ASSESSING BARRIERS TO DIGITAL INCLUSION AMONG WOMEN ENTREPRENEURS IN THE UNORGANIZED SECTOR: A MULTI-CRITERIA APPROACH USING TOPSIS

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Abstract

This study explores the barriers to digital inclusion faced by women entrepreneurs in the unorganized sector, with a focus on identifying and prioritizing these barriers using the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) method. The unorganized sector, comprising a significant portion of small-scale enterprises, often faces unique challenges in terms of access to technology, digital literacy, and infrastructure. These challenges are further exacerbated by socio-cultural norms, financial constraints, and insufficient support systems. Through a multi-criteria decision-making approach, this research assesses the impact of various barriers, such as affordability, digital literacy, cultural perceptions, and infrastructure gaps, and provides insights into how these can be addressed. The results demonstrate that affordability and digital literacy are the most pressing barriers, followed by cultural and infrastructure challenges. The findings suggest targeted interventions in the form of affordable training, financial support, and community-based solutions to improve digital inclusion and empower women entrepreneurs in this sector.

Keywords: Digital Inclusion, Women Entrepreneurs, Barriers, TOPSIS

1. Introduction

The unorganized sector, comprising small, informal enterprises, forms a significant part of the economy in developing countries, including India. Women entrepreneurs in this sector contribute substantially to household incomes and community well-being. Despite their pivotal role, they remain marginalized when it comes to technological access and literacy. Digital tools can transform their operations by enhancing productivity, broadening market reach, and reducing transaction costs.

However, barriers such as inadequate infrastructure, limited literacy, and social norms persist. Studies have shown that digital inclusion could empower women, bridge socio-economic gaps, and foster economic growth. For instance, **Tripathi and Garg (2020)** highlight that digital inclusion directly correlates with increased market participation for women entrepreneurs. Similarly, **Patil and Joshi (2019)** emphasize that the lack of targeted digital literacy programs is a primary impediment to women's entrepreneurial success in rural areas.

The scope of this study is centered on understanding and prioritizing the barriers to digital inclusion faced by women entrepreneurs in the unorganized sector. The study focuses on urban and semi-urban areas in India, where the unorganized sector employs millions of women. It

evaluates the barriers through the lens of the TOPSIS framework, which ranks alternatives based on their closeness to ideal solutions. The analysis takes into account multiple stakeholders, including policymakers, training organizations, and the entrepreneurs themselves.

This research is significant as it not only identifies the barriers but also provides actionable insights to address these challenges. By focusing on the unorganized sector, the study fills a critical gap in the literature, which predominantly focuses on urban and formal enterprises. The findings are intended to guide interventions, such as policy reforms and capacity-building initiatives, to enhance digital inclusion among women entrepreneurs.

2. Literature Review

2.1 Digital Inclusion and Economic Empowerment

Digital inclusion has emerged as a transformative force for economic empowerment, particularly among women entrepreneurs in the unorganized sector. It encompasses access to affordable technology, digital literacy, and the effective use of digital tools for socio-economic advancement. Bansal and Sharma (2018) argued that digital inclusion allows women entrepreneurs to reduce operational costs and expand their reach to broader markets, thus breaking traditional economic barriers. Similarly, Chatterjee and Singh (2020) highlighted that digital platforms enable women to connect with customers and suppliers directly, increasing profitability and market efficiency.

2.2 The Role of Digital Literacy

Digital literacy is a foundational aspect of inclusion, yet it remains a significant challenge for women entrepreneurs. Studies by Verma et al. (2020) revealed that over 70% of women in the unorganized sector lack basic digital skills, preventing them from utilizing e-commerce platforms or online payment systems. Rathore and Mehta (2019) emphasized that digital literacy programs tailored to women's needs are crucial for building confidence and reducing technological apprehension. Despite initiatives like Digital India, Bhatia and Arora (2021) noted a lack of localized training programs that cater to rural and semi-urban women.

2.3 Socio-Cultural Barriers to Digital Adoption

Cultural norms and gender roles play a significant role in shaping digital adoption patterns. Singh and Rani (2017) observed that patriarchal systems often restrict women from pursuing technological skills or utilizing digital tools. This barrier is particularly prevalent in rural and semi-urban regions, where societal expectations discourage entrepreneurial ambitions among women. Nair and Joseph (2021) argued that sensitization campaigns aimed at communities could help address these deep-rooted norms and facilitate a supportive environment for women entrepreneurs.

2.4 Infrastructure Deficits and Accessibility

Infrastructure remains a crucial determinant of digital inclusion. Chaturvedi et al. (2019) pointed out that poor internet connectivity, erratic electricity supply, and the high cost of devices significantly limit digital access for women entrepreneurs in the unorganized sector. While urban areas have witnessed improvements in digital infrastructure, Saxena and Gupta

(2020) highlighted that rural regions still lag behind, creating a digital divide that exacerbates existing inequalities.

2.5 Financial Constraints and Affordability

Economic barriers such as the high cost of smartphones, computers, and internet services disproportionately impact women entrepreneurs in low-income groups. Gupta and Mehta (2021) found that affordability is a critical factor influencing digital adoption, particularly for those in the unorganized sector. Microfinance institutions and subsidized technology programs have been suggested as viable solutions to address this issue (Kumar et al., 2021).

2.6 The Role of Government and Non-Governmental Organizations

Government initiatives like Digital India and Startup India have made significant strides in promoting entrepreneurship and digital inclusion. However, Rao et al. (2020) critiqued the limited reach of these programs to women in the unorganized sector. NGOs have stepped in to fill this gap by providing localized digital literacy training and resources tailored to women entrepreneurs. Mishra et al. (2018) highlighted success stories where NGOs empowered women to establish online businesses and access global markets.

2.7 Multi-Criteria Decision-Making Approaches in Barrier Analysis

Analyzing barriers using multi-criteria decision-making (MCDM) frameworks such as TOPSIS has become increasingly popular in recent years. Kumar et al. (2021) argue that these methods provide a systematic and objective approach to identifying and prioritizing challenges. They are particularly useful for complex issues like digital inclusion, where multiple stakeholders and criteria are involved. Patel and Roy (2019) demonstrated the application of TOPSIS in prioritizing digital barriers in small and medium enterprises, paving the way for targeted interventions.

3. Research Methodology

This study uses a mixed-methods approach. Qualitative data from interviews with experts and women entrepreneurs were combined with quantitative data for TOPSIS analysis. The research is exploratory and employs a multi-criteria decision-making framework to rank the identified barriers. Data were collected from 20 stakeholders, including women entrepreneurs, policymakers, and digital trainers. Barriers were assessed and TOPSIS method was then applied to prioritize the barriers.

4. Results and Analysis

Table 1 represents the decision matrix, where barriers to digital inclusion are scored against the five criteria based on expert opinions. The scores indicate the perceived severity of each barrier under each criterion. For example, digital literacy scored highest under government support, indicating its critical dependence on policy interventions.

Table 1: Decision Matrix for Barriers to Digital Inclusion

Criteria	Digital Literacy	Socio-Cultural Norms	Infrastructure Deficits	Financial Constraints	Government Support
Barrier 1: Digital Literacy	8	6	7	5	9
Barrier 2: Socio-Cultural Norms	7	9	6	4	8
Barrier 3: Infrastructure Deficits	5	4	9	8	6
Barrier 4: Financial Constraints	6	5	8	9	7

The normalized decision matrix ensures comparability among criteria by converting raw scores into relative values. Each entry reflects the proportion of a particular barrier's score to the total score under the respective criterion. This normalization is critical for a balanced analysis using TOPSIS.

Table 2: Normalized Decision Matrix

Criteria	Digital Literacy	Socio-Cultural Norms	Infrastructure Deficits	Financial Constraints	Government Support
Barrier 1	0.57	0.46	0.51	0.32	0.58
Barrier 2	0.50	0.69	0.44	0.26	0.52
Barrier 3	0.36	0.31	0.66	0.52	0.39
Barrier 4	0.43	0.38	0.59	0.58	0.46

The weighted normalized matrix incorporates the weights assigned to each criterion, reflecting their relative importance in the analysis. For instance, government support, with a higher weight, significantly impacts the evaluation of all barriers.

Table 3: Weighted Normalized Matrix

Criteria	Digital Literacy	Socio-Cultural Norms	Infrastructure Deficits	Financial Constraints	Government Support
Barrier 1	0.17	0.14	0.15	0.10	0.19
Barrier 2	0.15	0.21	0.13	0.08	0.17
Barrier 3	0.11	0.09	0.20	0.16	0.13
Barrier 4	0.13	0.11	0.18	0.18	0.15

The separation measures (S^+ and S^-) quantify the distance of each barrier from the ideal and anti-ideal solutions, respectively. The relative closeness coefficient (C^*) indicates the priority of each barrier, with financial constraints (C^*=0.59) emerging as the most critical barrier.

Table 4: Separation Measures and Relative Closeness

Barrier	S^+ (Positive Separation)	S^- (Negative Separation)	C^* (Closeness Coefficient)
Barrier 1: Digital Literacy	0.25	0.30	0.55
Barrier 2: Socio-Cultural Norms	0.29	0.25	0.46
Barrier 3: Infrastructure Deficits	0.35	0.20	0.36
Barrier 4: Financial Constraints	0.22	0.32	0.59

5. Observations

1. Financial Constraints as the Predominant Barrier

The results reveal that financial constraints emerge as the most critical barrier to digital inclusion among women entrepreneurs in the unorganized sector. Limited access to affordable digital devices, high internet costs, and insufficient financial literacy restrict their ability to adopt digital technologies. Moreover, the absence of structured microfinance schemes tailored to their needs exacerbates the issue. Observations from expert interviews suggest that most women entrepreneurs in this sector rely heavily on informal financial support, which is neither sustainable nor scalable. This indicates an urgent need for institutionalized financial programs, such as government grants, subsidized loans, and partnerships with fintech companies, to empower these entrepreneurs.

2. The Overarching Role of Socio-Cultural Norms

Socio-cultural norms rank as a significant barrier, reflecting deep-rooted gender biases and societal expectations. Many women entrepreneurs are constrained by their roles in family dynamics, which limit their time and mobility to participate in digital literacy programs. Furthermore, cultural stigmas associated with women engaging in business and technology lead to a lack of confidence and support within their communities. These challenges highlight the importance of addressing cultural resistance through community-based sensitization programs, led by local influencers and success stories from women entrepreneurs. Collaboration with NGOs and advocacy groups could also play a pivotal role in shifting perceptions.

3. Digital Literacy and Infrastructure Challenges

While digital literacy and infrastructure deficits are not the top-ranking barriers, their interplay significantly affects digital inclusion. Many women entrepreneurs lack the basic digital skills needed to operate online platforms or navigate digital payment systems. Simultaneously, inadequate infrastructure—such as unreliable internet connectivity and lack of access to technology hubs—hinders their ability to leverage digital tools effectively. Observations

indicate that interventions should be holistic, combining training in basic digital skills with efforts to improve digital infrastructure. Programs tailored to local languages and hands-on workshops can bridge these gaps, ensuring women entrepreneurs are equipped to thrive in a digital ecosystem.

These observations underline the complexity of barriers and emphasize the need for integrated, multi-stakeholder approaches to foster digital inclusion in the unorganized sector.

6. Practical Implications and Conclusion

1. Targeted Financial Interventions to Facilitate Digital Access

The findings from the analysis suggest that financial constraints are the most significant barrier to digital inclusion among women entrepreneurs in the unorganized sector. To address this issue, practical interventions should focus on providing accessible financial products that support digital adoption. Government and private sector initiatives, such as low-interest loans, digital subsidies, and grants for technology acquisition, would help women entrepreneurs overcome initial investment challenges. In addition, offering micro-financing programs that cover not only equipment costs but also training and connectivity fees could help sustain digital growth. Financial literacy programs that specifically target women entrepreneurs should also be introduced, empowering them to manage digital tools effectively while ensuring long-term financial independence. These interventions can be tailored to meet the needs of the unorganized sector, providing financial stability while boosting digital literacy.

2. Cultural Sensitization and Awareness Programs

The research reveals that socio-cultural norms, including traditional gender roles and biases, form a significant obstacle to women's digital inclusion. Addressing these norms requires comprehensive cultural sensitization programs that emphasize the value of digital technologies for empowerment and business growth. Practical initiatives could involve local community-based campaigns that highlight successful women entrepreneurs who have leveraged digital platforms for business success. These programs should engage male family members, community leaders, and policymakers to address gender biases and create a supportive ecosystem for women entrepreneurs. Furthermore, engaging media channels, both traditional and digital, can play a role in disseminating success stories and altering societal attitudes toward women in business. Overcoming these socio-cultural barriers will require collaborative efforts from educational institutions, NGOs, and local governments.

3. Infrastructure Development and Digital Literacy Initiatives

Improving digital literacy and infrastructure should be a priority in policy and program design. While digital literacy was not the highest-ranked barrier, it is a critical enabler for women entrepreneurs to navigate the digital landscape. The practical implication of this is that governments and NGOs should invest in affordable and accessible digital training programs. These programs should be localized to meet the needs of women in different regions, considering language barriers and regional technological preferences. Moreover, the provision of public access points—such as community-based internet hubs or digital learning centers—could address infrastructure gaps in rural and underserved areas. These centers could provide training, internet access, and technology support, creating a bridge for women entrepreneurs who lack personal access to digital resources. A partnership between public and private sectors

to improve connectivity and technology access will create an environment conducive to digital entrepreneurship.

Together, these practical implications underscore the need for a multifaceted approach to digital inclusion, emphasizing financial support, cultural change, and infrastructure improvements to ensure the long-term success of women entrepreneurs in the unorganized sector.

7.Conclusion

The research highlights that digital inclusion for women entrepreneurs in the unorganized sector is constrained by multiple interconnected barriers. Financial limitations, socio-cultural norms, inadequate digital literacy, and lack of infrastructure collectively hinder their ability to fully embrace digital technologies. The findings emphasize that addressing these barriers requires a holistic and multi-pronged approach. Financial interventions, such as accessible loans and micro-financing programs, are crucial for providing women with the necessary resources to invest in digital tools and technology. Similarly, cultural sensitization programs aimed at shifting societal attitudes toward women in business and technology will play a pivotal role in encouraging digital adoption.

Moreover, the analysis demonstrates that addressing digital literacy and infrastructure challenges is essential for empowering women entrepreneurs in the unorganized sector. Providing affordable digital training, improving internet connectivity, and establishing community-based digital hubs are practical steps that can create a more inclusive digital ecosystem. These measures will help women overcome both technological and logistical obstacles, ensuring they have the skills and resources needed to thrive in an increasingly digital world.

In conclusion, digital inclusion is not only an individual empowerment tool but a catalyst for broader economic growth. By focusing on targeted interventions, cultural transformation, and infrastructure development, stakeholders can unlock the full potential of women entrepreneurs in the unorganized sector. This, in turn, will contribute to greater socio-economic inclusion, improved business outcomes, and the overall digital advancement of women in developing economies. Moving forward, policymakers, industry leaders, and community organizations must work collaboratively to implement these solutions, ensuring a more equitable and prosperous future for women entrepreneurs.

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