https://doi.org/10.64211/oidaijsd191104

Designing Inclusive Learning Ecosystems for Marginalised Gig Workers in the Digital Economy towards Sustainability

Vasantha Shanmugam [1], Anitha Kulasekaran *[2], Narmadha K. [3]
[1] Department of MBA, Saveetha Engineering College, India.
[2] Meenakshi Academy of Higher Education & Research, India.
[3] School of Management Studies, VISTAS, India.
*Corresponding author: anitharamesh211@gmail.com

© Author (s)
OIDA International Journal of Sustainable Development, Ontario International Development Agency, Canada.
ISSN 1923-6654 (print) ISSN 1923-6662 (online) www.oidaijsd.com
Deposited in SSRN repository: https://ssrn.com/ssrn/

Abstract

Purpose

The growth of gig work has led to changes in the nature of work and skill requirements; however, many marginal gig workers remain excluded from engaging in valuable digital learning experiences. It is against this backdrop that this research attempts to provide a conceptual framework to understand the digital learning ecosystem of inclusivity and its application across different countries. Using previous studies, the paper constructs an inclusion theory for digital learning based on four pillars: Accessibility, Agency, Adaptability, and Accountability.

Design/Methodology/Approach

A mixed qualitative conceptual research design based on a PRISMA-informed integrative literature review of peer-reviewed articles and policy documents from 2013 through 2025 along with the conceptual framework study is planned to deepen the discussion of the concept. Thematic analysis of relevant literature has been used to identify the recurring patterns of digital inclusion, learning system and platform work. To illustrate the use of the proposed framework, a comparative qualitative analysis using secondary sources from India, the United States, and Kenya is carried out.

Findings

The results of this analysis indicate that all three groups of disadvantaged gig workers face comparable challenges including lack of access to information and communications technology (ICT), low institutional support, vague platform governance practices, and unfair opportunities for skills development. Nevertheless, the nature of the problems and their severity vary from one country to another: in India and Kenya, it is ICT-enabled and government-supported programs, while in the US it is affordability and inequality. In all cases, learning practices that combine formal learning, informal learning, and community support represent the best fit in terms of the gig work context to achieve sustainability.

Practical Implications

This framework provides tremendous value for the governments, platforms and educational organizations interested in creating inclusive ICT-based learning systems for the gig workers. The comparative study supplies the necessity of unified governance, adjusted learning techniques according to the locality, as well as uncomplicated and transparent accountability systems to facilitate fair access to lifelong learning.

Originality/Value

By integrating concepts from gig economy research, lifelong learning, and digital inclusion into a single ecosystem-based framework, this study contributes to the body of literature. It advances

knowledge of how inclusive learning ecosystems can be shaped to meet the needs of marginalised gig workers by combining conceptual development with comparative analysis across three national contexts. It also serves as a foundation for future empirical research and policy development.

Keywords: Digital inclusion, lifelong learning, gig economy, inclusive learning ecosystems, sustainability, platform work, and comparative analysis

Introduction

The fast growth of the platform-based work is an indicator of a structural change within contemporary labour markets. India, in its turn, is expected to achieve 23.5 million gig workers by 2029-30 (Economic Survey of India, 2024). Although such growth is witnessed, a significant number of gig workers, especially the low-income and rural ones, have no access to meaningful digital learning and skills development opportunities. According to the estimates provided by the World Bank, the number of online gig workers lies between 4.4 and 12.5 per cent of the global labour force, highlighting the magnitude of the group of workers whose means of livelihood is becoming more reliant on the digital platform. With the growth of platform-based work, the availability of continuous and inclusive learning has been at the forefront of the economic mobility of gig workers, even as the current learning systems are ill-suited to the informal, fragmented, and algorithmically mediated characteristics of gig work.

The gig economy has established itself as an important part of the global workforce because of digital platforms that provide ridesharing, delivery, and freelance options (Wood et al., 2019). Nevertheless, researchers believe that there is a digital divide of the gig economy beyond the access of physical facilities to include inequalities of skill, participation, and opportunity. Research into digital labour platforms also suggests that profit-based models and algorithmic forms of governance tend to be more efficient than empowering workers, supporting established marginalisation processes (Lutz, 2019).

In its turn, research starts to present inclusive learning ecosystems as the key connection between digitalisation and social equity (Sankararaman et al., 2024). These ecosystems combine formal learning, informal learning, and community-based sharing of knowledge towards more sustainable and inclusive access to learning opportunities. They can also contribute to participation and inclusion of marginalised gig workers in changing socio-technical settings, besides developing skills. The research study highlights the gig workers as the unconventional learners who are persistently excluded from national inclusive education contexts, though they are the key players of the digital economy. Nonetheless, the current literature is largely divided into two areas of interest despite this increasing interest: gig employment and digital inclusion (Wood et al., 2019). This has led to a lack of both theoretical and empirical insight into how digital forms of learning may be constructed to address the lived realities of precarious, informal and platform-based labour. To fill this gap, the paper suggests an integrative model based on four dimensions that are intertwined and interrelated, namely, accessibility, agency, adaptability, and accountability, and are conceptualised as an inclusive learning ecosystem of marginalised gig workers in the digital economy.

Research Objectives

The following objectives were framed for the study:

1. To theoretically examine how digital learning ecosystems shape Accessibility, Agency, Adaptability, and Accountability for marginalised gig workers, by integrating insights from digital inclusion, lifelong learning, and platform governance literatures.
2. To develop and advance a four-pillar (4A) inclusive learning ecosystem framework that explains inclusion as a systemic and governance-driven process rather than an individual learning outcome.

Literature Review

Digital Inequalities and the Gig Economy

The "digital divide" is often referred to as nations, provinces, individuals or groups, people, etc. that are entirely or slightly excluded from the returns of digital technology, has been the predominant lens used to explore the relationship between digital and inequality up to this point (Van Dijk, 2020). Nowadays, most people use some form of digital system. Digital inequality is defined by Kvasny (2006) as "the inequalities in the assembly of admission to and use of ICT" and "how ancient social dissimilarities outline beliefs and prospects regarding ICT and its impact on life chances." Unquestionably, this digital inclusion has benefited development, but it has also occasionally been connected to an upsurge in dissimilarity (Gurumurthy et al., 2019).

Gig workers frequently work in dispersed settings with no institutional support, which leads to unstable career and learning paths (Muntaner, 2018). Empirical research shows that algorithmic control and opaque data practices decrease worker agency and increase dependency, notwithstanding platforms' promotion of narratives of empowerment (Lutz, 2019). Studies highlight that in comparison with female rural workers, city gig workers are more exposed to online learning and upskilling options, as the female workers bump into operational hindrances such as meagre digital literacy and access to digital devices (Memon et al., 2025). A study conducted by Van Deursen and Van (2019) further exemplifies the complex nature of digital inequity, which highlights the technological gap in accessing the internet.

Inclusive Learning Ecosystems

While addressing diversity and equality, education can promote the development of understanding, abilities, mindsets, capacities, and standards necessary to support a just and sustainable future. The idea of an inclusive school, which aims to include these ideas into its organisational and pedagogical framework, is based on the idea of comprehensive and impartial education for all. The goal of inclusive education is to provide fair participation for all (Samaniego López et al., 2025). Opportunities, health, community and institutional resilience, sustainable economic growth, poverty reduction, and creativity can all be enhanced by a strong educational system (Bulathwela et al., 2024). To ensure operative education and lessen marginalisation both inside and outside of scholastic organisations, inclusive education is thought of as a process that seeks to identify and address the diversity of students' needs (Ruiz, 2015).. A change toward more flexibility to accommodate individual differences is necessary because inclusive education is founded on a set of ideals that support the teaching and learning process (Clavijo-Castillo & Bautista-Cerro, 2020).

Global standards and government regulations have developed to create inclusive systems, considering disparities from an all-encompassing perspective that definitely values the distinctive qualities of students, including variances in race, civilisation, sex, linguistics, religion, education styles, personal circumstances, and a range of skills

Despite ongoing concerns with impartiality, teacher preparation, and successful combination, studies conducted by (Haleem et al., 2022) insist on the radical effect of digitalisation on the scholastic system, especially in the wake of the COVID-19 pandemic, highlighting their capability to enhance learning and increase access to the internet. Tailored learning, which can be exclusively supportive for kids with functional diversity or distinct needs, is made possible by adaptive learning systems, which employ procedures to modify instructional content to each learner's distinctive needs (Isaeva et al., 2025). This expertise has the potential to significantly advance learning outcomes and involvement, but there also exist difficulties, such as the requirement for incessant training for instructors and reliance on adequate expertise infrastructure.

The volatile growth of the gig economy is mainly due to the rise of platforms like Amazon Mechanical Turk, Upwork, and TaskRabbit, where people looking for services and those who can supply them are matched (Van Doorn & Badger, 2020). Gig workers' assets on knowledge and information need to be identified for the effective creation of tailored inclusive learning, as they completely exploit the shifting labour, which also gets integrated into salient measures (Lenart-Gansiniec et al., 2025).

Inclusive Learning Ecosystem & Gig Workers

Agency in Inclusive Learning

Gig workers vigorously generate clusters and social networks that can reinforce shared activity (Pilatti et al., 2023). The talent of people to work together toward mutual objectives is known as collective agency. This is especially true when it comes to differing control appliances and promoting upgraded functional circumstances in the gig economy. These communities serve as an opportunity for information exchange, joint aid, and cluster stroke planning. According to Petriglieri et al. (2019) these workers create certain habitats to deal with their hazardous work characteristics. This suggests a type of group emotive and spiritual support that mitigates the isolating aspects of gig labour. He also states that these workers establish "holding environments"—compassionate networks and institutions that assist them in coping with the psychological strains of unstable employment Crayne and Newlin (2023). As scholars become more aware of the significance of psychological health and passionate well-being in gig work, this idea is becoming more popular. In terms of collective agency and worker resistance, the literature emphasises that workers manage to exercise agency despite platforms' dominant position. They create groups, exchange information, and devise tactics to combat some of the controlling and restricting elements of platform work. An algorithm's strict controls are lessened by this type of resistance (Bucher et al., 2021).

Crayne and Newlin (2023) investigate self-leadership in rideshare gig work and look at the role of employee agency in improving efficiency and job satisfaction despite the intellectual and corporal anxieties it imposes. It is important

to realize that while some employees thrive under self-management, others are compelled to leave because of the high level of difficulty and lack of conventional sustenance systems.

Adaptability in Inclusive Learning

The ability for learning ecosystems to evolve as labor markets shift is contingent upon their adaptability. Technical ecosystems need to find a balance between technological adaptation and human adaptability, according to the principles of Socio-Technical Systems Theory (Emery & Trist, 1965) and Complex Adaptive Systems Theory (Oniskovets, 2023).. Educational adaptability is hindered if novices do not have continuous exposure to adaptive learning ecosystems. Educators must rapidly adapt their instruction policies to meet the changing anxieties of their learners (Tsega & Ademe, 2024).

Digital assistance in the vibrant setting of gig platforms, which comprises not just the aptitude to use platform technologies as envisioned but also the aptitude to contemplate ingeniously when the online environment swings, breaks down, or does not meet their needs (Fiers, 2024). The gig economy, digitalisation, and the green transition are all causing significant disruptions to the global workforce and revealing significant skills gaps in important demographic groups. According to research studies, ASEAN governments must improve public-private collaboration, increase digital training, and create inclusive funding mechanisms that close skills gaps and prepare workers for a more dynamic economy to promote resilience and competitiveness Romora Edward Sitorus and Shrestha (2025).

Accountability in Inclusive Learning

The idea of a "digital ecosystem" describes an approach to inter-organisational collaboration involving multiple actors, driven and made possible by digitalisation in roughly organised connections (Bejjani et al., 2023) According to Guggenberger et al. (2025) data-driven inter-organisational collaboration facilitates the alignment of diverse participants by federating identification, trust, and policy services. Volz et al. (2025) in their research study highlight the need for the study of data governance as an essential lens for understanding how businesses may manage complexity, uphold belief, and endure to get value from statistics in consistent, vibrant settings like digital ecosystems. Tsaaro (2024) in their research study state that it is difficult for users to understand how the data is utilised and safeguarded because most gig economy companies lack the necessary transparency regarding their data privacy and protection policies. Establishing trust and responsibility requires clear and succinct privacy policies.

Accessibility in Inclusive Learning

Promoting accessibility and inclusiveness is essential to establishing an inclusive learning environment (Stefanic, 2025). For learners with disabilities to have equal opportunities, educational resources must be accessible (Beyene et al., 2023). According to the World Wide Web Consortium (W3C,2016) , accessibility is the ability of an item to be easily used by people with disabilities, whether they have assistive technologies. According to research, accessible learning resources can serve as a catalyst for guaranteeing and suggesting the assessment of learning technologies' accessibility to find and remove e-learning obstacles (Raja & Giannoumis, 2019).

Teachers may accommodate the varied needs of their students and advance fair learning opportunities by putting accessibility first. The goal of universal design for learning (UDL), a potent strategy, is to establish inclusive and accessible learning environments for every learner. UDL encourages equitable education and accessible learning environments that support each student on their educational journey by proactively developing instruction to address the different requirements of learners (Wilson, 2017). Giving gig workers access to training materials, workshops, and certifications will show that you are committed to their long-term development, which will increase their job satisfaction and fortify their loyalty to the company (Pontrelli, 2024).

Emerging Research Gaps

Though recent research persists on digital inclusion and platform work, there exist three major research gaps as follows:

- Research studies either explore digital inclusion or the gig workplace in isolation, and they fail to identify the association between the learning ecosystem & risky work structures.
- Very few studies explore the demographic factors that shape access to digital learning.
- Institutional and educational governance remain underexplored in most research studies on the gig economy.

Therefore, this research study addresses the above gap by structuring a four-pillar conceptual framework – Accessibility, Agency, Adaptability and Accountability, which intersects education, sociology, and digital governance to recommend a wide-ranging model for an inclusive learning ecosystem in the gig economy.

Theoretical Integration

Accessibility is influenced by Digital Divide Theory (Norris, 2001) and Sen's Capability Approach (Sen, 1999),Research on the digital divide highlights inequalities in access, skills, and outcomes. Self-Determination Theory (Deci & Ryan, 1985) and Critical Pedagogy (Freire, 1970), which emphasise learner empowerment, autonomy, and participation, form the foundation of agency. These theories highlight learning as a liberating and participatory process rather than just a top-down approach to skill compliance in the gig economy, where algorithmic management frequently limits worker choice. According to this framework, agency stands for both individual autonomy and the group's capacity to direct educational and professional paths.

Adaptability is the ability of the learning systems to respond to the fast-evolving needs of the current technology environment and learners' diversity, without creating a one-size-fits-all training solution. Adaptability is defined by Socio-Technical Systems Theory (Emery & Trist, 1965) and Complex Adaptive Systems Theory (Holland, 2006), as learning ecosystems are seen as an evolving dynamic structure in which technology, institutions and individuals interact and coevolve over time. Secondly, the concept of Accountability is drawn from Institutional Theory (DiMaggio & Powell, 1983) and Algorithmic Governance Theory (Yeung, 2018), whereby there is consideration of the effect of official or unofficial policies and norms in shaping individual perceptions and levels of trust towards each other.

Both perspectives frame accountability as a structural phenomenon that supports transparency, ethical data practices, and the sharing of responsibility among government, private, and educational entities—this has been largely absent from many learning models being tested in the gig economy.

Lastly, the four pillars have been synthesised considering major theoretical concepts, i.e. Connectivism, Inclusive Innovation Theory (Heeks, 2013), and Human-Centred Design (Costanza-Chock, 2020). Collectively, these frameworks view learning ecosystems as being composed of networked, participatory, and social justice-oriented components of the design process, where inclusion is actively at the forefront of thought and design rather than retroactively considered. Through the combination of these concepts, the 4A framework promotes an overarching ecosystem approach towards Inclusive Learning that links Education and Labour theories. The framework allows us to have a comprehensive understanding of how Digital Learning Systems can be created and governed to support Vulnerable Gig Workers within different countries.

Theoretical Framework: The 4A Model

This study uses a qualitative and exploratory design to build a theoretical framework for understanding how to develop inclusive learning ecosystems for marginalised gig workers. To do this, we analyse the common themes, structural issues, and governance challenges related to platform-based digital learning, and use them to build theory and synthesise concepts. The methodology consists of an integrative literature review of multiple disciplines (multi-disciplinary) between 2019 and 2025, using PRISMA guidelines to synthesise empirical, conceptual and policy studies. To increase the ability to generalise across cultures, a comparative qualitative analysis of secondary data from India, the US and Kenya was performed using six analytical dimensions. The findings led to the inductive development of a four-pillar (4A) Conceptual framework.

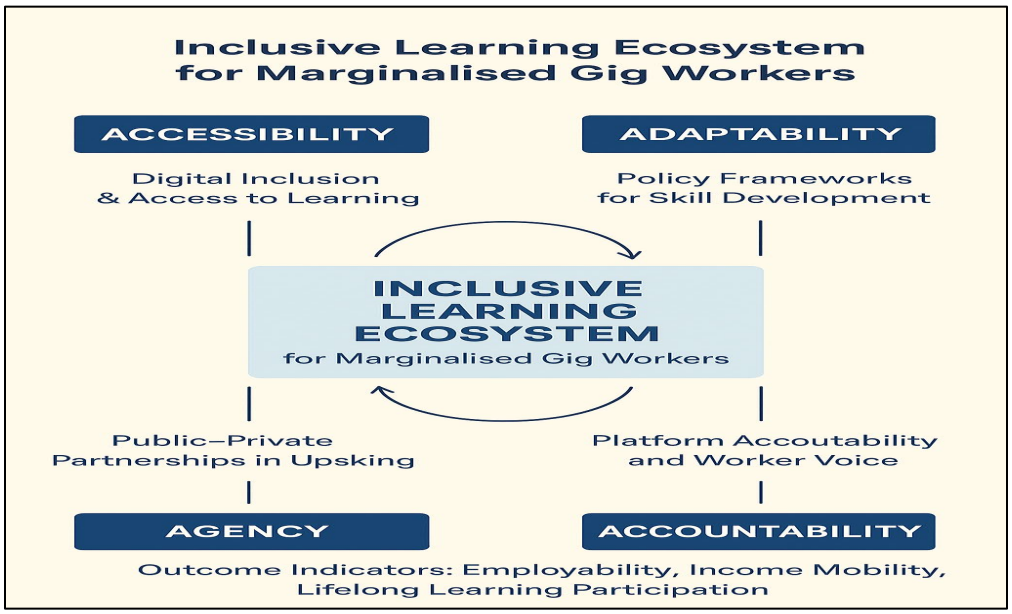
Teachers may accommodate the varied needs of their students and advance fair learning opportunities by putting accessibility first. The goal of universal design for learning (UDL), a potent strategy, is to establish inclusive and accessible learning environments for every learner. UDL encourages equitable education and accessible learning environments that support each student on their educational journey by proactively developing instruction to address the different requirements of learners .Giving gig workers access to training materials, workshops, and certifications will show that you are committed to their long-term development, which will increase their job satisfaction and fortify their loyalty to the company [44].

Accessibility is about how easy it is for gig workers who are struggling to find and use digital learning resources. Digital learning resources are things that can help people learn skills. Accessibility of learning resources means that these workers can actually find them, pay for them, and use them in a way that helps them. This is not about having a computer or a phone and being able to get online. It is also about being able to afford these things, knowing how to use them, being able to understand the language they're in and being able to use them even if you have a disability.

Accessibility of learning resources is very important for gig workers who are marginalised. Adaptability shows how learning systems handle changes in the job market and new technology and meet the different needs of gig workers.

The 4A framework (Figure 1) has a main part, and each part is based on ideas that people have thought about for a long time. Accessibility is one of these parts. It is based on the Digital Divide Theory and Sen's Capability Approach. These two ideas together tell us that access is not about having something but also about being able to use it to get what we want.

Figure 1: Inclusive Learning Ecosystem for Marginalised Gig Workers (Source: Authors)



The research is based on secondary data obtained from the International Labour Organisation (ILO), World Bank, Fairwork Foundation, and significant national policy reports. The study is going to assess six key variables related to digital inclusion, skill development programs, collaboration through public-private partnership, platform accountability, socio-economic issues, and employment effects.

Design/Methodology/Approach

This study implements an exploratory qualitative conceptual research design to develop a comprehensive framework for designing an inclusive learning ecosystem for marginalised gig workers within the digital economy. Given the emerging and multidisciplinary nature of the research problem, a combined literature review was selected as the most suitable methodological approach because it enables the synthesis of theoretical, empirical and policy-oriented evidence from diverse disciplines. The review was led in accordance with the Preffered Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to guarantee a transparent, systematic and replicable study selection process. Peer-reviewed journal articles, policy reports, institutional publications, and international organisation reports published between 2013 and 2025 were considered. To contextualize the proposed conceptual framework, a comparative qualitative analysis was commenced using secondary evidence from India, the United States and Kenya (Table 1). These countries were deliberately selected to represent diverse stages of digital platform development, labour market structures, and policy approaches toward gig work, thereby augmenting the comprehensiveness and practical relevance of the proposed framework.

As this study is conceptual in nature and is based completely on secondary evidence, the unit of analysis includes published scholarly literature, policy documents, and institutional reports rather than individual research participants. Accordingly, the review focuses on the systematic assortment and analysis of documentary sources instead of survey respondents. A summary of the research methodology is presented in Table 2.

Research Design

These criteria were as follows: Inclusion Criteria: 1) Peer-reviewed journal articles; 2) Written in the English language; 3) Addressed specific core research themes; 4) Published during the time frame selected. Exclusion Criteria: 1) Non-

peer-reviewed publications (n=10); 2) Conference papers, book chapters, editorials, and review notes (n=7); 3) Outside of the subject area (n=17). After evaluating the above criteria, a total of 133 studies met the definition of eligibility and were then included in the qualitative synthesis. Of these, 80 studies were selected as being relevant for bibliometric analysis and thematic analysis; these comprised the last group of studies for this review. The quantitative meta-analysis will not include any of the studies identified.

Table 1: Comparative Analysis Table

Indicator	India	United States	Kenya
Digital Inclusion & Access to Learning	Mobile saturation, but the rural digital divide remains. Programmes like Digital India and PMKVY 3 are aimed at ensuring digital literacy and inclusion.	Large online education infrastructure (Coursera, edX). However, racial and income inequalities prevent more people from participating in lifelong learning (Brookings Institution, 2023).	Mobile-first learning ecosystem delivered via Ajira Digital and eMobilis; a high level of youth involvement, but infrastructure constraints in depth (ILO, 2023)..
Policy Frameworks for Skill Development	Gig workers form a part of the National Policy for Skill Development (NPSD) and e-Shram database (NITI Aayog, 2022)..	Retraining is encouraged under the Workforce Innovation and Opportunity Act at the national level, and through state programs, but gig workers have sketchy coverage (U.S. DOL, 2022)..	Skills training has been incorporated in the national ICT policy through Ajira Digital Strategy and Digital Economy Blueprint (Government of Kenya, 2023)..
Public–Private Partnerships in Upskilling	Partnerships with NASSCOM FutureSkills, the industry who are collaborating under Skill India Mission (Fairwork, 2023)..	Robust corporate partnerships and microcredentialing programs with community colleges and platforms.	Partnerships between NGOs, donors and the private sector (Dalberg, 2023).. Initiatives supported by the Mastercard Foundation and GIZ.
Platform Accountability & Worker Voice	The Fairwork India rankings explicitly advocate transparency and fairer working (Fairwork, 2023)..	Heated discussion on platform regulation and worker classification; some local governments introduce piloting of benefits (OECD, 2024)..	Minimal worker voice; national groundswell of community and project supports for FAIR PAY and transparency (ILO, 2022)..
Socioeconomic Barriers (Gender, Rurality, Income)	Persistent gender gap in digital access; rural connectivity challenges restrict participation (ILO, 2022)..	Structural inequalities by race and income persist; low-income gig workers are underrepresented in upskilling programs (Brookings Institution, 2023)..	Rural youth and women benefit from mobile-first skilling, though device affordability remains an issue (Ajira Digital, 2023)..

Indicator	India	United States	Kenya
Outcome Indicators: Employability, Income Mobility, Lifelong Learning	Training improves digital literacy, but has a limited impact on income mobility due to credential recognition gaps.	Evidence shows moderate gains in employability for gig workers participating in certified upskilling (U.S. DOL, 2023)..	Participants in Ajira report enhanced employability, but sustainable income growth remains uncertain (Dalberg, 2023)..

PRISMA-Based Study Identification, Inclusion, and Exclusion Criteria

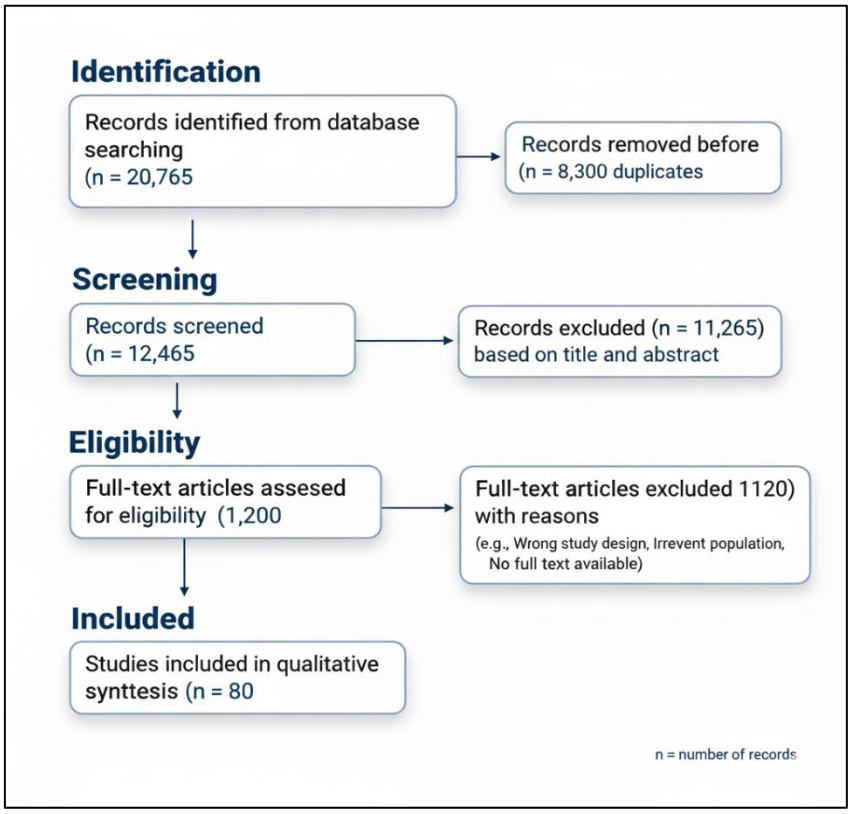
PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) was used as a systematic review guideline to ensure that the research could be replicated and made openly available (Figure 2). Using a standardised pre-validated form to collect the data, we were able to retrieve relevant information from each study, including the study design, the adherence level of the study to PRISMA, key findings related to rigour, and limitations. The potential for bias in the studies was evaluated using various instruments; AMSTAR 2 was applied. After categorising the findings of each study by the common themes of transparency, reproducibility, and practical challenges, a narrative synthesising the findings was created. Due to significant variations between the studies (heterogeneity), a meta-analysis was not practical.

The review period (2013-2025) was selected because it captures the advent and rapid development of digital labour platforms, the progression of gig work following technological advancements, and accumulative global attention towards sustainable development goals. Twenty-four thousand four hundred forty-five records were identified initially via several different academic databases. After duplicates were eliminated, as well as additional preliminary screening (based on English language, peer-reviewed journal articles, and relevance), a total of 482 records remained for title and abstract screening. At this time, 315 records were excluded from continuing with the next steps of the review because they were not relevant to the research objectives. A total of 167 full-text articles were further evaluated based on predetermined inclusion and exclusion criteria before they were determined to meet eligibility requirements and included in the analysis.

The final corpus of the studies was considered adequate because it achieved conceptual saturation, whereby repetitive themes relating to inclusive learning ecosystems, digital inclusion, policy interventions, and sustainable gig work constantly emerged across diverse geographical contexts. The inclusion of evidence from India, the United States and Kenya further strengthened the breadth and transferability of the conceptual framework by representing complete, incipient and emerging gig economy ecosystems.

Next page

Figure 2: PRISMA Framework



These criteria were as follows: Inclusion Criteria: 1) Peer-reviewed journal articles; 2) Written in the English language; 3) Addressed specific core research themes; 4) Published during the time frame selected. Exclusion Criteria: 1) Non-peer-reviewed publications (n=10); 2) Conference papers, book chapters, editorials, and review notes (n=7); 3) Outside of the subject area (n=17). After evaluating the above criteria, a total of 133 studies met the eligibility criteria and were included in the qualitative synthesis. Of these, 80 studies were selected as relevant for bibliometric analysis and thematic analysis, comprising the final group of studies for this review. The quantitative meta-analysis will not include any of the studies identified.

Data Quality Assurance and Bias Mitigation

To enhance the credibility, trustworthiness, and methodological rigour of the study, numerous measures were embraced to minimise potential biases associated with the selection and interpretation. First, the review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, which delivered a transparent and structured framework for identifying, screening, assessing and selecting relevant literature. Evidently defined inclusion and exclusion criteria were recognized before the review process to reduce selection bias and ensure consistency in screening of studies.

Furthermore, only peer-reviewed journal articles, policy documents, institutional reports, and publications from internationally recognised organisations published between 2013 and 2025 were reflected, thereby enhancing the reliability and academic quality of the evidence base. To minimise publication bias, literature was recovered from multiple scholarly databases and complemented with credible reports from governmental and international agencies wherever suitable. The inclusion of evidence from India, the United States and Kenya allowed methodological triangulation by incorporating perspectives from diverse socio-economic, technological and policy contexts. During the synthesis process, recurring themes and deviating viewpoints were critically examined rather than selectively reporting findings that reinforced the proposed framework. Contradictory evidence was also deliberated to ensure balanced interpretation and reduce confirmation bias. The conceptual framework was subsequently developed by assimilating consistent patterns emerging across multiple sources, thereby strengthening the validity, transparency,

and robustness of the study's conclusions while maintaining alignment with the principles of systematic evidence synthesis.

Data Analysis Procedure

Following the PRISMA – based screening process, the selected studies were exposed to a qualitative thematic analysis to identify recurring concepts, relationships, and emerging trends related to inclusive learning ecosystems for marginalized gig workers. Applicable information from each eligible study, including research objectives, methodological approaches, key findings, policy recommendations, and sustainability removed and organized to facilitate comparative analysis. The extracted data were subsequently coded into broad thematic categories, including digital inclusion, lifelong learning, digital skills development, platform-based employment, policy interventions, social protection, stakeholder collaboration, technological accessibility, and sustainable workforce development. Similar concepts recognized across different studies were grouped to identify common outlines, while contradictory findings were critically scrutinized to obtain a balanced understanding of the existing body of knowledge.

To support the contextual relevance of the proposed framework, a comparative qualitative analysis was commenced using secondary evidence from India, the United States and Kenya. These countries were selected because they characterize different stages of digital economy maturity, labour market characteristics, and policy responses to gig work. The cross-country comparison allowed the identification of transferable best practices as well as context-specific challenges influencing inclusive learning ecosystems. Finally, the synthesised themes, comparative insights, and sustainability-oriented evidence were combined to develop the proposed conceptual framework. This analytical approach ensured that the framework was grounded in existing empirical and theoretical evidence while simultaneously addressing gaps in the literature concerning digital inclusion, workforce resilience, and sustainable development within the rapidly evolving economy.

Table 2: Summary of Methodological Framework

Component	Description
Research Design	Exploratory Qualitative Study
Review Method	Integrative Literature Review
Reporting guidelines	PRISMA
Data Sources	Peer-reviewed articles, policy documents and institutional reports
Study period	2013-2025
Geographic Context	India, United States, Kenya
Data Analysis Technique	Qualitative thematic analysis and comparative analysis
Framework Development	Synthesis of recurring themes and cross-country evidence

Findings and Interpretation

In India and Kenya, people are using phones to learn new things, and the government is helping them with special programs to teach digital skills. This is especially helpful for people who do not have jobs and for young people. Learning is difficult to sustain due to the poor quality of the internet connection and the lack of content in the local

language.The first initiative and digital literacy are not a concern in the US since the digital infrastructure in the US is adequate. The main problem in the US is that accessing learning is difficult because of the high cost of learning and the lack of time. Also, some people are treated unfairly because of their skin colour or the amount of money they have, which makes it even harder for them to learn, and this is related to mobile-first initiatives and state-supported digital literacy programmes in India and Kenya. These findings show that we need to think about access in a way. Access is not about having technology available. It is about being able to use resources to learn new things and earn a living. This is what the Capability Approach is about. We need to understand that digital resources must lead to learning and livelihood outcomes, especially when we talk about the Capability Approach and access to digital resources.

Learning is important for people who work on a gig basis. The thing that helps them learn and keep learning is being able to adapt. Some people made a study. They found out that it is helpful to have learning programs that are flexible. This means that people can learn in parts, like little chunks, and they can get special certificates for each chunk they finish. This is good because gig workers often have schedules that are not regular. They might have to work at times, and they might need to learn new skills quickly. In the United States, companies are issuing certificates that are just for certain jobs. In India and Kenya, the government and private companies are working together to make learning programs, and they are also getting help from donors. The findings are important for people who make policies, companies that own platforms and people who teach. These policymakers should work together to create rules that consider gig workers as people who are learning new things throughout their lives. The companies that own platforms should make sure people are involved in designing their learning programs so that it is clear what people are learning and that everyone takes responsibility for helping people learn skills. If we put money into community learning centres and make sure people can use these programs on their phones, we can help people who do not have the opportunities as others to learn and get better jobs.

Figure 3: Distribution of Research by Continent

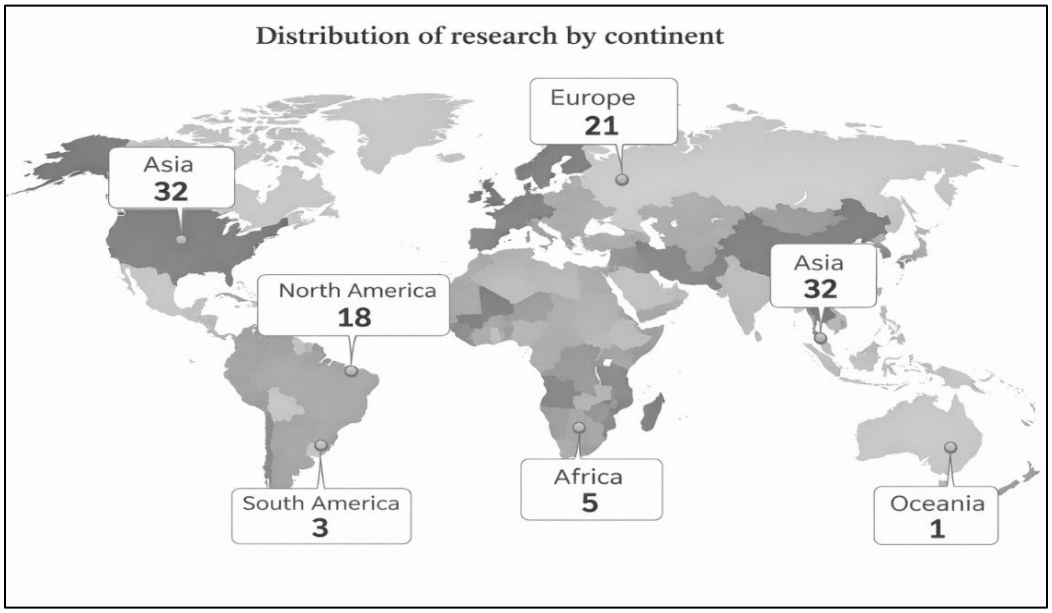
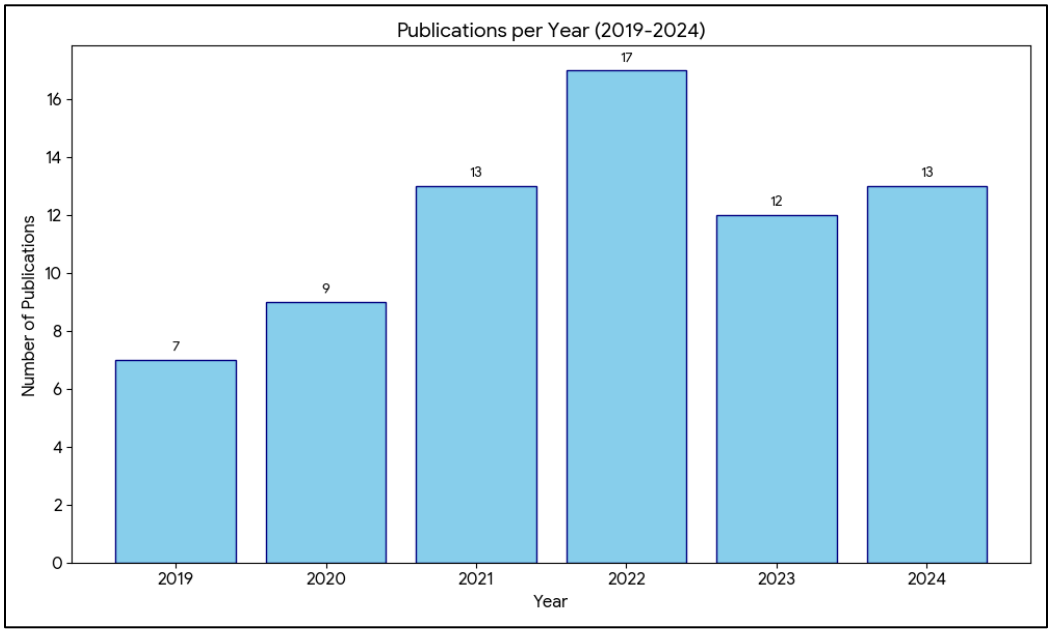


Figure 3 indicates the worldwide dispersion of scholarly research across regions, giving a visual representation of contributions to the body of knowledge from each region. Right away, it is apparent that Asia has produced the greatest number of studies (32). This growth is made possible by the significant increase in the number of research institutions throughout Asia, as well as increased government and private funding for scientific research. Europe is the next highest producer of studies (21), followed closely by North America (18). North America's numbers demonstrate its prominence in higher education, research funding, and technological development. By contrast to these three regions, Africa has produced a total of five studies, and South America has produced three (3). Low levels of funding, lack of physical availability of research facilities/equipment, and inequitable distribution of services and opportunities can all contribute to the lower levels of output seen in Africa and South America. Oceania has the smallest output in one study, largely because of its smaller population and its fewer research institutions.

Overall, there is considerable variance in the distribution of global research output by region; Asia, Europe, and North America dominate in terms of the volume of research they produce. Greater international cooperation, collaboration, and investment in the development of the research capacity of underrepresented regions must take place before more equitable access to knowledge can take place globally.

Figure 4: Distribution of Publications Year Wise



From Figure 4, it is evident that the publications of inclusive learning ecosystems were high in 2022, with 17 papers, and then 13 papers each in the years 2021 & 2024.

Next page

Table 3: Mapping the Key Findings to SDG

Major Finding	Sustainable Development Contribution	Relevant SDG
Digital Literacy Programs	Improve access to lifelong learning and digital competencies	SDG – 4 Quality Education
Inclusive Learning Ecosystem	Enhance employability and decent opportunities	SDG – 8 Decent Work and Economic Growth
Accessibility	Reduce inequalities in access to education and employment	SDG – 10 Reduced Inequalities
Digital Infrastructure and innovation	Support resilient and inclusive digital economies	SDG – 9 Industry, Innovation and Infrastructure
Institutional Collaboration	Strengthen partnership for sustainable workforce development	SDG – 17 Partnerships for the goals
Accountability	Improve transparency, worker protection, and inclusive policy implementation	SDG -16 Peace, Justice and Strong Institution

The findings presented in Table 3 validate that the proposed inclusive learning ecosystem framework adds to multiple dimensions of the sustainable development by bring into line its core component with UN SDG. Jointly these findings establish that inclusive learning ecosystems are not merely educational intrusions but strategic enablers of sustainable, equitable, and resilient workforce development within the digital economy.

Discussion

Institutional Support and Policy

To make sure everyone can learn and grow together, we need to have systems in place. When the government does not support these systems projects that are started by non-profit organisations or private companies that make educational technology often struggle to make a real difference. We have observed that having the government as a lead and initiating programs to train people on technology and relating these programs to how we can assist those in need and impart new skills to help the needy is much more helpful in including all. The state-initiated digital literacy initiatives are actually significant in ensuring that everybody is granted the opportunities. The major one, to assist people learn and developing collectively, is through digital literacy programs. As an example, platform firms, government agencies, and higher education institutions have worked together to design a scalable system for women, gig workers, and informal labourers in urban areas. But such problems as lack of coordination, outdated policy, and shortage of non-discriminatory methods of monitoring remain. Based on research, there should be coherent national strategies that facilitate the allocation of funding to digital infrastructure and recognition-based credentials, such as micro-certifications or digital badges, to make gig workers an acknowledged part of the lifelong learning programs.

The findings validate that the institutional support and policy coordination are important drivers of sustainable development within the digital gig economy. Government led digital literacy initiatives, labor protection policies, and collective partnerships between educational institutions and digital labor platforms significantly enhance learning accessibility and workforce resilience. These interventions subsidize to sustainable development by reinforcing human capital, endorsing lifelong learning and reducing socio economic inequalities among marginalized gig workers. Therefore, attaining sustainable development requires integrated policy frameworks that combine digital

infrastructure, inclusive education, labour market regulation and socio protection mechanisms within a coordinated governance approach.

Skills in Future Workplaces

As per the synthesis, job-specific skills were substituted with transferable and future-oriented skills. Digital, cognitive, and socioemotional skills are increasingly becoming important for work in the gig economy. The gig workers are forced to contend with the algorithms, manage their online identities, and adapt to constantly evolving technologies. Learning programs with a mixture of technical upskilling, such as data literacy and digital marketing, and soft skills, such as communication, self-management, and resilience, has the highest long-term outcomes. A number of innovative frameworks combine lifelong learning structural frameworks to encourage continuous interaction by piling up learning trajectories and micro-credentials. The application of AI in learning analytics further enhances personalised learning experiences and identifies learner gaps, enabling adaptive learning and broader access to digital content (Catherin et al., 2025). In order to make future work learning ecosystems inclusive, flexibility, adaptability and recognition of informal learning experience are necessary.

The findings further highlight that future workforce sustainability depends on continuous learning, digital adaptability and lifelong skill development rather than gaining of static technical competencies Anitha, K. (2024). As digital platforms increasingly transform employment structures, gig workers require opportunities to continuously upgrade their digital, entrepreneurial and socio- emotional skills to remain competitive within the evolving labor market. This adds directly to sustainable development by enhancing employability, supporting decent work, and cultivating workers capacity to adapt to technological disruption.

Integrative Synthesis: The PRIMA–Inclusive Learning Ecosystem Framework

The PRIMA-Inclusive Learning Ecosystem Framework is an interconnected framework with 3 dimensions made up of the cross-analysis of the 4 themes:

Technological Inclusion: Providing every gig worker with an accessible, flexible and affordable learning environment.

Pedagogical Innovation: Utilising the flexibility, situational, learner-based learning designs that honour diversity.

Integrating Policies: This is a triadic model of effecting a change—from projects that help people to a big plan that helps everyone. This big plan gives people who work jobs and are not treated fairly the chance to learn new things all the time. The triadic model gives these workers, who are often marginalised gig workers, continual and worthwhile learning chances.

The proposed PRISMA – Inclusive Learning Ecosystem framework advances current understanding of sustainable development by integrating multiple dimensions of workforce learning into a coherent conceptual model. The framework provides both a theoretical contribution and a practical roadmap for policymakers seeking to achieve sustainable development through inclusive learning system.

The Four Pillars of Inclusive Learning Ecosystems

The review of studies and reports from 2013 to 2025 shows that learning systems for gig workers who are marginalised are made up of four parts: Accessibility, Agency, Adaptability and Accountability of these learning systems. These parts are found in the three countries that were studied India, the United States and Kenya. The strength of these parts and the support they get from institutions are very different in each country. The following discussion will look at the points from these parts and put them into the bigger picture of what experts think and what policies say about learning systems for marginalised gig workers and the role of Accessibility and Agency, Adaptability and Accountability, in these learning systems.

Accessibility: Expanding Entry Points to Learning

Accessibility is the thing that is needed for people to be included in digital learning ecosystems. The internet and smartphones are being used by people around the world. The problem is that some people, like workers who do small jobs, are still facing problems. They cannot afford to pay for the internet or smartphones. Some of them do not know how to use these things. The language used on the internet is also a problem for them. The quality of the internet connection is not good in some areas. Such a situation is particularly true for women, rural population, and low-income earners. Thus, accessibility remains a concern among such populations.

People in India and Kenya are actively engaging with mobile devices for acquiring education on digital skills. The government plays its role and launches special programs. Such initiatives prove to be very effective since they are targeted at unemployed individuals and youths. Still, people continue experiencing challenges associated with poor-quality Internet connection and lack of appropriate local content for training. The situation in the US proves to be a bit different. While first initiatives and digital literacy programs remain non-issues due to excellent digital infrastructure in this country, the problem lies in lack of opportunities for people to access education due to high costs and limited time. Moreover, discrimination based on ethnicity or socio-economic status becomes a real challenge for individuals' ability to acquire necessary skills. In other words, the findings show the necessity to address the concept of access in terms of opportunity. Indeed, access does not mean availability of technologies. Rather, it involves accessing resources that can help learners gain skills and earn money. This approach is described by Capability Approach.

Agency: Participation without Power

The agency of workers becomes particularly important in relation to learning ecosystems, which are currently available to use. As far as learning in gig economy is concerned, most often, it is the responsibility of the platform to decide and define what training will be conducted and who will benefit from it. In other words, workers have very little opportunities to influence both the speed of their training, type of credentials they might acquire and content of such courses. It would seem that training itself is perceived as a duty of workers themselves, who have to perform the task alone.

As far as workers' personal experience can be seen, they make attempts to take their lives into own hands, using networks of friends and other unofficial groups as platforms for sharing their experience and dealing with difficult situations. Such networks allow workers to exchange knowledge, become more confident and develop strategies, which will help them cope with challenges that they face. However, the lack of official recognition makes these experiences not only invisible, but also useless in career advancement. All gig workers need them to feel empowerment. That is what they are claiming, based on their experience with the process of learning and self-governance through Critical Pedagogy and Self-Determination Theory.

Adaptability: Learning for a Shifting Labour Market

Learning is really important for people who work on a gig basis. The thing that helps them learn and keep learning is being able to adapt. Some people made a study. They found out that it is really helpful to have learning programs that are flexible. This means that people can learn in parts, like little chunks, and they can get special certificates for each chunk they finish. This is good because gig workers often have schedules that're not regular. They might have to work at times, and they might need to learn new skills quickly. In the United States, companies are issuing certificates that are just for certain jobs. In India and Kenya, the government and private companies are working together to make learning programs, and they are also getting help from donors. Learning is not about using technology. It is also about being able to fit in with the people and culture around us. This means we need to make sure the things we learn are relevant to where we live. We should be able to get help in our language. It is good to have people from our community to guide us. When we combine teaching with learning from our friends and getting help when we need it seems to work better for people who use online platforms for work.

Accountability: The Missing Pillar

The accountability is that it is not really developed in the initiatives that were looked at. There is not a lot of clarity about what the platform is responsible for when it comes to helping workers get better at their jobs, taking care of data and making sure people are learning what they need to. A lot of the time, the platform gets to have workers who're good at their jobs, but the platform does not do much to help the workers get better. This means that the workers must take care of learning things on their own, which is not fair. There are a lot of rules and ideas. Like the Fairwork principles. Those who are trying to make things better. There is now discussion on the regulation of platforms. This indicates that there is an increasing awareness of the issues surrounding the governance structure. The problem lies in the inconsistent enforcement of these regulations in different parts of the world. The key learning point from this issue is that there should be mechanisms for accountability and transparency in all the parties involved. This includes the provision of truthful information regarding data usage. There is also the need for collaborative efforts among all stakeholders involved.

Collectively the four pillars illustrate that sustainable learning ecosystems cannot be recognized through isolated educational initiatives alone. Instead, sustainable development depends upon the simultaneous collaboration of accessible learning opportunities, worker empowerment, adaptive skill development, and accountable institutional

governance. The comparative proof from India, the United States and Kenya demonstrates the weakness in any single pillar reduce the effectiveness of the entire ecosystem regardless of technological advancement or policy investment. Accordingly, the proposed framework highlights the prominence of adopting a systems based approach in which governments, digital platforms, educational institutions, employers and community organizations share accountability for creating equitable learning environments that promotes lifelong learning, workforce resilience, and inclusive economic participation.

Integrative Insights: Learning as an Ecosystem

When looking into all we have discovered, you can easily identify the connection between the four pillars that form an interdependent system, rather than stand separately. The first pillar allows participation, and if the person does not have any kind of control over the process, they may find no use in accessibility. Adaptability ensures that what we are doing is relevant, yet without any responsibility behind it, we will continue to repeat the same mistakes and create the same discrimination as before. Accountability is crucial, but it cannot work if there is no proper coordination or institutions acting ethically enough. Together, the four pillars create a dynamic system, where access allows the opportunity, agency provides choices, adaptability keeps everything relevant, and accountability institutionalizes fairness and trust.

This research is significant to policy makers, platform owners, and educators. Policy makers need to collaborate with one another and create regulations taking into account that gig workers are lifelong learners. Platform owners need to make sure that individuals are involved in developing learning initiatives so that it will be clear what is being learned by these individuals, and everyone needs to take ownership of supporting skill acquisition. If we invest resources into community learning centers and ensure that these services can be accessed via mobile applications, then we will be able to assist underprivileged individuals in acquiring skills and improving their employability.

7. Implications for Policy, Practice, and Research

The findings are important for people who make policies, companies that own platforms and people who teach. These policymakers should work together to create rules that consider gig workers as people who are learning new things throughout their lives. The companies that own platforms should make sure people are involved in designing their learning programs so that it is clear what people are learning and that everyone takes responsibility for helping people learn skills. If we put money into community learning centres and make sure people can use these programs on their phones, we can help people who do not have the opportunities as others to learn and get better jobs.

Conclusion

This study examined the design of inclusive learning ecosystems for marginalized gig workers by synthesising the evidence from India, the United States, and Kenya through an integrative literature review guided by the PRISMA framework. The primary objective was to classify the contributions and challenges associated with sustainable development within rapidly digital gig economy and to develop a conceptual framework capable of supporting inclusive and lifelong learning opportunities. The findings demonstrate that sustainable development in the gig economy extends beyond providing access to digital platforms; it requires the formation of equitable learning ecosystems that strengthen workers' capabilities, improve employability, reduce socio-economic inequalities, and endorse long-term workforce resilience. The comparative analysis revealed that the efficiency of learning ecosystems depends on the interaction of four interrelated pillars – Accessibility, Agency, Adaptability, and Accountability. While all three countries have made prominent development in expanding digital learning countries through technological innovation, digital literacy initiatives, and cross-sector collaborations, significant disparities remain in institutional support, policy coordination, affordability of learning opportunities, recognition of informal learning, and platform accountability. These challenges continue to limit the ability of maginalised gig workers to participate fully in sustainable economic development.

Accordingly, the proposed PRISMA Inclusive Learning Ecosystem Model establishes that sustainable development cannot be attained solely through technological advancement; rather it requires integrated governance mechanisms that endorse inclusive education, social protection, equitable access to skills development and collaborative partnerships among governments, digital labour platforms, educational institutions, civil society organizations and employers. The study donates to the growing body of literature on sustainable development by extending the discussion from fragmented learning interventions toward a holistic ecosystem perspective. The proposed framework advances understanding by illustrating how coordinated institutional arrangements can simultaneously support SDG – 4 (Quality Education), SDG - 8 (Decent Work and Economic Growth), SDG -10 (Reduced Inequalities) and SDG - 17 (Partnerships for the Goals). By assimilating learning accessibility with worker agency, adaptive skill development,

and institutional accessibility with worker agency, adaptive skill development, and institutional accountability, the framework provides policymakers, platform organizations, educational institutions, and workforce development agencies with a hands-on roadmap for creating inclusive digital learning environments capable of enhancing both individual well-being and sustainable labour market outcomes. To augment the credibility of the findings, numerous measures were adopted to mitigate potential internal biases associated with secondary data. The literature review followed the PRISMA guidelines using predefined inclusion and exclusion criteria, confirming a transparent and systematic study selection process. Evidence was drawn from peer-reviewed journal articles, policy documents, institutional reports, and international publications published between 2013 and 2025, thereby reducing selection bias and improving the reliability of the synthesized evidence. Furthermore, comparative analysis across India, United States and Kenya enabled methodological triangulation by joining diverse social-economic and policy contexts rather than relying on a single national perspective. Throughout the synthesis process, both convergent and divergent findings were critically inspected to minimize confirmation bias and ensure balanced interpretation. Accordingly, the conclusions presented in this study are derived from recurring patterns consistently identified across multiple credible sources rather than isolated findings, thereby strengthening the robustness and trustworthiness of the proposed conceptual framework.

Despite these assistances, the study is subject to certain limitations. As a conceptual investigation based on the secondary evidence, the outcomes are dependent on the availability and quality of the published literature and policy documents. Although the comparative approach enhances contextual understanding, the framework has not yet been empirically validated through primary data collected from gig workers or other stakeholders. Future research should therefore commence longitudinal and cross-national empirical studies to examine the applicability of the proposed framework across different digital labor markets. Additional research may also investigate emerging issues such as artificial intelligence enabled personalized learning, platform governance, digital credentialing systems, gender disparities among gig workers, and the long-term influence of inclusive learning ecosystems on sustainable development outcomes. Such investigations would further reinforces evidence-based policymaking and add to the development of resilient, equitable, and sustainable digital economies.

Acknowledgement

The authors declare that no financial support, grant, or funding was received from any public, commercial, or non-profit organization for the conduct of this study. The research was undertaken independently by the authors. The authors further acknowledge the limited use of AI assisted writing tools solely for language refinement and paraphrasing to improve the clarity and readability of the manuscript.

References

[1] Ajira Digital. (2023). *Ajira Digital Programme impact report 2023*. Ajira Digital. https://dalberg.com/wp-content/uploads/2022/06/Dalberg-Implementation-of-the-Ajira-Digital-Program_Report_VF_20211207.pdf

[2] Anitha, K. (2024). Emerging trends in sustainability: A conceptual exploration. In S. Kulkarni & A. K. Haghi (Eds.), *Global sustainability* (World Sustainability Series). Springer, Cham. https://doi.org/10.1007/978-3-031-57456-6_2

[3] Bejjani, M., Göcke, L., & Menter, M. (2023). Digital entrepreneurial ecosystems: A systematic literature review. *Technological Forecasting and Social Change, 189*, 122372. https://doi.org/10.1016/j.techfore.2023.122372

[4] Beyene, W. M., Mekonnen, A. T., & Giannoumis, G. A. (2023). Inclusion, access, and accessibility of educational resources in higher education institutions: Exploring the Ethiopian context. *International Journal of Inclusive Education, 27*(1), 18–34. https://doi.org/10.1080/13603116.2020.1817580

[5] Brookings Institution. (2023). *Digital inclusion and gig workers in the United States*. Brookings Institution. https://www.brookings.edu/articles/the-gig-economy-complement-or-cannibal/

[6] Bucher, E., Kowalski, P., & Waldkirch, M. (2021). Pacifying the algorithm: Anticipatory compliance in the face of algorithmic management in the gig economy. *Organization, 28*(1), 44–67. https://doi.org/10.1177/1350508420961531

[7] Bulathwela, S., Pérez-Ortiz, M., Holloway, C., Cukurova, M., & Shawe-Taylor, J. (2024). Artificial intelligence alone will not democratise education: On educational inequality, techno-solutionism, and inclusive tools. *Sustainability, 16*(2), 781. https://doi.org/10.3390/su16020781

[8] Catherin, T. C., Vettriselvan, R., Mathur, S., Regins, J. C., & Velmurugan, P. R. R. (2025). Integrating AI and learning analytics in distance learning: Strategies for educators and institutions. In H. S. Mamede & A. Santos (Eds.), *AI and learning analytics in distance learning* (pp. 207–228). IGI Global. https://doi.org/10.4018/979-8-3693-7195-4.ch009

[9] Clavijo-Castillo, R. G., & Bautista-Cerro, M. J. (2020). La educación inclusiva: Análisis y reflexiones en la educación superior ecuatoriana. *ALTERIDAD. Revista de Educación, 15*(1), 113–124. https://doi.org/10.17163/alt.v15n1.2020.09

[10] Cobben, D., Ooms, W., Roijakkers, N., & Radziwon, A. (2022). Ecosystem types: A systematic review on boundaries and goals. *Journal of Business Research, 142*, 138–164. https://doi.org/10.1016/j.jbusres.2021.12.046

[11] Costanza-Chock, S. (2020). *Design justice: Community-led practices to build the worlds we need*. MIT Press. https://direct.mit.edu/books/oa-monograph/4605/Design-JusticeCommunity-Led-Practices-to-Build-the

[12] Crayne, M. P., & Newlin, A. M. B. (2023). Driven to succeed, or to leave? The variable impact of self-leadership in rideshare gig work. *International Journal of Human Resource Management, 35*, 98–120. https://doi.org/10.1080/09585192.2023.2211712

[13] Dalberg. (2023). *Gig economy skills development in Kenya: NGO and private sector partnerships*. Dalberg Advisors. https://dalberg.com/wp-content/uploads/2021/11/Kenyas_Digital_Ecomony_Full_report_Aug_2021-1-1.pdf

[14] Dalenogare, L. S., Le Dain, M.-A., Benitez, G. B., Ayala, N. F., & Frank, A. G. (2022). Multichannel digital service delivery and service ecosystems: The role of data integration within smart product-service systems. *Technological Forecasting and Social Change, 183*, 121894. https://doi.org/10.1016/j.techfore.2022.121894

[15] Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Plenum Press. https://doi.org/10.1007/978-1-4899-2271-7

[16] DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review, 48*(2), 147–160. https://www.jstor.org/stable/2095101

[17] Economic Survey of India. (2024). *India's gig economy: Projected growth to 23.5 million workers by 2029–30*. Ministry of Finance, Government of India. https://www.indiabudget.gov.in/budget2025-26/economicsurvey/doc/Infographics%20English.pdf

[18] Emery, F., & Trist, E. (1965). The causal texture of organizational environments. *Human Relations, 18*(1), 21–32. https://doi.org/10.1177/001872676501800103

[19] Fairwork. (2023). *Fairwork India ratings 2023: Labour standards in the platform economy*. Fairwork Foundation. https://fair.work/wp-content/uploads/sites/17/2023/10/Fairwork-India-Ratings-2023-English.pdf

[20] Fiers, F. (2024). Resilience in the gig economy: Digital skills in online freelancing. *Journal of Computer-Mediated Communication, 29*(5), zmae014. https://doi.org/10.1093/jcmc/zmae014

[21] Freire, P. (1970). *Pedagogy of the oppressed*. Herder and Herder. https://files.libcom.org/files/Paulo%20Freire,%20Myra%20Bergman%20Ramos,%20Donaldo%20Macedo%20-%20Pedagogy%20of%20the%20Oppressed,%2030th%20Anniversary%20Edition%20(2000,%20Bloomsbury%20Academic).pdf

[22] Government of Kenya. (2023). *Kenya digital economy blueprint: Powering Kenya's transformation*. Ministry of ICT, Innovation and Youth Affairs. https://repository.kippra.or.ke/items/7611aa16-73e8-44ca-8c16-e894066a9802

[23] Guggenberger, T. M., Schlueter Langdon, C., & Otto, B. (2025). Data spaces as meta-organisations. *European Journal of Information Systems*, 1–21. https://doi.org/10.1080/0960085X.2025.2451250

[24] Gurumurthy, A., Chami, N., Bharthur, D., & Singh, P. J. (2019). *Tackling online inequality: Making digital platforms work for inclusive development*. IT for Change. http://hdl.handle.net/10625/59174

[25] Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers, 3*, 275–285. https://doi.org/10.1016/j.susoc.2022.05.004

[26] Heeks, R. (2013). *Inclusive innovation: Definition, conceptualisation and future research priorities* (Working Paper No. 53). University of Manchester Development Informatics Group. https://hummedia.manchester.ac.uk/institutes/gdi/publications/workingpapers/di/di_wp53.pdf

[27] Holland, J. H. (2006). Studying complex adaptive systems. *Journal of Systems Science and Complexity, 19*, 1–8. https://doi.org/10.1007/s11424-006-0001-z
[28] International Labour Organization. (2022). *Gendered digital gaps: Women and access to digital work*. ILO. https://www.ilo.org/projects-and-partnerships/projects/understanding-and-improving-womens-work-digital-labour-platforms
[29] International Labour Organization. (2023). *The future of work in the platform economy: Evidence from Kenya*. ILO. https://www.ilo.org/sites/default/files/2024-06/24004-ILO-Digital-Labour-Kenya-v6%20Final%20May%2031%202024.pdf
[30] Isaeva, R., Karasartova, N., Dznunusnalieva, K., Mirzoeva, K., & Mokliuk, M. (2025). Enhancing learning effectiveness through adaptive learning platforms and emerging computer technologies in education. *Jurnal Ilmiah Ilmu Terapan Universitas Jambi, 9*(1), 144–160. https://doi.org/10.22437/jiituj.v9i1.37967
[31] van Dijk, J. (2020). *The digital divide*. Polity. https://doi.org/10.1002/asi.24355
[32] Kunkolienker, N. (2022, February). Not just manufacturing—Electronics repair is a 20 billion opportunity to create 5 million jobs. *The Economic Times*. https://economictimes.indiatimes.com/small-biz/sme-sector/not-just-manufacturing-electronics-repair-is-a-20-billion-opportunity-create-5-million-jobs/articleshow/89557224.cms?from=mdr
[33] Kvasny, L. (2006). Cultural (re)production of digital inequality in a US community technology initiative. *Information, Communication & Society, 9*(2), 160–181. https://doi.org/10.1080/13691180600630740
[34] Lenart-Gansiniec, R., Najda-Janoszka, M., & Solidoro, A. (2025). Editorial: Gig workers and learning organizations. *The Learning Organization, 32*(5), 705–711. https://doi.org/10.1108/TLO-07-2025-365
[35] Lutz, C. (2019). Digital inequalities in the age of artificial intelligence and big data. *Human Behavior and Emerging Technologies, 1*(2). https://doi.org/10.1002/hbe2.140
[36] Memon, S. B., Nobre, H., & Ahmad, N. (2025). Gig work and women's empowerment in rural Pakistan. *Journal of Digital Economy, 4*, 237–250. https://doi.org/10.1016/j.jdec.2025.09.002
[37] Muntaner, C. (2018). Digital platforms, gig economy, precarious employment, and the invisible hand of social class. *International Journal of Health Services, 48*(4), 597–600. https://doi.org/10.1177/0020731418801413
[38] NITI Aayog. (2022). *India's booming gig and platform economy: Perspectives and recommendations on the future of work*. Government of India. https://www.niti.gov.in/sites/default/files/2022-06/25th_June_Final_Report_27062022.pdf
[39] Norris, P. (2001). *Digital divide: Civic engagement, information poverty, and the internet worldwide*. Cambridge University Press. https://doi.org/10.1017/CBO9781139164887
[40] OECD. (2024). *Platform work and the future of labour regulation: Policy considerations*. OECD Publishing. https://www.oecd.org/en/publications/regulating-platform-work-in-the-digital-age_181f8a7f-en.html
[41] Oniskovets, B. (2023). Resilience and adaptation: Organizing the educational process in wartime. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4497921
[42] Petriglieri, G., Ashford, S. J., & Wrzesniewski, A. (2019). Agony and ecstasy in the gig economy: Cultivating holding environments for precarious and personalized work identities. *Administrative Science Quarterly, 64*(1), 124–170. https://doi.org/10.1177/0001839218759646
[43] Pilatti, G., Candia, C., Montini, A., & Pinheiro, F. L. (2023). From co-location patterns to an informal social network of gig economy workers. *Applied Network Science, 8*, 77. https://doi.org/10.1007/s41109-023-00603-1
[44] Pontrelli, C. (2024). *Creating an inclusive culture for gig workers*. Talroo. https://www.talroo.com/blog/inclusive-culture-for-gig-workers/
[45] Raja, D. S., & Giannoumis, G. A. (2019). Harnessing technology to realize the right to inclusive education. In G. de Beco, S. Quinlivan, & J. E. Lord (Eds.), *The right to inclusive education in international human rights law* (pp. 346–372). Cambridge University Press. https://doi.org/10.1017/9781316392881.014
[46] Rodrigo-Martín, I., Rodrigo-Martín, L., & Mañas-Viniegra, L. (2020). Education, values, technology and music: Aiming for an inclusive model committed to equality and interpersonal relations. *Revista Electrónica Complutense de Investigación en Educación Musical, 17*, 33–47. https://doi.org/10.5209/reciem.64141
[47] Ruiz, M. J. C. (2015). Walking towards inclusive education: Walking towards an inclusive society. *International Journal of Innovation and Research in Education, 1*. https://revistaselectronicas.ujaen.es/index.php/ininv/article/view/2554

[48] Samaniego López, M. V., Orrego Riofrío, M. C., Barriga-Fray, S. F., & Paz Viteri, B. S. (2025). Technologies in inclusive education: Solution or challenge? A systematic review. *Education Sciences, 15*(6), 715. https://doi.org/10.3390/educsci15060715

[49] Sankararaman, G., Rengaraju, N., Rengarajan, V., Vembu, N. R., & Indhumathi, D. (2024). Gig economy's impact on workforce dynamics and economic resilience. *Educational Administration: Theory and Practice, 30*, 1627–1634. https://doi.org/10.53555/kuey.v30i6.5561

[50] Sen, A. (1999). *Development as freedom*. Oxford University Press. https://raggeduniversity.co.uk/wp-content/uploads/2025/01/1_x_senDevelopmentasFreedom-_compressed.pdf

[51] Sitorus, R. E., & Shrestha, R. (2025). *Scaling workforce resilience and adaptability: Toward inclusive lifelong learning systems in ASEAN* (Working Paper PB-2025-06). Economic Research Institute for ASEAN and East Asia (ERIA). https://www.eria.org/uploads/Scaling-Workforce-Resilience-and-Adaptability.pdf

[52] Stefanic, D. (2025). *Accessibility and inclusion in learning*. Hyperspace. https://hyperspace.mv/accessibility-and-inclusion-in-learning/

[53] Tsaaro. (2024). *Data privacy in the gig economy: Transparency and platform accountability*. Tsaaro Consulting.

[54] Tsega, S., & Ademe, E. (2024). Meta-analysis review of research in education in emergencies and some theoretical approaches for coping: Implications for Ethiopia. *International Journal of Multidisciplinary Research, 6*(4). https://doi.org/10.36948/ijfmr.2024.v06i04.25113

[55] U.S. Department of Labor. (2022). *Workforce Innovation and Opportunity Act: Gig worker coverage and retraining programs*. U.S. Department of Labor. https://www.dol.gov/agencies/eta/wioa

[56] U.S. Department of Labor. (2023). *Employability outcomes for certified upskilling programs*. U.S. Department of Labor. https://www.dol.gov/sites/dolgov/files/general/budget/2025/CBJ-2025-V1-01.pdf

[57] Van Deursen, A., & Van Dijk, J. (2019). The first-level digital divide shifts from inequalities in physical access to inequalities in material access. *New Media & Society, 21*(2), 354–375. https://doi.org/10.1177/1461444818797082

[58] Van Doorn, N., & Badger, A. (2020). Platform capitalism's hidden abode: Producing data assets in the gig economy. *Antipode, 52*(5), 1475–1495. https://doi.org/10.1111/anti.12641

[59] Veluchamy, R., Ganesan Alias Kanagaraj, M., K. K., K., & Vimalnath, V. (2025). Speculative scenarios for the future of talent management in higher education. In *Cultivating creativity and navigating talent management in academia* (pp. 24). IGI Global. https://doi.org/10.4018/979-8-3693-6880-0.ch016

[60] Volz, F., Münch, C., Lohmüller, M., & Küffner, C. (2025). From data jungle to data governance in digital ecosystems: Empirical evidence from a multiple holistic case study. *Journal of Business Research, 201*, 115747. https://doi.org/10.1016/j.jbusres.2025.115747

[61] Wilson, J. D. (2017). Reimagining disability and inclusive education through universal design for learning. *Disability Studies Quarterly, 37*(2). https://doi.org/10.18061/dsq.v37i2.5417

[62] Wood, A. J., Graham, M., Lehdonvirta, V., & Hjorth, I. (2019). Good gig, bad gig: Autonomy and algorithmic control in the global gig economy. *Work, Employment and Society, 33*(1), 56–75. https://doi.org/10.1177/0950017018785616

[63] World Wide Web Consortium (W3C). (2016). *Accessibility, usability, and inclusion*. https://www.w3.org/WAI/intro/usable

[64] Yeung, K. (2018). Algorithmic regulation: A critical interrogation. *Regulation & Governance, 12*(4), 505–523. https://doi.org/10.1111/rego.12158

Author Bio

Prof. Dr. Vasantha MBA PhD is a seasoned academic with over 30 years of experience in teaching, research, and curriculum development. She holds a Ph.D. in Management Studies from Mother Teresa University, with a research focus on micro-financing among women's self-help groups in rural Tamil Nadu. Currently a Professor at Saveetha Engineering College, she has previously served in leadership roles at Vels Institute of Science, Technology & Advanced Studies (VISTAS), including five-year tenure as Head of the MBA Shipping and Logistics Department. Her teaching career spans reputed institutions such as Jaya Engineering College, Magnus School of Business, Valliammal College for Women, and Chellammal College for Women. A prolific researcher, she has published 133

Scopus-indexed articles (h-index: 11), 11 Web of Science papers, and over 240 publications on Google Scholar (h-index: 24). She has authored 10 books and successfully guided 25 Ph.D. and 11 M.Phil. Scholars. An ICSSR-recognized Post-Doctoral Supervisor, Dr. Vasantha has secured several research grants, including a major ₹2.66 crore STI Hub project focused on empowering SC communities in Tamil Nadu. She has also played key roles in organizing national and international conferences, served on NAAC peer teams, and provided consultancy services across sectors such as logistics, manufacturing, and trading.

Dr. Anitha. K MBA M.Phil. PhD is currently the Head of Department of Management Studies, Meenakshi Academy of Higher Education and Research (MAHER), India. She received her PhD degree from MAHER and M.Phil degree from Vels University and an MBA from Bharathiar University. She completed her UGC NET in Management and UGC NET in HRM. Her research interests include recruitment, employee well-being, work-life balance, and AI in human resource management (HRM). She also holds the dual responsibility as Placement Officer and Assistant Director for Online Education at MAHER. Her accolades include the Mary Parker Follet Award, Best Women Outstanding Researcher Award from the PARA association for her exemplary research. She has also received accolades for outstanding achievement in placements. She has published 3 books, 10 patents, many book chapters and journal articles and presented papers at international and national conferences.

Dr. A. Narmadha is an Assistant Professor in the Department of Management Studies at Vels Institute of Science, Technology and Advanced Studies. She has 15 years of teaching experience and has published research papers in Scopus, Web of Science, and other UGC-referred journals. She has actively presented papers at national and international conferences and currently supervises seven research scholars. Her academic interests include management, competency development, and organisational studies.