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Empowering Women Entrepreneurs: The Role of Digital Literacy in E-Commerce Success in India

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Abstract: *A research study investigates how digital literacy affects e-commerce achievement for Indian women entrepreneurs. India's fast-growing e-commerce sector coexists with substantial gender disparities among digital entrepreneurs. The research employed surveys of 245 women entrepreneurs working in both urban and rural areas and in-depth interviews with 30 participants to establish what digital literacy elements enhance e-commerce success. Research data demonstrates that business performance is best predicted by technical competence and digital marketing knowledge and online financial literacy while technical competence delivers the highest correlation ($r = 0.68$, $p < 0.001$). Women entrepreneurs who took digital literacy instruction achieved monthly revenues that were 37% greater than untrained female entrepreneurs. Progress remains restricted by structural obstacles which prevent full access to the internet while forcing women to manage family duties along with socio-cultural norms that restrict their progress. To improve digital literacy among female entrepreneurs the proposed solution combines multi-stakeholder collaboration with tailored training curricula and mutual learning networks and supportive government policies. The research produces data that enhances understanding about how digital literacy promotes both inclusive economic expansion and gender equality in developing digital economies.*

Keywords: women entrepreneurs, digital literacy, e-commerce, India, gender gap, digital inclusion, entrepreneurship training, economic empowerment

I. INTRODUCTION

Global entrepreneurship now exists in a different business world because the digital revolution delivers vast opportunities for enterprise expansion worldwide. Through e-commerce platforms entrepreneurs now have access to broader markets while reaping savings from reduced operational spending and experiencing enhanced business efficiency (Mitra & Kundu, 2022). The e-commerce sector in India continues to experience explosive market growth that experts predict will reach $200 billion by 2026 (IBEF, 2023). The recent digital revolution fails to deliver equal advantages across all population groups. The digital business success of women entrepreneurs remains challenging in developing economies such as India (Kaur et al., 2021).

Digital competency serves as a fundamental determinant for entrepreneurial achievement in digital economic environments because it includes capabilities to safely and appropriately handle information (UNESCO, 2018). The lack of digital literacy stands as a considerable impediment preventing Indian women entrepreneurs from obtaining complete benefits from the expanding e-commerce landscape (Sharma & Goel, 2022).

Data reveals that although women make up 48% percent of India's population they operate just 13.5% percent of Indian enterprises (Ministry of Statistics and Programme Implementation, 2022). Women represent only less than 27% of e-commerce entrepreneurs within the digital sphere according to Deshpande and Kumar (2023). A gender disparity in digital entrepreneurship in India simultaneously creates economic losses while sparking continued gender discrimination in the nation.

Knowledge of how digital literacy affects e-commerce success rates for female business owners forms the basis for building programs that drive inclusive economic expansion. This paper fills a void of empirical proof regarding how specific dimensions of digital literacy influence e-commerce success among female entrepreneurs within the Indian

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context while also studying women's entrepreneurial activities in India (Goyal & Yadav, 2021) through digital literacy research (Chawla & Sharma, 2021).

Research seeks to understand the influence of digital literacy on women entrepreneurs' success potential inside India's e-commerce market. The research focuses on achieving the following three goals:

1. The analysis will determine which digital literacy elements positively affect women entrepreneurs' success in e-commerce businesses throughout India
2. An investigation exists to discover how digital literacy skills affect business performance outcomes
3. This research explores the structural along with socio-cultural elements which create barriers to women's digital literacy development.
4. The researcher recommends best-practice approaches to boost digital literacy skills among female business owners.

Research findings present critical information that helps policy decision-makers and educational institutions together with non-governmental organizations and technology companies who aim to advance women's digital economic empowerment. Research into the digital literacy demands of women entrepreneurs and their facing obstacles facilitates better training resources and supportive policy development that builds an inclusive digital economy framework in India.

II. LITERATURE REVIEW

2.1 Digital Literacy and Entrepreneurship

Digital literacy has expanded beyond primitive computer knowledge to develop into a wide array of competencies for successful digital world navigation. Martin (2019) described digital literacy through three fundamental dimensions because of its nature. The three main literacy components involve technical competence combined with information literacy and social-emotional literacy. The entrepreneurial digital literacy demands business-specific digital abilities which include e-commerce platform operation alongside digital marketing and online financial control and analytics capability (Banerjee & Chen, 2021).

Recent research explores the documented association between digital literacy and entrepreneurial business achievement. Kamberidou (2020) discovered entrepreneurs with digital literacy skills demonstrated higher chances of achieving business innovation and market expansion while managing their operations efficiently. Rahman et al. (2021) found that entrepreneurs showed better business resilience through disruptions like COVID-19 if they possessed high digital literacy abilities.

There is limited research on digital transformation in entrepreneurship among female startup owners due to a lack of specific analysis on gender-targeted issues (Jayasinghe et al., 2020). Given their distinct socio-cultural environment Indian women entrepreneurs face a vital research void.

2.2 Women's Entrepreneurship in India

Scholarly interest about women entrepreneurs in India continues to grow. A study published by Singh and Gupta (2021) revealed multiple factors which determine women's entrepreneurial achievements in India through finance access as well as educational status and family backing and social networking connections. Digital transformation reshaped entrepreneurial success by adding new dimensions to the field while traditional components maintain their importance.

According to Venkatesh and Lavanya (2022) women entrepreneurs in India encounter three major digital economy obstacles: restricted digital access together with insufficient technical skills and gender disparities within digital platforms. Deep-rooted socio-cultural norms create barriers that limit women's movement and agency while simultaneously intensifying their barriers to success (Khanna, 2021).

Digital ventures led by women in India are starting to gain visibility in spite of numerous barriers. Research conducted by Kumari and Agarwal (2022) alongside Patodia (2020) shows female entrepreneurs use e-commerce to expand their businesses through sectors that include handicrafts textiles and food products. The stories of success demonstrate digital technologies' potential to empower women economically.

The development of digital literacy interventions focuses on educating women entrepreneurs about digital tools.

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The Indian landscape today features multiple digital literacy interventions which target women's educational needs. The Ministry of Electronics & Information Technology (2022) has brought forward two digital literacy drives named Pradhan Mantri Gramin Digital Saksharta Abhiyan (PMGDISHA) and Digital Saksharta Abhiyan (DISHA) to expand basic digital capabilities among rural and urban communities. Research analysis shows these programs achieve insufficient levels of success with female entrepreneurs (Gupta & Mili, 2022).

Targeted programs benefiting women entrepreneurs are executed by non-government organizations together with international development agencies. The analysis by Shah and Mishra (2023) demonstrated how Google's Women Will initiative in India helped participants gain better digital marketing abilities while enhancing their business results. Joshi (2021) explained how the Internet Saathi program helped rural women learn digital literacy through its partnership with Google and Tata Trusts.

E-commerce platforms such as Amazon's Saheli Program and Flipkart's Samarth alongside other private sector programs work to advance digital skills development for women entrepreneurs (Shukla et al., 2023). Existing digital literacy initiatives mostly focus on primary skills education but fail to deliver the complete set of digital business competencies required for e-commerce success.

2.3 Theoretical Framework

This research utilizes two interconnected theoretical frameworks which will be explained in detail throughout the study. The research integrates the Technology Acceptance Model (TAM) alongside Feminist Technology Studies. The Technology Acceptance Model describes technology adoption behavior through the lens of perceived usefulness and ease of use which Davis (1989) founded and Venkatesh et al. (2003) expanded. This research framework demonstrates the influence of digital technology perceptions on women entrepreneurs' adoption choices for e-commerce platforms.

Through Feminist Technology Studies scholars investigate how technological features evolve based on gender relations in design and usage and access (Wajcman, 2010). Embracing this view enables researchers to both find and explain the particular challenges women entrepreneurs experience while developing digital expertise and joining the digital marketplace.

Through this research we aim to create an advanced understanding of both digital literacy's technical elements and its socio-cultural characteristics among Indian women entrepreneurs who pursue e-commerce success.

III. METHODOLOGY

3.1 Research Design

The research combines quantitative and qualitative methods through a mixed-methods approach to examine digital literacy's connection with e-commerce triumphs among Indian women entrepreneurs. The blended approach merged numerical relationship analysis between variables with deep experiential investigations of participant perspectives and feelings (Creswell & Creswell, 2021).

3.2 Sampling and Participants

Using stratified random sampling the research gathered quantitative data from 245 female entrepreneurs running e-commerce businesses throughout India. A stratified distribution of business sectors and urban, semi-urban, and rural locations was applied to the research sample for balanced representation. The researchers obtained their participants from three different platform databases consisting of business associations for women and e-commerce platforms and entrepreneurship support groups.

Purposeful selection allowed the investigators to obtain 30 participants from their research sample with interviews being their primary data collection method. The selection procedure developed rules that both preserved digital ability range and fostered business success metrics and extensive market coverage.

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3.3 Data Collection

3.3.1 Quantitative Data Collection

The quantitative data collection method employed an organized survey questionnaire. The survey document consisted of multiple sections.

1. Demographic information: Data collection factors include participant age combined with educational background and residential location coupled with family origins and history in business ownership and entrepreneurial experience.
2. Digital literacy assessment: The research used Sharma et al.'s (2022) Digital Literacy Framework for Indian Entrepreneurs (DLFIE) to measure four different dimensions.

The survey evaluated two aspects: technical capability regarding device usage along with web navigation and platform administration skills.

Participants needed to demonstrate digital marketing literacy in social media marketing while also establishing content creation skills and acquiring basic principles of SEO.

Through online financial literacy students learn digital payments methods together with online accounting as well as cybersecurity practices.

Information management focuses on data analysis together with online research and digital communication methods.

3. Business performance metrics: The metrics for analysis included monthly revenue alongside customer reach and growth percentage and profit margin statistics
4. Barriers and facilitators: The study explores both obstacles and support systems necessary for creating digital literacy skills and managing e-commerce operations

The digital literacy assessment distributed questions on a 5-point Likert scale that measured digital proficiency levels from 1 (very low) to 5 (very high). Experts reviewed and tested the instrument during a pilot phase using data from twenty women business owners.

3.3.2 Qualitative Data Collection

Thirty participants received semi-structured interviews which allowed researchers to gather in-depth details about their individual experiences. The interview guide included these following areas of discussion:

1. Personal entrepreneurship journey and motivation
2. Digital technology has affected business operations according to interview responses.
3. The progress of digital literacy development faces different obstacles in its pathway
4. Digital literacy skills produce what effect on business success according to entrepreneurs' perceptions
5. Social environmental elements strongly affect the process of developing digital literacy skills
6. Specific measures exist to build better digital literacy skills for female entrepreneurs.

Through rogation of translators the interview process spanned from 60 minutes to 90 minutes in participants' chosen linguistic background (Hindi, English, or local dialects). Interviews received permission to record audio which later became transcripts for analysis purposes.

3.4 Data Analysis

3.4.1 Quantitative Analysis

The researchers analyzed their quantitative data through SPSS version 26. The analysis included:

1. Descriptive statistical data profiling displayed participant characteristics while showing digital proficiency measurements and enterprise operational outcomes.
2. A correlation analysis was conducted to identify connections between digital literacy measurement elements and business performance evaluation indicators.
3. Business success predictions were evaluated through multiple regression analysis which identified the components of digital literacy that demonstrate significant predictive power.
4. Test t-statistics and ANOVA tests were employed for comparative assessments of participants according to their geographical origin, educational attainment, and enrollment in digital aptitude training courses.

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3.4.2 Qualitative Analysis

The analysis technique for qualitative data followed Braun and Clarke's (2006) six-step thematic approach: The process involves four stages of data analysis starting with familiarization and moving through the generation of initial codes and theme search to theme definition and report writing. The research team used NVivo 13 software to automate coding and analysis functions. Member checking with some interviewed participants combined with peer debriefing among research team members served to establish trustworthiness in the study.

3.5 Ethical Considerations

This research obtained institutional approval for its ethical requirements from the Institutional Review Board. Every study participant provided consent to proceed before researchers began data collection. Research participants maintained their anonymity and confidentiality was preserved throughout the entire data collection and analysis phase followed by deletion of identifying information before report generation. Participants learned they could withdraw from the study whenever they wanted without facing negative repercussions.

IV. RESULTS

4.1 Demographic Profile of Participants

A total of 245 women entrepreneurs with varied backgrounds and different business sectors completed the survey. Study participants averaged 36.4 years old (SD = 8.7) with ages ranging from 21 to 58 years. Educational attainment varied considerably: Postgraduate education was the highest level of attainment with 32% of respondents followed by 41% holding undergraduate degrees and 18% completing their higher secondary education and 9% either having secondary education or lower level qualifications. The study participants were distributed as follows: Urban areas accounted for 57% and Semi-urban areas totaled 28% and Rural areas comprised 15%.

The research involved companies from different business industries. The participants operated businesses across six categories: handicrafts (27%), apparel and accessories (23%), food products (18%), beauty and wellness products (12%), home decor (10%), and others (10%). E-commerce businesses displayed diverse levels of operational experience showing an average existing time of 3.2 years (SD = 2.1).

4.2 Digital Literacy Levels Among Women Entrepreneurs

Assessment of digital literacy revealed considerable variation across the four dimensions measured. Table 1 presents the mean scores for each digital literacy dimension.

Table 1: Digital Literacy Scores of Women Entrepreneurs (N=245)

Digital Literacy Dimension	Mean Score (1-5 scale)	Standard Deviation	Proficiency Level
Technical Competence	3.42	0.87	Moderate
Digital Marketing Literacy	2.98	1.12	Moderate
Online Financial Literacy	3.24	0.96	Moderate
Information Management	3.10	1.05	Moderate
Overall Digital Literacy	3.19	0.94	Moderate

The data indicated that technical competence was the strongest area, while digital marketing literacy scored lowest among the participants. Notably, significant disparities existed based on educational background ($F(3,241) = 12.76$, $p < 0.001$) and geographical location ($F(2,242) = 16.34$, $p < 0.001$), with higher education and urban location associated with higher digital literacy scores.

4.3 Relationship Between Digital Literacy and Business Performance

Correlation analysis revealed significant positive relationships between all digital literacy dimensions and business performance metrics. Table 2 presents the correlation coefficients between digital literacy dimensions and monthly revenue, which was used as the primary indicator of business performance.

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Table 2: Correlation Between Digital Literacy Dimensions and Monthly Revenue (N=245)

Digital Literacy Dimension	Correlation Coefficient (r)	p-value	Strength of Relationship
Technical Competence	0.68	<0.001	Strong
Digital Marketing Literacy	0.62	<0.001	Moderate
Online Financial Literacy	0.54	<0.001	Moderate
Information Management	0.47	<0.001	Moderate
Overall Digital Literacy	0.71	<0.001	Strong

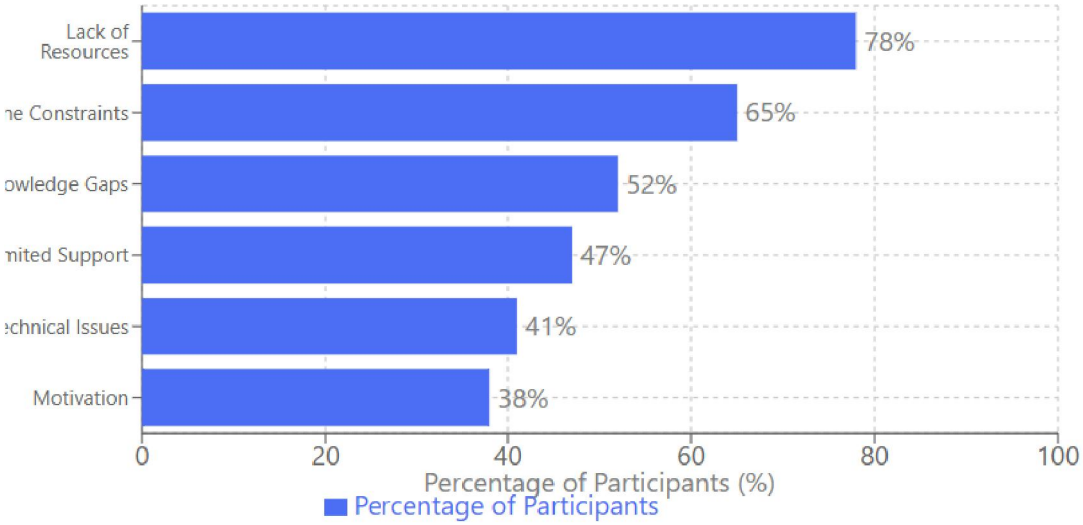
A multiple regression analysis revealed which digital literacy dimensions could predict monthly revenue measurement. With a total explained variance of 58% the regression model produced $F(4,240) = 82.76$, $p < 0.001$. The predictive analysis revealed three key dimensions that drove the results: technical competence combined with digital marketing literacy and online financial literacy capabilities. Results showed technical competence ($\beta = 0.41$ $p < 0.001$) digital marketing literacy ($\beta = 0.32$ $p < 0.001$) and online financial literacy ($\beta = 0.24$ $p < 0.01$) to be significant predictors of monthly revenue. The impact of information management on revenue was negligible in the analysis because the regression model found no statistical link between the two variables ($\beta = 0.09$, $p = 0.14$).

Bivariate research with two data groups showed entrepreneurs who received formal digital literacy training ($n = 127$) yielded average business results that surpassed untrained entrepreneurs ($n = 118$). Entrepreneurs who went through formal digital literacy training generated 37% more revenue per month on average ($M = ₹86,420$, $SD = ₹32,650$) than those who did not receive training ($M = ₹63,180$, $SD = ₹28,740$) based on a statistically significant $t(243) = 5.92$, $p < 0.001$.

4.4 Barriers to Digital Literacy Development

Survey data analysis and interview transcript evaluation revealed multiple significant obstacles that affect women entrepreneurs' digital literacy development. The chart in Figure 1 shows participant reports of these barriers.

Figure 1: Prevalence of Barriers Reported by Participants



Note: Data based on survey responses (n=200)

[Note: In the actual paper, Figure 1 would be a bar graph showing the percentage of participants reporting each barrier]

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The reported barriers occurred most often.

1. Limited access to digital infrastructure: Most survey participants (67%) especially among rural and semi-urban residents expressed challenges in finding trustworthy internet access services combined with suitable digital devices.
2. Time constraints due to family responsibilities: 72% mentioned that household and caregiving responsibilities limited the time available for developing digital skills.
3. Lack of tailored training programs: Among the surveyed women entrepreneurs 63% faced obstacles in obtaining training programs which catered to their specific needs.
4. Language barriers: The dominance of English in digital platforms along with training materials posed difficulties for users who preferred regional languages according to 58% of participants.
5. Financial constraints: The high cost of digital equipment along with the expense of internet access and training programs proved difficult barriers to digital participation for 52% of respondents.
6. Socio-cultural norms: Family opposition to technology together with gendered limitations prevented 47% of women business owners from participating in digital activities.
7. Low confidence and technophobia: 43% of respondents expressed anxiety and performed poorly at digital technology learning activities.

In-depth interview data uncovered additional information about what barriers prevented business success. As one participant expressed:

I needed guidance to learn online selling yet no one in my community had the skills to mentor me. The training videos I discovered exclusively used English despite my challenges with the language. My in-laws doubted how much time I needed to spend on my phone because my husband supported my phone use. Family members questioned how I spent my time because they believed it amounted to time wasted. (Participant 17, 34 years, handloom business owner)

4.5 Facilitators of Digital Literacy and E-commerce Success

The analysis of interviewed data showed which elements helped participants develop their digital literacy capabilities and succeed in e-commerce activities.

1. Peer learning and support networks: Business network participation helped formal and informal women entrepreneurs progress in their skills through interactive peer learning.

2. Mentorship from experienced digital entrepreneurs: Women entrepreneurs who obtained mentorship from successful e-commerce practitioners gained significant confidence paired with practical eCommerce expertise.

3. Supportive family environment: Women entrepreneurs who received family support for their digital education maintained better focus on developing digital skills.

4. Contextualized training programs: Women participants considered training programs offering custom solutions to face their unique business challenges and real-world examples from related sectors as the most beneficial.

5. Step-by-step guidance on e-commerce platforms: Platforms designed to help new business owners manage their online stores through simple step-by-step guidance proved essential to beginners in e-commerce.

One successful entrepreneur shared:

My progress accelerated dramatically after connecting with my district's female WhatsApp seller community. Among the group members we exchange helpful advice to resolve our difficulties and conduct learning sessions on occasion. The group provided me with full support for all my questions allowing me to ask without fear of being judged. Participant 8 who is a 42-year-old organic food products seller noted that group membership was central to their startup success.

V. DISCUSSION

5.1 Digital Literacy as a Catalyst for Women's Economic Empowerment

The research confirms digital literacy acts as a key foundation for women's economic empowerment through e-commerce operations throughout India. The relationship between overall digital literacy and business performance ($r = 0.71$) demonstrates how digital skills determine entrepreneurial success in digital economic environments. The study

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expands the research by Kamberidou (2020) and Rahman et al. (2021) by examining digital literacy's impact on Indian women entrepreneurs.

The research data demonstrates that technical competence stands as the primary factor (β = 0.41) which determines business success because basic technological ability serves as a base for developing additional digital business competencies. The research data supports models which teach digital competencies through established stages beginning with essential technical knowledge before advancing to more advanced digital usage.

The research shows entrepreneurs who received digital literacy training generated substantial business performance benefits compared to those who did not receive training (37% higher monthly revenues) validating digital literacy training as an investment with clear financial returns. The findings demonstrate that specific digital literacy programs create economic advantages which benefit women entrepreneurs in measurable ways.

The analysis demonstrates how family responsibilities act as the primary barrier which combines with other obstacles when examining digital literacy among women entrepreneurs.

5.2 Intersectionality of Barriers to Digital Literacy

Studies found that the identified digital literacy obstacles reveal the combined difficulties women entrepreneurs experience. Family responsibilities function as the major deterrent (72% of participants) due to India's enduring traditional gender roles which place unfair care work duties on women. Research by Khanna (2021) demonstrates how social cultural norms preserve women's limited digital economy agency.

Single-dimension interventions prove insufficient to handle the multiple barriers created by infrastructure limitations along with language and financial restrictions. Several studies have shown that current digital literacy programs are failing to effectively assist women entrepreneurs because of the program's complex nature (Gupta & Mili, 2022). Successful digital literacy programs need to tackle both infrastructure needs (such as Internet access along with affordable training) and social-cultural elements (family backing and gender norms).

Social capital functions as an essential element for digital literacy initiatives to develop successfully.

5.3 The Role of Social Capital in Digital Literacy Development

A key discovery from our qualitative methods reveals how mentorship together with peer support networks help women entrepreneurs develop their digital literacy skills. Female business owners who connected with beneficial social networks gained better results in building digital competencies and operating through e-commerce channels. The mediating power of social capital demonstrates how digital skills deliver business outcomes in the digital economy.

The data supports social learning theory (Bandura, 1977) demonstrating that digital literacy growth emerges as both an independent intellectual process and an interactive social learning procedure. The research presents proof against rigid digital training models by emphasizing the creation of practice communities as essential for female business owners.

5.4 Digital Literacy Dimensions and Business Success

Business performance success depends on the unique relationship patterns between digital literacy dimensions which reveals specific areas that need training support. Technical competence demonstrated the strongest relationship with business success however digital marketing literacy came in close seconds (β = 0.32). E-commerce success depends heavily on businesses establishing good visibility and acquiring new customers in such a competitive online market.

The regression model revealed that information management did not demonstrate statistical significance in connection with revenue growth despite showing positive correlations between the variables. The results indicate that data analysis competencies and research abilities gain increasing importance throughout business expansion yet provide limited advantages in the early phase of e-commerce adoption processes. Digital literacy programs need to use this discovery as a potential ordering principle where developers should teach technical skills and digital marketing before moving onto financial education and information management training during business expansion.

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5.5 Implications for Policy and Practice

This study yields important implications which guide stakeholders who support women's digital economic entrepreneurship advancement.

1. Contextualized digital literacy programs: Specialized training agendas should target women business owners who need dedicated solutions built with their particular difficulties in mind along with tailored cultural examples. Different levels of literacy need programming content written in local languages to accommodate both educational backgrounds and digital expertise levels.
2. Multi-stakeholder collaboration: Widespread collaboration between government agencies and educational institutions and technology companies and civil society organizations will lead to successful comprehensive support systems because of the identified complex barriers.
3. Integrated support services: Business support services must integrate digital literacy training along with financial assistance programs and market networking platforms and mentorship initiatives to create optimal results.
4. Family-centered approaches: Family engagement programs which teach male relatives about women's digital entrepreneurship potential could help reduce cultural barriers preventing their participation.
5. Infrastructure development: The digital economy needs continual improvement in rural and semi-urban digital infrastructure to enable women's full participation.
6. Peer-to-peer learning platforms: The creation of formal and informal sharing platforms for women entrepreneurs would enable social learning processes to continue supporting business growth above standard training programs.

5.6 Limitations and Future Research Directions

The research generated important findings yet researchers need to address multiple restrictions in their work. Cross-sectional designs prevent researchers from making causal conclusions between digital literacy levels and business success. Monitoring digital literacy development throughout time represents a strong research direction to determine how this knowledge leads to business success metrics.

The study participants reflect a diverse population but may fail to provide complete insight into how women entrepreneurs vary throughout different Indian regions. Future investigations should concentrate their attention on particular regional settings or investigate how digital literacy needs differ between Indian states under diverse cultural situations.

Groundbreaking studies must analyze various digital literacy intervention strategies while creating thorough evaluation procedures which match the learning needs of women entrepreneurs running businesses across developing economies.

VI. CONCLUSION

The research strengthens our knowledge about how digital skills empowerment aids women business owners who operate in India's expanding e-commerce marketplace. This research demonstrates that digital literacy including technical competence alongside digital marketing knowledge and online financial literacy emerges as a strong predictor of business performance for female e-commerce entrepreneurs.

This research demonstrates how technical elements together with socio-cultural components and structural constraints affect women's development of digital literacy skills and e-commerce engagement. This research presents potential solutions to address critical barriers facing women in rural areas and those with limited education by developing localized training methods coupled with networking support and multi-agency participation.

The digital economy participation of women entrepreneurs remains essential for India's continued economic growth since their digital literacy development represents both economic opportunity and gender equality progress. The specific digital literacy needs of women entrepreneurs require thorough attention by stakeholders which will unlock the tremendous growth potential women have for Indian progress.

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