effect, but pathway currently blocked at the Resources stage by cost and safety

Table 1. Comparative relevance of AI and the metaverse to women's economic empowerment in developing economies

Implications for Enterprise Development and Microfinance Practice

The comparison above suggests several practical priorities for MFIs, SHG federations, and enterprise-development practitioners working with women.

- Build on existing SHG and MFI digital infrastructure. AI-enabled credit scoring, bookkeeping, and customer-engagement tools should be layered onto the SHG-Bank Linkage Programme and comparable MFI channels, where trust and delivery infrastructure for women already exist, rather than introduced through new, unfamiliar platforms.
- Pair AI credit tools with bias audits and grievance redress. Because algorithmic credit-scoring pilots for women vendors have already surfaced bias and platform-literacy concerns, MFIs should combine AI adoption with human-oversight mechanisms and channels through which women borrowers can question an automated decision (SRG-IJEMS, 2025).
- Treat digital and AI literacy as core SHG curriculum. Given the documented mobile and smartphone ownership gaps, SHG federations and MFIs should budget for basic digital- and AI-literacy training as a precondition for tool adoption, not an optional add-on.
- Defer metaverse investment for women's programmes until safety and cost barriers are addressed. Development funders considering metaverse pilots for women's skills training or market access should require documented safety protocols against harassment and should recognise that hardware cost alone currently exceeds what most SHG members could justify.
- Disaggregate future evaluation by sex. Both AI and metaverse pilots should report outcomes separately for women and men, since aggregate accessibility figures can mask a gender gap that compounds at every additional stage of hardware, connectivity, and literacy requirement.

Limitations and Future Research

This paper is conceptual and synthesises secondary evidence rather than presenting new primary data; the comparative claims made here should be tested through field research with SHG members and women MSME owners across regions, castes, and income levels, since the Karnataka evidence on algorithmic bias suggests outcomes are unlikely to be uniform even within India. Future research could evaluate specific AI credit-scoring pilots for repayment outcomes and bias by gender, and could track whether metaverse hardware costs and documented harassment rates change as the technology matures, to establish whether the gap identified here is closing or widening over time.

Conclusion

For enterprise-development and microfinance institutions whose core mission is women's economic empowerment, AI and the metaverse are not equally ready technologies today. AI-enabled tools reach women through the mobile phones and SHG/MFI channels they already use, and are already producing documented, if imperfect, results in credit access and enterprise support. The metaverse remains blocked, for most women in developing economies, before it can even reach the resources stage of empowerment: by cost, and by a body of evidence showing that immersive virtual environments carry safety risks that fall disproportionately on women and girls. This does not foreclose a future role for the metaverse in women's economic empowerment, but it does mean that, on the evidence available today, MFIs and SHG federations should prioritise responsible AI adoption – with attention to bias and digital literacy – as the nearer-term and more equitable path, while treating metaverse investment for women's programmes as contingent on cost reductions and safety guarantees that do not yet exist.

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