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Bridging the digital divide for empowerment of rural women entrepreneurs in Tumkur District: An empirical study

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Abstract

Bridging the digital divide is crucial for empowering rural women entrepreneurs, especially since gaps in digital access, skills, and infrastructure continue to hold back inclusive economic growth in developing areas like India. Research shows that efforts by social organizations, training programs, and government-led digital inclusion initiatives can significantly boost digital literacy and entrepreneurial opportunities for rural women. This, in turn, helps them gain better access to markets, financial services, and business networks. Even though there are major hurdles—like the fact that only 25% of rural women in India have internet access compared to 49% of rural men—focused digital inclusion strategies have made a real difference in post-pandemic recovery, enhancing business performance and socio-economic empowerment, as highlighted by quantitative surveys and mixed-method analyses. The ongoing issues of limited digital infrastructure, costs, and socio-cultural barriers highlight the urgent need for customized policies and community support to promote equitable participation and sustainable rural development.

Keyword: Rural empowerment, digital inclusion, sustainable rural development, entrepreneurial opportunities, digital access and skills, social organizations

Introduction

The rapid growth of digital technologies and the internet have dramatically changed socioeconomic landscapes around the world. Yet, in India, there's still a significant digital divide between urban and rural areas, with rural women facing the toughest challenges when it comes to access and inclusion. National statistics paint a stark picture: only about 24-25% of rural women have internet access, compared to nearly 50% of rural men. This highlights the persistent gender inequalities that are worsened by inadequate infrastructure, high costs, and deeply ingrained sociocultural barriers. For rural women, these gaps mean limited access to crucial educational, health, and business resources, which in turn restricts their ability to participate fully in the digital economy and keeps them trapped in cycles of marginalization. Women entrepreneurs in rural areas are truly driving local development forward. They're not just promoting innovation; they're also creating jobs and helping to lift their communities out of poverty. Recognizing this incredible potential, various government agencies, NGOs, and corporate partners have rolled out targeted initiatives. These include digital literacy programs, outreach via mobile technology, and entrepreneurship development schemes, all designed to bridge the gaps in infrastructure and knowledge while fostering digital empowerment. Initiatives like Internet Saathi and the NIIT Foundation's Digital Bus have successfully equipped millions of rural women with the vital digital skills they need to start and grow their businesses, improve financial inclusion, and explore new markets. Even with all the progress we've made, women living in rural areas still face a triple whammy—being in a rural setting, being female, and struggling with limited digital access. The ongoing battle for inclusion shows that creating sustainable pathways for rural women entrepreneurs in India isn't just about improving infrastructure and training. It also means challenging deeprooted gender norms and expanding support systems for digital engagement. Research is increasingly pointing out that closing the digital divide for these women is essential for achieving balanced regional development, gender equality, and lasting economic resilience in India's ever-evolving digital landscape.

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Research Scholar & Faculty of M. Com (Information Systems), Tumkur University, Tumkur, Karnataka, India The landscape of women's entrepreneurship in India has undergone a remarkable transformation. What once revolved around traditional, informal, home-based businesses—mainly in handicrafts, agriculture, and small-scale trading—has now evolved into a diverse and formalized range of ventures. These new businesses span various sectors, including textiles, food processing, and services. Historically, women faced numerous challenges due to socio-cultural norms, which limited their access to education, finance, and markets. However, since the late 20th century, women entrepreneurs have started to gain more visibility and support, thanks to government initiatives, microfinance options, and self-help groups that

have empowered them both economically and socially. In Karnataka, one of India's more industrially advanced states, women entrepreneurship has been bolstered by state-specific initiatives like the Karnataka Women's Development Corporation, along with programs aimed at skill development, startup incubation, and digital literacy. These efforts have helped both rural and urban women break through barriers and contribute to the state's economic growth. As a result, a supportive ecosystem has emerged, allowing women's entrepreneurship to flourish and reflecting broader national trends of increasing female participation in business leadership and innovation.

Government schemes for empowering women entrepreneurs in India ae well as in Karnataka

Scheme/initiative	Launched by	Objective	Key features	Target beneficiaries	Challenges / Limitations
Stand-up India	Government of India (2016)	Promote entrepreneurship among SC/ST and women	Loans from ₹10 lakh to ₹1 crore for new enterprises	Women SC/ST entrepreneurs	Limited awareness, complex procedures
Pradhan Mantri MUDRA Yojana (PMMY)	Government of India (2015)	Provide micro- credit to small enterprises	Shishu (₹50K), Kishore (₹50K– ₹5L), Tarun (₹5L–₹10L) loans	Small entrepreneurs, SHGs	Limited access to banking, collateral issues
Digital India Mission	Government of India (2015)	Empower digitally inclusive society	E- Governance, rural connectivity, digital literacy programs	Rural Women's	Connectivity gaps, digital illiteracy
Mahila E-Haat	Ministry of Women and Child Development (2016)	Provide online marketplace for women	Platform to promote/sell products and services online	Women entrepreneurs, SHGs	Low digital literacy, limited reach
Women Entrepreneurship Platform (WEP)	NITI Aayog (2018)	Support women startups and leadership	Mentorship, funding, incubation, learning resources	Aspiring/existing women entrepreneurs	Poor rural penetration, lack of awareness
PMGDISHA	Government of India (2017)	Promote rural digital literacy	Free training for one member per rural household	Rural	Lack of follow-up, practical use missing
Startup India	Government of India (2016)	Foster startup ecosystem	Tax exemptions, startup hub access, seed funding	Women-led startups (urban and rural)	Low rural outreach, limited awareness

Source: https://wep.gov.in

Review of Literature

Aiswarya, S., & Sangeetha, S. (2025) [1]: The article titled "Bridging the Digital Divide: Empowering Rural Women Entrepreneurs through Digital Inclusion," delves into how digital inclusion can empower rural women entrepreneurs in Kerala, India, especially in the aftermath of COVID-19. It explores how these women leverage digital platforms and the various benefits they reap, including improved digital skills, better business performance through e-commerce, and a boost in self-confidence. The researchers gathered data from 264 rural women entrepreneurs using structured questionnaires and analyzed it with statistical methods like weighted averages and one-way ANOVA. The key findings indicate that enhancing digital literacy and skills is a major driving force for women to participate in digital inclusion programs. While digital inclusion has a positive effect on sales, networking, time and resource management, and overall entrepreneurial effectiveness, significant hurdles remain, such as inadequate internet connectivity, high installation costs, and network issues. The study underscores the vital role of both government and non-government initiatives in offering training and resources to help rural women overcome the digital divide. In conclusion, while

digital inclusion programs have certainly boosted the digital skills of rural women entrepreneurs, persistent challenges call for ongoing efforts to improve affordable digital infrastructure and support systems. The research suggests a continuous evaluation of digital initiatives and encourages further studies on women entrepreneurs in wider contexts to thoroughly address digital skill gaps and foster inclusive rural entrepreneurship. The practical takeaway from this study is that digital inclusion is essential for socio-economic empowerment and rural development, but it must go hand in hand with tackling infrastructural and socio-cultural challenges to truly unlock the potential of rural women entrepreneurs. Digital Empowerment Foundation (DEF). (2024, August) [5]. the study "An Exploratory Study of Adoption and Usage of Technology by Rural Women for Entrepreneurship and Empowerment" takes a deep dive into the existing research surrounding the gender digital divide. It sheds light on the various challenges that rural women encounter when trying to access and utilize digital technologies. The study emphasizes how socio-cultural norms, economic inequalities, and household power dynamics all work together to restrict women's digital involvement. Key issues like low literacy rates, inadequate infrastructure, financial dependence, and safety concerns are highlighted as significant barriers. Additionally, the literature discusses how initiatives aimed at improving digital literacy and inclusion can enhance women's entrepreneurial skills and socio-economic empowerment. However, it also warns against oversimplifying the idea of digital access as a form of empowerment without acknowledging the underlying structural inequalities. The evidence gathered underscores the critical role of family and community support, digital skills training, and tailored policy interventions that address the diverse needs of women. These elements are essential for effectively closing the digital gap and fostering meaningful digital engagement and economic independence among rural women. The review calls for a more nuanced and context-aware approach that recognizes the intersectional identities of women and the complex socio-technical factors that influence the adoption of digital technology in rural India. Yoganandham, D.G. (2024) [8]. The incorporation of Information Technology (IT) into rural economies holds the promise of profoundly transforming livelihoods and empowering marginalized groups. This research investigates the function of IT within the rural economy of Tamil Nadu, with a particular emphasis on its effects on women's empowerment. The digital divide continues to be a significant concern, as socioeconomic elements such as education, income, and infrastructure play a crucial role in the adoption of IT in these regions. By analyzing the degree to which rural populations, especially women, are able to access and utilize digital technologies, this paper brings to light both the opportunities and obstacles related to IT adoption. The results indicate that IT can improve access to vital services, increase income-generating prospects, and foster social inclusion. Nevertheless, challenges such as insufficient digital literacy, poor infrastructure, and sociocultural norms may hinder advancement. The research highlights the necessity for focused interventions, including digital literacy initiatives, enhanced infrastructure, and gender-sensitive policies, to close the digital divide and harness IT for sustainable economic growth and the empowerment of women in rural Tamil Nadu. This academic paper also explores the political, social, and economic ramifications of income inequality, emphasizing its considerable impact on society. Nayak, M., & Nayak, P.M. (2025) [9]. This research seeks to improve the comprehension of personal factors that affect rural women's intentions to participate in sustainable entrepreneurship in India. It examines the direct effects of perceived capability, social perception, and individual competencies on women's Sustainable Entrepreneurial Intention (SEI). Additionally, the study looks into how these factors indirectly influence perceived opportunities. A quantitative approach was employed, utilizing randomly distributed questionnaires among rural women in India. A total of 1250 responses were gathered and analyzed through Structural Equation Modeling (SEM) with Partial Least Squares (PLS). The findings indicated that perceived capability ($\beta = 0.103$), individual competencies ($\beta = 0.052$), and social perception $(\beta = 0.226)$ had a significant and positive impact on SEI. Moreover, the study suggests that perceived opportunity acts as a mediator in the relationships between perceived capability, social perception, individual competencies, and

women's SEI. The proposed model accounted for 50.9% of the variance in SEI. This research adds to the existing body of literature by empirically examining the link between women's individual characteristics and their intentions to engage in sustainable entrepreneurship, with a particular focus on rural women in India.

Statement of the problem

The issue highlighted in "Bridging the Digital Divide for Empowerment of Rural Women Entrepreneurs" revolves around the considerable gaps in digital access, skills, and usage that rural women entrepreneurs in India experience, which impede their capacity to utilize digital technologies for business growth and socio-economic empowerment. Despite the expanding digital economy, rural women face numerous obstacles such as inadequate infrastructure, low levels of digital literacy, socio-cultural limitations, financial dependence, language barriers, and safety issues, all of which hinder their active and meaningful engagement in digital platforms. These challenges contribute to ongoing gender and rural-urban digital divides, restricting the ability of rural women's entrepreneurship to play a role in economic development and poverty reduction. Furthermore, current digital inclusion initiatives frequently do not adequately tackle the intersectional and structural inequalities that influence women's digital access and empowerment. This issue is pressing as digital technologies increasingly dictate market access, financial inclusion, and business competitiveness; neglecting to close this gap risks worsening socio-economic disparities and excluding a crucial segment of rural economic participants from the advantages of digitalization. Therefore, it is essential to explore the scope, causes, and effects of the digital divide among rural women entrepreneurs to guide targeted, context-sensitive strategies that promote digital inclusion and sustainable empowerment.

Objectives of the study

- 1. To know the Government initiative towards enhancing digital literacy among rural women Entrepreneurs in Tumkur.
- 2. To know the current levels of digital literacy among rural women entrepreneurs of Tumkur.
- 3. To Analyses the barriers to access availability and affordability of digital devices.
- 4. To examining the impact of the digital divide in different business aspects.

Hypothesis of the study

H0: There is no significant difference in current levels of digital literacy among rural women entrepreneurs.

H₀₁: There is a significant difference in current levels of digital literacy among rural women entrepreneurs.

H0: There is no significant difference in the barriers to access availability and affordability of digital devices.

H02: There is a significant difference in the barriers to access availability and affordability of digital devices.

H0: The digital divide does not significantly impact on different aspects of business for women entrepreneurs.

H03: The digital divide significantly impacts on different aspects of business for women entrepreneurs.

Methodology of the study

The focus of this study is on all rural women entrepreneurs located in the Tumkur district of Karnataka, who are involved in diverse sectors including agriculture, small-scale industries, handicrafts, retail trade, and service-oriented businesses. These women are either self-employed or manage micro or small enterprises in rural settings. The research encompasses a sample of 56 rural women entrepreneurs, which includes both registered and unregistered business owners who are actively operating their businesses and living in rural villages or semi-urban regions of Tumkur. The researcher employed purposive sampling to select the sample of rural women entrepreneurs. Primary data was gathered from these women entrepreneurs in the Tumkur district and was analyzed using a variety of statistical methods. Descriptive statistics, such as mean and standard deviation, along with inferential statistics, including t-tests and ANOVA, were utilized through Excel and SPSS.

Data tools and variable description

The study examined variables such as digital literacy among rural women entrepreneurs, obstacles to access, the availability and affordability of digital devices, in addition to various business aspects including marketing, finance, and human resources.

Validity and reliability of the data

Reliability statistics							
Cronbach's alpha	No. of items						
0.934	54						

Source: Author calculations

The reliability statistic known as Cronbach's Alpha, which stands at a solid 0.934 for 54 items, shows that the measurement scale has an excellent level of internal consistency. This impressive alpha value indicates that these 54 items are closely related and effectively measure the same underlying concept or trait. In simpler terms, when respondents tackle these items, they do so consistently, which bolsters the reliability and validity of the scale in use. However, it's crucial to keep an eye on the possibility that such a high value might stem from redundancy among the items. If the alpha exceeds 0.95, it could mean that some items are too similar or repetitive. All in all, a Cronbach's Alpha of 0.934 is definitely a strong indicator of reliability for research purposes.

Case processing summary									
N %									
	Valid	55	98.2						
Cases	Excludeda	1	1.8						
	Total	56	100.0						
a Listwise deletion based on all variables in the procedure									

Source: Author calculations

The Case Processing Summary reveals that out of 56 cases, 55 (which is 98.2%) were valid and included in the analysis, while 1 case (1.8%) was left out due to missing data on one or more variables. This exclusion was carried out using a method called listwise deletion, which removes an entire

case if it has any missing values in the variables being analyzed. While listwise deletion ensures that only complete data records are considered, it can also lead to a smaller sample size and reduced statistical power if there are many cases with missing values. Fortunately, in this dataset, the impact was minimal, with just one case excluded, so it's likely that the analysis remains largely unaffected.

Results and Discussions

Table 1: Shows demographic profile of the respondents

Age-group	Frequency	Percentage
Below 25	3	5.4
26 – 35	19	33.9
36 – 45	22	39.3
46 and above	12	21.4
Total	56	100

Source: Primary data

Table 2: Shows educational background of the respondents

Education qualification	Frequency	Percentage
SSLC	27	48.2
PUC	18	32.1
Diploma	3	5.4
Under Graduation	5	8.9
Post Graduation	3	5.4
Total	56	100

Source: Primary data

Table 3: Shows type of business operated by the respondents

Business	Frequency	Percentage
Tailoring	8	14.29
Food Products	3	5.36
Handicrafts	3	5.36
Retail	13	23.21
Hotel	4	7.14
Beauty Parlor	5	8.93
Farmer	7	12.50
Textile	6	10.71
Other	7	12.50
Total	56	100

Source: Primary data

The data shows that among the 56 women entrepreneurs surveyed, retail businesses take the lead with 23.21%, followed by tailoring at 14.29%. Both farming and the "other" categories come in at 12.50%. Textiles make up 10.71%, beauty Parlors account for 8.93%, hotels represent 7.14%, and food products and handicrafts each stand at 5.36%. This distribution reflects the common trends in women's entrepreneurship in India, where trade, small-scale manufacturing, and service-oriented businesses flourish thanks to lower entry barriers, flexibility, and a fit with traditional gender roles. The strong showing in retail suggests that many women prefer businesses that allow for direct customer interaction and require relatively low capital investment. Tailoring, textiles, and handicrafts also highlight sectors rooted in traditional skills, providing income-generating opportunities often linked to home-based

or cottage industries. Farming remains a crucial livelihood, showcasing women's active participation in agriculture-related ventures. The "other" category points to the diverse entrepreneurial activities women are engaging in, emphasizing their adaptability and creativity. In summary, the data reveals that women entrepreneurs are mainly found

in sectors that strike a balance between social acceptability and economic viability, while also hinting at potential growth areas like hospitality and beauty services. This aligns with national trends where women-led MSMEs primarily operate in informal, micro, and small-scale sectors, leveraging local skills and community networks.

Table 4: Shows respondents' perception towards digital literacy level

Statements	N	Mean	Standard deviation
I have regular access to a smartphone or computer	56	3.70	0.893
I can easily connect to the internet from my home or nearby.	56	3.73	0.751
The internet data cost is affordable for me.	56	3.30	1.008
I know how to operate a smartphone or computer for basic tasks.	56	3.64	0.923
I can use a search engine (like Google) to find information.	56	2.98	1.168
I can create and manage an email or social media account.	56	2.98	1.243

Source: Primary data

Inferential statistics

H0: There is no significant difference in current levels of digital literacy among rural women entrepreneurs.

 H_{01} : There is a significant difference in current levels of digital literacy among rural women entrepreneurs.

One-sample t-test for analysis of digital literacy among rural women entrepreneurs

One-sample t-test								
Test Value = 0								
	N Tables of Barrier Mean 95% confidence interval of the		T-value df P-value		of the difference	Decision		
		T-value	uı	P-value	difference	Lower	Upper	
Digital literacy level	56	32.852	55	0.000	20.339	19.098	21.580	Reject null
Advanced digital task	56	33.017	55	0.000	20.750	19.490	22.009	hypothesis

Source: Primary data

The findings from the one-sample t-test show a clear and significant difference between the sample mean for "digital literacy level" and "advanced digital task" when compared to a test value of zero. With an impressive t-value of 32.852 (df=55) and a p-value of 0.000 for digital literacy level, plus a similar t-value of 33.017 and p-value of 0.000 for advanced digital tasks, we confidently reject the null hypothesis that suggests no mean difference exists. The mean differences are around 20.34 and 20.75, respectively, and the 95% confidence intervals for these differences are well above zero. This tells us that the average digital literacy level and proficiency in advanced digital tasks among the

respondents are significantly higher than zero. In other words, it confirms that the respondents possess notable digital skills and capabilities in advanced tasks, which are clearly distinct from having no digital skills at all. The test offers strong evidence that digital competencies are indeed present within the sample we studied.

H0: There is no significant difference in the barriers to access availability and affordability of digital devices.

H02: There is a significant difference in the barriers to access availability and affordability of digital devices.

One-sample t-test for analysis of barriers to access availability and affordability for digital divide of rural women entrepreneurs

One-sample t-test								
Test value = 0								
	N	T-value df P-value Mean difference 95% confidence interval of the difference		terval of the difference	Decision			
		1-value	uı	r-value	Mean unierence	Lower	Upper	
Challenges faced by rural women entrepreneur	56	32.965	55	0.000	34.732	32.6207	36.843	Reject null hypothesis

Source: Primary data

The findings from the one-sample t-test on the challenges faced by rural women entrepreneurs show a strikingly high t-value of 32.965, with 55 degrees of freedom and a p-value of 0.000. This strongly suggests that we can reject the null hypothesis, which claims that the average challenge score is

zero. The mean difference stands at 34.73214, and the 95% confidence interval ranges from 32.6207 to 36.8436. This clearly indicates that the challenges these respondents face are not just significant; they are considerably greater than none at all. It underscores the serious and widespread

difficulties that rural women entrepreneurs encounter in their business ventures. Research has identified several common hurdles, including limited access to financing, socio-cultural barriers, lack of education and skills, poor infrastructure, and the challenge of juggling family responsibilities. These issues significantly impede their growth potential, highlighting the need for targeted policy interventions and support systems to enhance their economic participation and empowerment. The statistical evidence points to an urgent and ongoing necessity to systematically tackle these challenges to promote the development of rural women entrepreneurs.

H0: The digital divide does not significantly impact on different aspects of business for women entrepreneurs.

H03: The digital divide significantly impacts on different aspects of business for women entrepreneurs.

One-way ANOVA analysis for impact of digital divide on marketing aspect

One-way ANOVA								
Marketing aspect								
	Sum of	Df	Mean	F	P-value	Decision		
	squares	וט	square	Г	r-value	Decision		
Between groups	1089.57	3	363.191			Daigat mull		
Within groups	3110.356	52	59.815	6.072	0.001	Reject null hypothesis		
Total	4199.929	55				nypotnesis		

Source: Primary data

One-way ANOVA analysis for impact of digital divide on financial aspect

One-way ANOVA								
Financial aspect								
	Sum of Df Mean F P-va				P-value	Decision		
	squares	Di	square	r	1 -value	Decision		
Between groups	137.109	3	45.703			Daigat mull		
Within groups	699.73	52	13.456	3.396	0.025	Reject null hypothesis		
Total	836.839	55				nypomesis		

Source: Primary data

One-way anova analysis for impact of digital divide on human resource aspect

One-way anova								
HR aspect								
Sum of Df Mean F P- Deci								
	squares	ы	square	r	value	Decision		
Between groups	435.773	2	217.886			Daigat mull		
Within groups	1265.781	53	23.883	9.123	0.000	Reject null hypothesis		
Total	1701.554	55				nypomesis		

Source: Primary data

The One-Way ANOVA results for marketing, finance, and HR show some interesting differences in group averages across these three areas within the sample we studied. Starting with marketing, we found an F-value of 6.072 and a p-value of 0.001 (which is less than 0.05). This means we can confidently reject the null hypothesis, suggesting there are significant differences in how the groups perceive or experience things. Moving on to finance, the F-value is 3.396 with a p-value of 0.025, which also leads us to reject

the null hypothesis, indicating notable variations among the groups in financial metrics. Lastly, the HR aspect stands out the most, boasting an F-value of 9.123 and a very significant p-value of 0.000. This confirms that there are indeed significant differences between groups when it comes to human resource-related factors. The "Between Groups" sum of squares shows how much variability comes from differences between the groups, while the "Within Groups" values highlight the leftover variability that exists within those groups. To calculate the degrees of freedom, you take the number of groups and subtract one for the between groups, and for the within groups, you subtract the number of groups from the total sample size. In short, these results suggest that the groups identified in the study have notable differences in marketing, finance, and human resources. This calls for further post hoc analyses to pinpoint exactly which groups differ, allowing for targeted strategies or adjustments to boost performance and tackle any gaps among rural women entrepreneurs or the demographic in question. The findings stress the importance of addressing the unique needs in marketing, finance, and HR to enhance entrepreneurial success.

Conclusion

The research aimed at closing the digital gap for women entrepreneurs in the rural areas of Tumkur district reveals that the participants have a commendable level of digital literacy. However, it also highlights persistent challenges like affordability, accessibility, and socio-cultural factors that continue to obstruct broader digital inclusion. The data collected strongly indicates that these digital inequalities significantly impact crucial business aspects, such as marketing, finance, and human resource management, which ultimately affects overall entrepreneurial success and empowerment. While government initiatives and digital literacy programs have made progress, ongoing efforts to tackle infrastructural issues and gender-specific socioeconomic barriers are essential. Bridging the digital divide is crucial not just for enhancing the skills and competitiveness of rural women entrepreneurs, but also for promoting inclusive and sustainable rural development, gender equality, and economic resilience in rural Karnataka. This underscores the urgent need for tailored policies and support systems that address the unique challenges rural women face in leveraging digital technologies for their entrepreneurial growth and socio-economic empowerment.

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