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Critical Financial Barriers to Technology Adoption and Entrepreneurship in Rural India: A TISM Modeling Approach

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ABSTRACT

This study investigates the critical barriers impacting the financial mechanisms necessary for adopting innovative technologies and fostering entrepreneurial initiatives in rural areas of India. Despite the rich natural and human resources in rural India, which present an ideal combination for innovation and entrepreneurship, these areas remain underdeveloped, partly due to insufficient financial mechanisms. Aligning with the UN's Sustainable Development agenda and the imperative for sustainability-oriented innovation, the research employs the Total Interpretive Structural Modeling (TISM) approach to identify and analyze the hierarchical relationships among the critical barriers. Key impediments identified include insufficient financial literacy, lack of government initiatives, gender disparity, lack of financial independence for youth and women, limited access to traditional banking services, complex banking procedures, lack of easy fundraising processes, lack of investors, and lack of education and training. The findings highlight that the lack of investors is a significant constraint, and governmental intervention is crucial for creating the necessary infrastructure, providing financial education, and improving banking services to stimulate rural economies and drive innovation adoption. This research offers valuable insights for policymakers and stakeholders to strategically address these barriers and promote inclusive economic growth.

1. INTRODUCTION

The UN's 2030 Agenda for Sustainable Development has garnered support from industries and academia for its expected far-reaching impact on the world environment and economies (United Nations, 2015). This agenda underscores the importance of natural resources for economic development to ameliorate widespread hunger and poverty while avoiding environmental degradation. Rural entrepreneurship endeavours using region-specific natural and Indigenous populations are considered the best approach to sustainable development in nations like India (Mei et al., 2022). India is characterized by abundant natural resources, significant demographic dividends, and lop-sided industrial development that favours cities. Despite rural India being rich in natural and human resources, presenting an ideal combination for innovation and entrepreneurial development, these areas remain underdeveloped. A key reason for this underdevelopment is the insufficient mechanisms required to provide the necessary financial education and finances to invest in innovative endeavours (Ge et al., 2022; Yao & Yang, 2022).

While government and NGO initiatives have supported entrepreneurial endeavours, they are far from optimal given the vast potential rural areas offer for innovation and entrepreneurial development. Sustainability-oriented innovation is crucial for India to establish itself as an advanced industrial nation (Rodriguez-Espindola et al., 2022). This advancement is impossible unless the rural areas, home to 60 percent of India's population, are brought into the mainstream of innovation and entrepreneurial journey. Achieving this requires overcoming critical barriers that hinder sound financial mechanisms for adopting innovative technologies and entrepreneurial initiatives in rural industrialization. Innovations are seen as a means for closed-loop production and eco-efficiency, leading to the achievement of sustainability. This can result in the development of a new model for sustainable development through a circular economy encompassing both rural and urban areas of India. However, critical barriers to a sound financial mechanism prevent entrepreneurial minds from investing in innovative ideas for rural industrialization. These barriers can range from limited access to banking services to insufficient access to financial guidance, such as financial education and knowledge on how to invest one's own money. Hence this study first examines: What are the critical barriers to a financial mechanism for adopting innovative technologies in rural areas?

The literature identifies a range of such critical barriers, including limited access to banking services, insufficient financial guidance and education, lack of knowledge to invest one's own money, limited access to credit and financing, poor financial literacy, the absence of tailored financial prod investors (quate infrastructure, high transaction costs, bureaucratic processes, insufficient government support and policy implementation, gender disparity, lack of financial independence for youth and women, complex banking procedures, lack of an easy fundraising process, and a lack of investors (Fernando et at., 2024; Gupta & Chaudhary, 2023). The core problem driving the need to investigate the hierarchical order and interrelationship of these barriers is that these impediments do not exist in isolation; they are interconnected in a complex system. Merely listing the barriers is insufficient for developing effective strategies to overcome them. Understanding how these barriers influence or are influenced by one another is crucial. For instance, a lack of education and training might contribute to insufficient financial literacy, which in turn affects access to financial services. Similarly, limited access to traditional banking services and complex procedures can impact the ease of fundraising or the financial independence of individuals. Gender disparity can affect access to resources and decision-making power, thereby influencing financial independence and access to financial mechanisms. Hence, this study's second aim is to examine: *What is the hierarchical order and interrelationship of the identified barriers?*

The paper's contribution lies in providing a comprehensive understanding of the critical barriers to a financial mechanism for adopting innovative technologies in rural areas and identifying their hierarchical relationship and interrelationship. By utilizing the Total Interpretive Structural Modeling (TISM) approach, the study offers a systematic framework for decision-making. It helps in making informed decisions, crafting evidence-based policies, and prioritizing interventions by sequencing them effectively. The TISM approach guides the identification of the root causes of barriers, allowing interventions to be directed towards the most influential barriers for cascading positive impacts. This thorough understanding facilitates the best allocation of resources towards developing a sound financial mechanism to maximize technology adoption for innovation expansion in rural areas. Furthermore, the study provides practical implications for strategic planning by NGOs and development agencies, guiding financial institutions to tailor products and services, and enabling the private sector to increase investment through innovative credit terms and public-private partnerships. Theoretically, it adds to the literature on TISM, demonstrating its robustness and leading to methodological advances. It also helps develop a conceptual framework adaptable to other contexts and enhances the understanding of technology adoption barriers and innovative financial mechanisms in rural areas.

2. LITERATURE REVIEW

Rural areas in India, despite being rich in natural and human resources and home to a significant portion of the population, remain underdeveloped compared to urban areas, partly due to insufficient sound financial mechanisms to provide the necessary financial education and investment finance for innovative endeavours. The adoption of innovative technologies and entrepreneurial initiatives is hindered by these barriers. Innovations are seen as a means for achieving sustainability through closed-loop production and eco-efficiency. However, critical barriers exist to a sound financial mechanism that would allow entrepreneurial minds to invest in innovative ideas for rural industrialization. These barriers can range from limited access to banking services to insufficient access to financial guidance, knowledge to invest one's own money, and more. Here are the identified barriers from the literature:

2.1 Lack of Supportive Social and Economic Environment

Despite phenomenal growth in urban areas of India, the Rural sector jostles for basic development due to challenges it faces in technological adoption and extension in the agriculture and industrial sectors (Dixit et al., 2023). Social and economic facets deeply affect the extension strategies of technology in rural areas (Gardezi et al., 2024; Dixit et al., 2023). The efficacy of innovative technology extension in agriculture and industry is subject to obsolete social and economic environments in rural areas. Although agriculture is the linchpin for the economy and food security in India (Encinales et al., 2024), it is unable to shatter the age-old shackles of social and economic thought processes, which are deeply rooted in the maxim of self-sufficiency and the notion that all is well with the grace of God. This thought process puts chains on the development path(Weyers et al., 2008; Roy et al., 2015).

People are normally reluctant to come out of that poverty or insufficiency zone and try to remain happy within the limits set by the economic and social environment (Gupta & Chaudhary, 2023). They live in the inertia of technological processes. They do not wish to grow at the expense of risk. To them, it is not worth taking risks for some material gains, and this thought process of rural people in India is one of the most serious impediments to technology adoption. Then there are other exacerbating factors such as inadequate crop design and planning, suboptimal environmental conditions, use of ineffective practices, and above all, low technification of processes such as irrigation and draining (Dixit et al., 2023; Encinales et al., 2024). Then, there is the problem of the low level of industrial progress. The social and economic environment does not warrant any gambling or risk-taking with business activity (Liu et al., 2021; Nanako, 2018). Most people have an aversion to business activities. Even if someone tries to do so, there is a lack of economic machinery that can support the establishment of any venture. Other than these problems, gender-based biases exist due to a lack of understanding of business and entrepreneurship and access to the requisite skills to run these enterprises (Lingam, P., 2023). In addition, rural entrepreneurs face a lack of understanding of market needs, viability of products, and whether the product is suitable for manufacture (Dixit et al., 2023). Even established businesses that manage some early-stage revenues face problems of inconsistent market linkages, severe competition from urban markets, a lack of good infrastructural facilities, and logistic challenges (Gardezi et al., 2024). Government policies for support mechanisms for farmers fail to reach them. Above all is the unavailability of working capital, which leads to a lack of technology adoption and an inability to diversify product ranges (Gupta et al., 2023; Gupta & Chaudhary, 2023).

2.2 Insufficient Financial Literacy

Financial literacy is the basic ability for a person to understand and use effectively the financial skills that include management of personal finances, budgeting, interest rates, inflation, risk management, and investing (Gupta & Chaudhary, 2023). People in rural areas are seldom provided with an opportunity to gain financial literacy (Gardezi et al., 2024; Dixit et al., 2023). Due to a lack of financial literacy, they do not possess a smart relationship with money (Fernando et al., 2024). Moreover, they are devoid of learning about various financial aspects of life. This is due to the education system of India, which does not contain material on financial literacy during the learning years (Molina et al., 2023; Gardezi et al., 2024; Dixit et al., 2023).

Moreover, children and elders in rural areas do not have basic education, so leaving aside financial literacy mars the prospects of rural people learning about banking and financial aspects of their lives (Gardezi et al., 2024; Dixit et al., 2023). Lack of financial literacy makes them vulnerable to financial fraud. This lack of financial literacy acts as an impediment to their initiative to undertake any innovative or entrepreneurial activity (Cai et al., 2024; Song et al., 2024) to improve their income and rise higher in life. This lack of financial literacy is damaging to rural society and is the most critical impediment to attaining financial success (Gardezi et al., 2024; Dixit et al., 2023). A person who does not have financial literacy may not be able to make short-term or long-term financial strategies and have low risk tolerance, due to which they may fall into many pitfalls, such as accumulating unsustainable debt burdens due to poor spending habits or a lack of financial planning. This may lead to poor credit, bankruptcy, housing foreclosures, and many other negative consequences (Kicova et al., 2025; Fernando et al., 2024; Czech et al., 2024)

2.3 Gender Disparity

Gender disparity can be a significant barrier to adopting innovative technologies in rural areas (Watson et al., 1994; Matthews et al., 2000; Gupta et al., 2023; Gupta et al., 2023). In rural areas, the issue of gender disparity encompasses various dimensions, including access to resources, decision-making power, and socio-cultural norms (Gupta et al., 2023). Firstly, women have to jostle with limited access to financial resources (Cai et al., 2024; Song et al., 2024; Fernando et al., 2024). Women often have less access to credit and loans than men (Modi, 2023). Moreover, financial institutions may require collateral that women do not have, or they may be perceived as higher-risk borrowers (Gardezi et al., 2024). Women have very low earning opportunities in rural areas (Modi, 2023). They typically fall in lower earning strata than men, even if they have any. Their low earnings limit their capacity to invest in new technologies (Cai et al., 2024; Song et al., 2024). Women in rural seldom have land ownership rights, and even if they have, they are not free to exercise those rights as they have to follow the word of males in the family, which seriously reduces their access to finance (Modi, 2023). Ownership of other productive assets (like livestock or machinery) is also often skewed in favour of men (Kanthaliya, 2017; Shenbei et al., 2023).

In many rural households, men make the major financial decisions (Gardezi et al., 2024; Lingam, 2023). This can result in a preference for investments that align with men's priorities and interests, potentially sidelining innovations that could benefit women. Men are more likely to hold leadership positions in rural communities, influencing communal decisions (Lingam, P., 2023) on resource allocation and technological adoption (Dixit et al., 2023; Lingam, 2023) Women often have lower levels of education and less access to training programs critical for adopting and managing new technologies. Women typically have more domestic responsibilities, limiting their time and ability to attend training or engage in activities that require travel (Lingam, 2023). Women may have less access to information about new technologies and financial mechanisms due to lower literacy rates, fewer opportunities to participate in extension services, and limited access to mobile technology (Fernando et al., 2024). Men's networks often extend beyond the community, providing better access to information and opportunities. Women's networks might be more localized, limiting their exposure to new ideas and innovations.

2.4 Lack of Financial Independence for Youth and Women

India is making strides in financial inclusion. However, two issues are yet to be tackled: one is the financial inclusion of the rural population, and the second is the financial independence of youth and women in matters related to investment (Xiao et al,. 2014; Fernando et al., 2024; Branzoli et al., 2024). Inequity is evident in human development rankings, as the two are closely linked. Although India is one of the fastest-growing economies, it ranks 131 out of 189 countries on the Human Development Index. Therefore, addressing the gender gap and ensuring women's financial independence is crucial for improving this ranking and fostering a desirable social framework (Gupta et al., 2023). Women in rural areas are involved in several earning activities in farmlands and small business activities; however, they seldom have the right to spend or invest that money, as financial decisions are primarily taken up by males of the family (Srivastava, 2020; Evelyn et al,. 2021; Gupta et al., 2023).

In certain cases, even young males are not free to take on investment activities without the consent of senior males in the family. In general, there is low financial literacy, so senior male members find no virtue in spending money on innovative activities, which, according to them, are risky ventures, so innovative and entrepreneurial activities take a backseat in rural areas of India (Danladi et al., 2023; Gupta et al., 2023). Moreover, education and vocational training are crucial for economic empowerment. In many rural areas, access to quality education and skill development programs is limited, restricting opportunities for youth and women to gain the skills needed for gainful employment or entrepreneurship. Without adequate education and training, youth and women often depend on traditional and low-paying agricultural or unskilled labour (Gardezi et al., 2024; Dixit et al., 2023). Deep-rooted gender biases and social norms in rural areas often restrict women's participation in the workforce and their ability to manage finances. Cultural practices may prioritize male education and employment, limiting opportunities for women to pursue careers or entrepreneurial activities, thereby maintaining their financial dependence on male family members. Rural areas often have fewer formal employment opportunities than urban centres (Lingam, P., 2023, Danladi et al., 2023). This scarcity of jobs disproportionately affects youth and women, who may have less mobility or face societal restrictions on working outside the home. The limited availability of jobs forces many to remain low-paying (Gupta et al., A., 2023) and informal or seasonal work, which does not provide financial stability or independence (Fernando et al., 2024). Financial services, including bank accounts, credit, savings, and insurance, are less accessible in rural areas (Danladi et al., 2023). This lack of access prevents youth and women from independently managing their finances, saving for the future, or investing in business opportunities.

Women, in particular, face additional barriers to accessing financial services due to gender biases in banking and financial institutions. Agriculture remains the primary source of income in rural areas, but it is often low-paying and subject to risks such as weather fluctuations and market volatility (Fernando et al., 2024). The dependence on agriculture limits financial independence, as incomes are irregular and insufficient to support economic autonomy (Danladi et al., 2023). Entrepreneurship can lead to financial independence, but rural youth and women often lack the necessary resources, such as startup capital, business training, and markets (Gupta et al., 2023). The absence of government or NGO support to foster rural entrepreneurship stifles opportunities for youth and women to become financially independent through their ventures. Government schemes and policies promoting financial inclusion and independence are often inadequately implemented in rural areas (Fernando et al., 2024). A lack of awareness, bureaucratic hurdles, and insufficient targeting means that many youth and women do not benefit from these initiatives, perpetuating their financial dependence.

2.5 Limited Access to Traditional Banking Services

Traditional financial institutions in India, including banks, face significant challenges in serving a large population segment, especially in rural areas with limited physical presence (Fernando et al., 2024). This scarcity restricts access to formal banking, causing inconvenience and additional costs for those who must travel long distances (Mavhiki et al,. 2015; Rajapathirana & Hui, 2018). Furthermore, the cumbersome paperwork and stringent documentation required by banks often deter individuals, particularly those with limited education and literacy (Gardezi et al., 2024; Dixit et al., 2023), from seeking their services (Rajapathirana & Hui, 2018). Women face additional challenges with traditional banking, marked by gender bias and discrimination, which limit their financial autonomy. Cultural norms and collateral requirements for loans further disadvantage women, leading to unjust denials of critical credit (Visconti, 2016; Lew et al., 2020). This, in turn, hinders their economic empowerment and financial independence in entrepreneurial endeavours (Gonzalez et al,. 2015 ;Gupta et al., 2023).

Moreover, rural areas often have a limited number of bank branches compared to urban centres. Rural regions' lower population density and higher operational costs discourage banks from expanding their branch networks (Gardezi et al., 2024; Dixit et al., 2023). According to the Reserve Bank of India (RBI), despite the increase in the number of rural branches, a significant proportion of the rural population still lacks access to bank branches nearby. Additionally, rural India's vast and diverse geography, including remote and hard-to-reach areas, makes establishing and maintaining banking infrastructure challenging (Fernando et al., 2024, Apr 12). Poor transportation and communication networks further exacerbate these challenges, making it difficult for rural residents to travel to distant bank branches (Gardezi et al., 2024; Dixit et al., 2023). Many rural areas lack the necessary financial infrastructure, such as ATMs, point-of-sale (POS) terminals, and internet connectivity (Shaikh & Shah, 2022), which are crucial for modern banking services. The absence of reliable electricity and digital connectivity hinders the establishment and operation of electronic banking services. The costs associated with

maintaining bank accounts, such as minimum balance requirements and transaction fees, can be prohibitive for rural residents with low and irregular incomes (Gupta et al., 2023; Gupta et al., A., 2023). High transaction costs discourage the rural population from using formal banking services, pushing them towards informal and often exploitative financial systems. Social norms and cultural practices in rural areas can influence access to banking services, particularly for women, who may face restrictions on mobility and financial autonomy (Branzoli et al., 2024; Lingam, P., 2023). Gender biases and societal expectations can limit women's participation in the formal banking system.

Banks often perceive rural clients as high-risk due to irregular income streams, lack of collateral, and the informal nature of many rural businesses. This risk aversion leads to stringent lending criteria and reduced willingness to extend credit to rural borrowers, limiting their access to necessary financial services (Gupta et al., 2023). Traditional banking services are often not tailored to the specific needs of rural populations, such as agricultural loans, microcredit for small enterprises, and financial products that accommodate irregular income patterns (Danladi et al., 2023; Gupta et al., 2023; Gupta et al., 2023). The absence of customized financial products makes traditional banking less relevant and less accessible to rural residents. While government schemes aim to improve financial inclusion, inadequate implementation, awareness, and support hinder their effectiveness in rural areas (Shaikh & Shah, 2022). A more robust and targeted approach is needed to bridge the gap between policy intentions and on-the-ground realities. Addressing these challenges requires a multi-faceted approach that includes expanding the rural banking infrastructure, simplifying banking procedures, enhancing financial literacy, and developing customized financial products (Visconti, 2016; Danladi et al., 2023; Gupta et al., 2023).

2.6 Complex Banking Procedures

The banking procedures in India are quite complex for rural people with low literacy levels (Taihui et al., 2023; Fernando et al., 2024). Getting a loan from any bank is no easy feat for a layman; hence, many people of the underprivileged class seldom visit banks for loans (Gardezi et al., 2024; Dixit et al., 2023). There are several other problems. Firstly, there is the low physical presence of banks in India. Many rural areas have few or no branches, either commercial or nationalized banks, making it difficult for residents to access banking services (Okpukpara, 2009; Mwangi et al., 2021; Salehi et al., 2021). Travelling long distances to reach the nearest bank can be time-consuming and costly. Then there are cumbersome documentation requirements because Banks often require extensive documentation for loan applications, including proof of identity, address, and income (Fernando et al., 2024). Rural residents may lack the necessary documents or find the process confusing and burdensome, especially if they have limited literacy (Ackah et al., 2014; Dixit et al., 2023; Lingam, P., 2023). After that, there is a lack of collateral. Many rural individuals do not have sufficient collateral to secure a loan, such as land titles or other valuable assets. Banks are often unwilling to approve loans without adequate collateral, leaving applicants without the necessary funds. Additionally, rural individuals have limited financial literacy (Talaia et al., 2016; Dixit et al., 2023; Lingam, P., 2023).

Many rural populations have a limited understanding of banking procedures and financial products. This lack of financial literacy makes it difficult for them to navigate the loan application process effectively. Then, there are credit history issues. Many rural residents do not have a formal credit history, which banks often require to assess creditworthiness. The absence of a credit history can lead to loan application rejections. Loans are difficult to secure due to high transaction costs. The cost of processing small loans is relatively high for banks, leading them to be less interested in servicing rural borrowers (Fernando et al., 2024). Higher transaction costs can also be passed on to borrowers, making loans less affordable. Gender bias is yet another reason for low loan procurement by rural people who want to indulge in some innovative or entrepreneurial endeavour, as women in rural areas face additional hurdles, including gender bias and discriminatory practices by bank officials. Cultural norms and societal expectations can further restrict women’s access to credit. Bureaucratic inefficiencies are other hurdles in getting financial aid in rural areas (Danladi et al., 2023; Gupta & Chaudhary, 2023). Lengthy and bureaucratic procedures can delay loan approvals and disbursements. Rural applicants often face longer waiting times compared to their urban counterparts. Rural areas have a high level of awareness regarding loan facilities and schemes. Many rural residents are unaware of the various loan schemes and benefits available, including government initiatives to support rural borrowers (Fernando et al., 2024). This lack of awareness prevents them from taking advantage of financial opportunities.

2.7 Lack of Fundraising Process

Innovative initiatives are a luxury in rural areas due to the lack of easy fundraising processes. To begin with, there are various regulatory hurdles (Dixit et al., 2023). Complex regulations and compliance requirements can complicate the fundraising process (Kudlawicz et al., 2015; Talaia et al., 2016). Navigating legal frameworks, tax codes, and registration processes requires significant effort and expertise. After that, there is limited access to networks for fundraising (Fernando et al., 2024; Mwangi et al., 2021). Entrepreneurs and small businesses often lack connections to potential investors, including venture capitalists, angel investors, and crowdfunding platforms. Networking opportunities are crucial for securing funds, and a lack of access can hinder fundraising efforts. Limited financial documentation is yet another hurdle in fundraising in rural areas (Talaia et al., 2016). Many startups and small businesses struggle with maintaining comprehensive financial records and projections. Investors typically require detailed financial statements, business plans, and forecasts to assess the viability of an investment (Talaia et al., 2016; Fernando et al., 2024; Dixit et al., 2023). There is rampant market competition in

fundraising. The fundraising landscape is highly competitive, with many businesses vying for the attention of a limited pool of investors. Standing out in a crowded market requires a compelling value proposition and an effective pitch.

2.8 Lack of investors

Rural investment is associated with high risk and risk and investors often exhibit a high degree of risk aversion, particularly in uncertain economic climates like rural areas (Mwangi et al., 2021; Salehi et al., 2021). This cautious approach can result in more stringent due diligence and higher barriers to fundraising in rural areas. Geographical limitations of rural areas also make it less profitable for investors and businesses in remote or less economically developed regions may find it more challenging to attract investment (Gupta & Chaudhary; A., 2023). Geographic distance from major financial hubs can limit access to capital and investor networks. Lack of proven track record goes against the rural entrepreneurs, leading to difficulty obtaining finances (Saxena, 2012; Gupta, K. & Chaudhary; A., 2023). Moreover, early-stage companies and startups without a proven track record may find convincing investors of their potential difficult. Investors prefer businesses with demonstrated success and growth potential (Tran, 2013; Dixit et al., 2023).

Additionally, discrepancies between investor expectations and the entrepreneur's vision or business model can create barriers. Aligning interests and expectations is crucial for securing investment. Furthermore, rural entrepreneurs lack the knowledge and expertise to navigate the fundraising process effectively. Understanding different funding options, such as equity, debt, or grants, and their implications requires specialized knowledge. Lastly, economic downturns, market volatility, and other external factors can negatively impact investor sentiment and willingness to invest, especially in rural areas where profitability is hard to predict (Tran, 2013; Fernando et al., 2024; Salehi et al., 2021). These conditions can lead to tighter capital availability and increased scrutiny of investment opportunities (Kukhar, 2024).

2.9 Lack of Education and Training

Rural areas' lack of education and training facilities is a significant reason for low innovative endeavours and entrepreneurship in rural India. There is a large lack of business knowledge and skills in rural areas due to a lack of formal education and vocational training (Ye et al., 2025; Cai et al., 2024; Branzoli et al., 2024). Entrepreneurship requires various skills, including business planning, financial management, marketing, and strategic thinking. Without access to education and training facilities, rural residents often lack these critical skills. Formal education provides foundational knowledge (Song et al., 2024), while specialized training programs can equip individuals with specific entrepreneurial skills needed to start and manage a business (Gardezi et al., 2024; Danladi et al., 2023). Moreover, education and training facilities serve as important sources of information about market trends, business opportunities, and regulatory requirements. Without such facilities, rural individuals may remain unaware of potential business opportunities or lack the knowledge to navigate the complexities of starting and running a business. Lack of education impedes innovations and technology adoption (Olalekan et al., 2025; Danladi et al., 2023; Gupta et al., 2023).

Education fosters critical thinking, creativity, and innovation, essential for successful entrepreneurship. Without educational opportunities, rural populations may find it challenging to develop innovative ideas or solutions to become viable businesses (Song et al., 2024). Additionally, educational institutions and training programs often provide access to mentors and successful entrepreneurs who can offer guidance, support, and inspiration (Danladi et al., 2023; Gupta, K. & Chaudhary, 2023). In rural areas with limited educational facilities, aspiring entrepreneurs may lack access to role models and mentorship, which are crucial for building confidence and navigating challenges (Song et al., 2024). Vocational training centres and technical institutes provide hands-on training in various trades and skills that are essential for certain types of businesses, such as manufacturing, agriculture, and services (Fernando et al., 2024; Mwangi et al., 2021). The absence of such facilities in rural areas means fewer individuals have the practical skills to start and sustain businesses in these sectors.

Moreover, modern entrepreneurship increasingly relies on digital tools and technologies (Song et al., 2024; Fernando et al., 2024). Education and training facilities can teach digital literacy and technology usage. In rural areas with limited educational infrastructure, residents may struggle to adopt and utilize technology effectively, limiting their ability to compete in the broader market (Danladi et al., 2023; Nipo et al., 2024). Training programs often include information about financial resources, such as loans, grants, and government schemes that support entrepreneurship (Cai et al., 2024). Without this knowledge, rural entrepreneurs may struggle to access the necessary funding and support to start their ventures. Lastly, educational and training facilities can act as hubs for community development and networking, bringing together potential entrepreneurs to share ideas, collaborate, and support each other (Cai et al., 2024; Song et al., 2024). The lack of such centres in rural areas means fewer opportunities for community-based initiatives and collective entrepreneurship efforts (Fernando et al., 2024). In conclusion, rural areas' lack of education and training facilities significantly hinders entrepreneurship development by depriving individuals of essential skills, knowledge, resources, and networks (Song et al., 2024). Addressing this gap is crucial for fostering a more vibrant and dynamic entrepreneurial ecosystem in rural India.

2.10 Lack of Government Initiatives

Although the government of India has fostered a banking and financial network in India, it is still insufficient to cater to the burgeoning population of India and it is meeting its financial needs for innovative and entrepreneurial purposes (Ataei et al., 2020). Moreover, this lack of government initiatives for rural financial mechanisms in rural areas significantly hampers

economic development and entrepreneurship (Fernando et al., 2024; Dixit et al., 2023). Government initiatives play a crucial role in promoting financial inclusion by ensuring that financial services are accessible to all segments of the population (Dixit et al., 2023). In many rural areas, the absence of robust government-led financial programs (Salehi et al., 2021) means that a large portion of the population remains unbanked or under-banked, limiting their ability to save, invest, or obtain credit (Lingam, P., 2023).

Moreover, Microfinance Institutions (MFIs) are essential for providing financial services to rural populations, especially for those who do not have access to traditional banks. A lack of government support and regulatory frameworks for MFIs (Salehi et al., 2021) can hinder their growth and outreach, reducing their ability to serve rural communities effectively (Dixit et al., 2023). Additionally, rural entrepreneurs and farmers often need access to credit to start or expand their businesses. To facilitate this, government initiatives can provide low-interest loans, subsidies, and credit guarantees (Fernando et al., 2024). Rural residents may rely on informal and often exploitative lending practices without sufficient government-backed credit facilities, leading to debt traps and financial instability. Moreover, financial literacy is crucial for understanding and effectively using financial services (Salehi et al., 2021). Government initiatives can provide education and training to enhance financial literacy among rural populations. Without such programs, rural residents may lack the knowledge to make informed financial decisions, hindering their ability to manage finances, save for the future, or invest in business opportunities. Government initiatives are needed to develop digital financial infrastructure, such as mobile banking and internet-based financial services, which can reach remote rural areas (Danladi et al., 2023; Ali, 2011; North and Smallbone 2006). Without these initiatives, rural populations may be excluded from the benefits of digital finance, such as easier access to banking services, lower transaction costs, and enhanced financial security.

Even when government initiatives exist, their impact can be limited by poor implementation, lack of awareness, and bureaucratic inefficiencies (Danladi et al., 2023; Gupta et al., 2023). Effective implementation requires continuous monitoring, evaluation, and adjustments to ensure financial schemes reach their intended beneficiaries in rural areas (Smallbone, 2003). Rural economies have specific needs, such as agricultural loans, crop insurance, and financial products suited for small-scale enterprises. Government initiatives are necessary to develop and promote financial products tailored to these unique needs. The absence of such initiatives means that rural residents often lack access to appropriate financial services (Danladi et al., 2023; Gupta, Ali, 2011). Government investment in infrastructure, such as roads, electricity, and internet connectivity, supports financial mechanisms in rural areas. Even the best financial initiatives can fail to reach or be effective in rural settings without adequate infrastructure. Government initiatives are crucial for promoting financial inclusion among women, who often face additional barriers to accessing financial services (Gupta, K. & Chaudhary, A., 2023). The lack of targeted initiatives for women in rural areas can perpetuate gender disparities in financial access, limiting their economic empowerment and contribution to rural development. Addressing these gaps requires a comprehensive approach that includes strengthening existing initiatives, introducing new programs tailored to rural needs, enhancing infrastructure, and improving the implementation and monitoring of financial schemes (Gupta, K. & Chaudhary, 2023). Such efforts can significantly enhance financial inclusion and economic development in rural areas.

3. RESEARCH METHODOLOGY

In this study, TISM was utilized to explore the critical factors influencing the barriers to financial mechanisms for the adoption of innovative technologies in rural areas of India (Singh et al, 2024). Through an extensive literature review, key factors were identified in the previous section. TISM was then applied to understand the relationships between these factors and establish a hierarchical structure, offering a systematic framework for decision-making. The TISM approach is renowned for its systematic and logical approach to complex issues (Sushil & Dinesh, 2022).

This study sought input from 21 experts (see Appendix B for expert demography) in financial mechanisms adoption, including senior officials from the Ministry of Commerce and Industry, doctoral scholars, professors, and entrepreneurs. Experts were selected via convenient judgmental sampling. Structured questionnaires (see Appendix A) aligned with TISM principles were used for data collection. The collected data underwent analysis using the prescribed steps of TISM, leading to the development of a comprehensive model (Sushil, 2017).

Interpretive structural modelling (ISM) proves invaluable in dissecting complex scenarios where multiple elements are intricately interconnected. Recognizing the need for a thorough evaluation framework in qualitative research, TISM, a modified version of ISM, has been employed. TISM not only inherits ISM's advantages but also allows for interpreting each relationship, making the model entirely interpretive. This method enables the systematic inclusion of subjective judgments from respondents, leading to transparent interconnections. The TISM process involves several steps (see Figure 1):

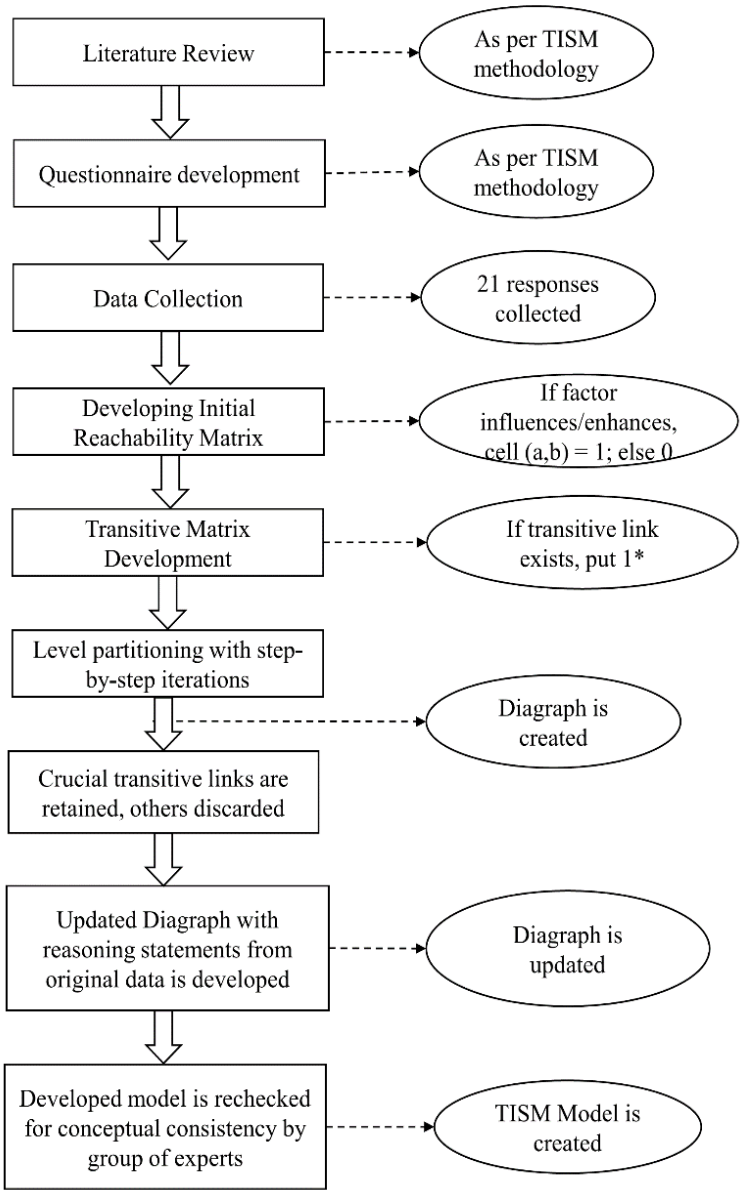

Figure 1. The flow of TISM method

• Key factors are identified through a literature review.

• Establishment of contextual relationships between factors.

• Interpretation of relationships to understand influence or enhancement.

• Conducting pair-wise comparisons to determine relationships.

• Formulating a reachability matrix based on comparisons and checking transitivity.

• Partitioning factors into hierarchical levels.

• Construction of a diagraph based on relationships.

• Transformation of the diagraph into an interaction matrix, refining transitive links.

• Development of TISM based on connective logic and interpretive insights, establishing directive links between nodes.

This approach allows for a comprehensive mapping of complex relationships, eliciting managerial insights and facilitating a deeper understanding of qualitative research. The following tables provided for the reachability matrix and deciding the levels of factors that influence the purchase intention of buyers for handicrafts. Table 1 presents barriers that have been identified from the literature review for the TISM model:

Table 1. List of variables and their codes for TISM modelling

S. No.	Variable Code	Variables
1	1	Lack of supportive social and Economic Environment
2	2	Insufficient Financial Literacy
3	3	Gender disparity
4	4	Lack of financial independence for youth and women
5	5	Limited Access to Traditional Banking Services
6	6	Complex banking procedures
7	7	Lack of an Easy Fundraising Process
8	8	Lack of investors
9	9	Lack of Education and training
10	10	Lack of Government Initiatives

4. ANALYSIS AND RESULTS

The TISM methodology involved several steps. Following data collection from 21 experts, an Initial Reachability Matrix was developed (Table 2). In this matrix, a '1' in cell (a, b) indicates that factor 'a' influences or enhances factor 'b', while '0' indicates no such influence. Table 2 presents the initial direct relationships between the ten identified barriers based on expert judgment. Next, a Transitive Matrix was developed (see Table 3). This matrix builds upon the Initial Reachability Matrix by including transitive links, which are indicated with a '1*'. Transitivity in TISM implies that if barrier A influences barrier B, and barrier B influences barrier C, then barrier A transitively influences barrier C.

The subsequent step involved partitioning the reachability matrix into different hierarchical levels through iterative calculations (Table 4). This process identifies the driving power and dependence of each barrier, allowing them to be grouped into distinct levels within the TISM hierarchy. Table 4 illustrates the steps taken to partition the barriers, showing the reachability set, antecedent set, intersection set, and the resulting level for each barrier across different iterations. Insufficient Financial Literacy (B2) was placed at Level I. Lack of Government Initiatives (B10) was placed at Level II. Gender Disparity (B3) was placed at Level III. The Lack of a Supportive Social and Economic Environment (B1) was placed at Level IV. Lack of Financial Independence for Youth and Women (B4), Limited Access to Traditional Banking Services (B5), and Lack of Easy Fundraising Process (B7) were all determined to be at Level V. Complex Banking Procedures (B6) and Lack of Education and Training (B9) were both placed at Level VI. Finally, the Lack of Investors (B8) was placed at Level VII.

Finally, the study established the hierarchical order of the barriers based on this partitioning process, as presented in Table 5. The levels indicate the degree of influence a barrier has within the system, with lower levels representing more fundamental or driving barriers and higher levels representing more dependent barriers. This hierarchical structure, derived from the reachability matrix and level partitioning, reveals the complex interrelationships and the driving influence of the barriers on one another. Understanding this order is crucial for developing effective strategies and prioritizing interventions to overcome these impediments and foster the adoption of innovative technologies in rural areas.

Table 2. Reachability Matrix

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
B1	1	1	1	0	0	0	0	0	0	0
B2	0	1	0	0	0	0	0	0	0	0

B3	0	1	1	0	0	0	0	0	0	0
B4	0	0	0	1	1	0	0	0	0	1
B5	0	0	1	1	1	0	1	0	0	1
B6	0	0	0	0	0	1	0	0	1	1
B7	0	1	1	1	0	0	1	0	0	0
B8	0	0	0	0	0	1	0	1	1	0
B9	0	0	1	0	0	1	0	0	1	0
B10	0	0	0	0	0	0	0	0	0	1

Table 3. Reachability Matrix with transitivity

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
B1	1	1	1	0	0	0	0	0	0	0
B2	0	1	0	0	0	0	0	0	0	0
B3	0	1	1	0	0	0	0	0	0	0
B4	0	1*	1*	1	1	0	1*	0	0	1
B5	0	1*	1	1	1	0	1	0	0	1
B6	0	1*	1*	0	0	1	0	0	1	1
B7	0	1	1	1	1*	0	1	0	0	1*
B8	0	1*	1*	0	0	1	0	1	1	1*
B9	0	1*	1	0	0	1	0	0	1	1*
B10	0	0	0	0	0	0	0	0	0	1

Table 4. Partitioning the Reachability Matrix into different levels

Variables	Reachability Set	Antecedent Set	Intersection Set	Level
Iteration 1				
B1	1, 2, 3	1	1	
B2	2	1, 2, 3, 4, 5, 6, 7, 8, 9	2	I
B3	2, 3	1, 3, 4, 5, 6, 7, 8, 9	3	
B4	2, 3, 4, 5, 7, 10	4, 5, 7	4, 5, 7	
B5	2, 3, 4, 5, 7, 10	4, 5, 7	4, 5, 7	
B6	2, 3, 6, 9, 10	6, 8, 9	6, 9	
B7	2, 3, 4, 5, 7, 10	4, 5, 7	4, 5, 7	
B8	2, 3, 6, 8, 9, 10	8	8	
B9	2, 3, 6, 9	6, 8, 9	6, 9	

B10	10	4, 5, 6, 7, 8, 10	10	II
Iteration 2				
H1	1, 3	1	1	
B3	3	1, 3, 4, 5, 6, 7, 8, 9	3	III
B4	3, 4, 5, 7	4, 5, 7	4, 5, 7	
B5	3, 4, 5, 7	4, 5, 7	4, 5, 7	
B6	3, 6, 9	6, 8, 9	6, 9	
B7	3, 4, 5, 7	4, 5, 7	4, 5, 7	
B8	3, 6, 8, 9	8	8	
B9	3, 6, 9	6, 8, 9	6, 9	
Iteration 3				
B1	1	1	1	IV
B4	4, 5, 7	4, 5, 7	4, 5, 7	V
B5	4, 5, 7	4, 5, 7	4, 5, 7	V
B6	6, 9	6, 8, 9	6, 9	VI
B7	4, 5, 7	4, 5, 7	4, 5, 7	V
B8	6, 8, 9	8	8	
B9	6, 9	6, 8, 9	6, 9	VI
Iteration 4				
B8	8	8	8	VII

Table 5. List of variables and their levels in TISM

S. No.	Variable Code	Variables	Level in TISM
1	2	Insufficient Financial Literacy	I
2	10	Lack of Government Initiatives	II
3	3	Gender Disparity	III
4	1	Lack of Supportive Social and Economic Environment	IV
5	4	Lack of Financial Independence for Youth and Women	V
6	5	Limited Access to Traditional Banking Services	V

7	7	Lack of an Easy Fundraising Process	V
8	6	Complex Banking Procedures	VI
9	9	Lack of Education and Training	VI
10	8	Lack of Investors	VII

A **Diagraph** (See Figure 2) was constructed to visually represent the hierarchical structure and the directive links between the barriers at different levels. This model shows the factors arranged which are explained below:

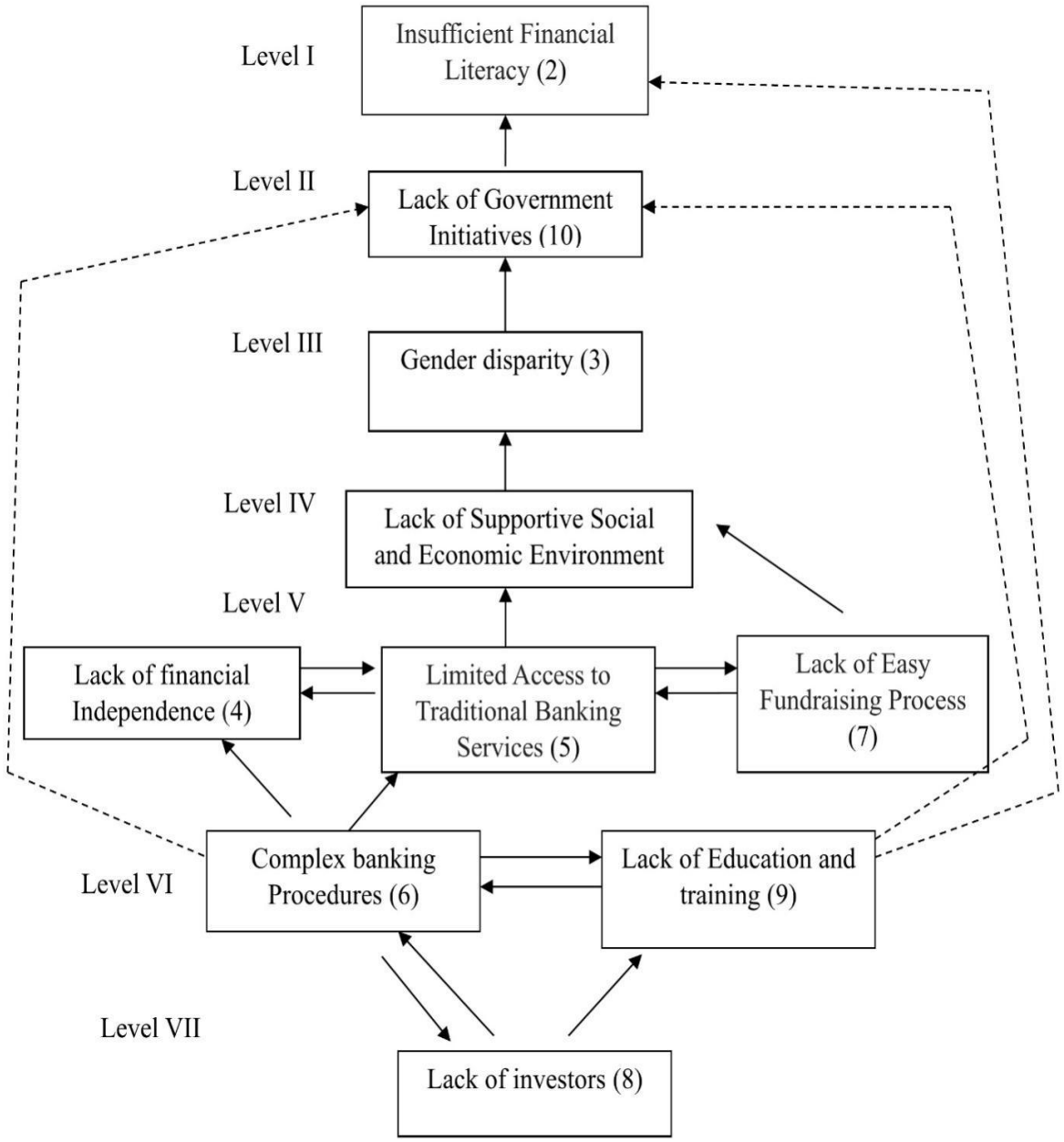

Figure 2. Model for TISM Framework

Level VII consists of variable 8 namely lack of investors, which affects complex banking procedures (6) level VI and gets affected by it; lack of investors also affects lack of education and training (9) level VI regarding financial mechanism and its importance.

Level VI comprises complex banking procedures variable (6), and lack of education and training variable (9). Complex banking procedures (6) affect lack of education and training (9) and lack of education and training (9) affects complex

banking procedures (6). Lack of education and training (9) also affects insufficient financial literacy (2) level 1 and lack of government initiatives level II. On the other hand complex banking procedures (6) affect the lack of government initiatives level II. It also affects lack of financial independence (4) level V and limited access to traditional banking services (5) level V.

Level V consists of a Lack of financial independence (4), limited access to traditional banking services (5), and a lack of an easy fundraising process (7). Lack of financial independence (4) impacts limited access to traditional banking services (5) and vice-versa. Similarly, there is a two-way relationship between limited access to traditional banking services (5) and lack of an easy fundraising process (7), which both affect each other mutually. Limited access to traditional banking services (5) also impacts the lack of social and economic environment (1) level IV in rural areas for innovation and investment.

Level IV comprises a lack of supportive social and economic environment (1) and affects gender disparity in level III. it gets affected by limited access to traditional banking services (5) and lack of an easy fundraising process (7) level V.

Level III consists of gender disparity (3) and it affects the lack of government initiatives (10) level II and gets affected by a lack of social and economic environment (1) level IV.

Level II comprises of lack of government initiatives (10). it affects insufficient financial education (2) level I and gets impacted by complex banking procedures level VI and lack of education and training level IV.

Level I consists of insufficient financial literacy (2) and is impacted by lack of government initiatives (10) level II and lack of education and training (9) level VI.

5. DISCUSSION

This study employed the Total Interpretive Structural Modeling (TISM) approach to analyze and structure the critical barriers hindering financial mechanisms for the adoption of innovative technologies in rural areas of India. TISM was chosen for its systematic and logical method of dissecting complex scenarios involving intricately interconnected elements, allowing for the interpretation of each relationship and providing a systematic framework. Experts in financial mechanisms adoption were consulted through structured questionnaires to inform the development of the model. The resulting TISM model establishes a hierarchical structure and interrelationships among ten identified barriers based on their driving and dependence power.

The deepest and most influential level in the hierarchy, Level VII, is occupied by the barrier "Lack of investors" (variable 8). The sources indicate that investment in rural areas is often perceived as high-risk, stemming from factors like low purchasing power, geographical limitations, and the absence of a proven track record for many rural ventures. This fundamental barrier directly influences "Complex banking procedures" (variable 6) and "Lack of education and training" (variable 9), both positioned at Level VI. The perceived risk in rural areas due to a lack of investors is likely to contribute to financial institutions implementing complex procedures and being hesitant to invest in education/training regarding rural financial mechanisms. The model also reveals a reciprocal relationship where "Lack of investors" is affected by "Complex banking procedures".

Moving up the hierarchy, Level VI contains "Complex banking procedures" (variable 6) and "Lack of education and training" (variable 9). Complex banking procedures are particularly challenging in rural areas due to low literacy levels, cumbersome documentation, lack of sufficient collateral, limited financial literacy, issues with credit history, high transaction costs for small loans, and bureaucratic inefficiencies. The lack of education and training limits access to business knowledge impedes innovation adoption, reduces digital literacy, and restricts access to information on financial resources. The TISM analysis indicates a two-way relationship between these two barriers, suggesting that complex procedures necessitate more training, while a lack of training makes procedures seem more complex. "Lack of education and training" (9) influences "Insufficient financial literacy" (variable 2) at Level I and "Lack of government initiatives" (variable 10) at Level II. Similarly, "Complex banking procedures" (6) also affect "Lack of government initiatives" (Level II), "Lack of financial independence for youth and women" (variable 4) at Level V, and "Limited access to traditional banking services" (variable 5) at Level V.

Level V consists of three interconnected barriers: "Lack of financial independence for youth and women" (4), "Limited access to traditional banking services" (5), and "Lack of easy fundraising process" (7). The lack of financial independence for youth and women is linked to inequity, limited control over earnings, gender biases, restricted access to education/training, fewer formal jobs, and inadequate implementation of supporting schemes. Limited access to traditional banking is due to the low physical presence of banks, cumbersome paperwork, lack of infrastructure, high transaction costs, and services not tailored to rural needs. The lack of an easy fundraising process is hindered by complex regulations, limited access to investor networks, difficulty with financial documentation, and market competition. The TISM model reveals reciprocal relationships between "Lack of financial independence" (4) and "Limited access to traditional banking services" (5), and between "Limited access to traditional banking services" (5) and "Lack of easy fundraising process" (7). This indicates these issues are mutually reinforcing. Furthermore, "Limited access to traditional banking services" (5) impacts the "Lack of supportive social and economic environment" (variable 1) at Level IV.

Level IV is represented solely by the "Lack of supportive social and economic environment" (1). This barrier reflects the lag in rural development, characterized by inertia towards new technologies, risk aversion, inadequate agricultural practices, low

industrial progress, aversion to business, gender biases, lack of market understanding, and unavailability of working capital. This environment influences "Gender disparity" (variable 3) at Level III. It is, in turn, affected by "Limited access to traditional banking services" (5) and "Lack of easy fundraising process" (7) from Level V.

At Level III, we find "Gender disparity" (3). Gender disparity in rural areas involves limited access to financial resources, lower earning opportunities, restricted land ownership, male dominance in financial decisions, lower education/training levels for women, and limited access to information and networks due to socio-cultural norms. This barrier affects the "Lack of government initiatives" (10) at Level II. "Gender disparity" (3) is influenced by the "Lack of supportive social and economic environment" (1) at Level IV.

Level II contains a "Lack of government initiatives" (10). This barrier includes insufficient reach of financial networks, lack of support for microfinance, reliance on informal lending due to insufficient government credit, inadequate financial literacy programs, limited digital financial infrastructure, poor implementation/awareness of schemes, and absence of tailored financial products. This barrier affects "Insufficient financial literacy" (2) at Level I. "Lack of government initiatives" (10) is impacted by "Complex banking procedures" (Level VI), "Lack of education and training" (Level VI), and "Gender disparity" (Level III). Finally, the most dependent barrier at Level I is "Insufficient financial literacy" (2). This barrier describes the lack of understanding and effective use of financial skills, leading to difficulty managing finances, budgeting, investing, and vulnerability to fraud. It is impacted by the "Lack of government initiatives" (10) at Level II and the "Lack of education and training" (9) at Level VI.

Collectively, the TISM hierarchy reveals that fundamental issues like the "Lack of investors" (Level VII) drive a chain of interconnected barriers related to complex procedures, lack of education/training (Level VI), and limited financial access/independence/fundraising processes (Level V). These in turn influence higher-level barriers such as the "Lack of supportive social and economic environment" (Level IV) and "Gender disparity" (Level III), ultimately impacting the effectiveness of "Lack of government initiatives" (Level II) and contributing to "Insufficient financial literacy" (Level I). This structured understanding highlights the critical dependencies among these barriers.

The hierarchical relationship in the identified barriers reveals that the lack of investors is one of the main reasons for the limited financial mechanisms in rural areas. Private investors are least interested in rural areas due to a lack of infrastructural facilities and prospects of earning profit. Prospects of profits are meager due to the low purchasing power of inhabitants and low purchasing power is the result of low employment creation in rural areas (Sandhu et al., (2012). If there is innovation and entrepreneurial activity in rural areas combined with a very high propensity to consume in rural areas, it can lead to a virtual goldmine for investors. However, to attain that state the inertia of low employment creation has to be ended by the government by creating infrastructural facilities and establishing entrepreneurial and business ventures in rural areas for the generation of employment and raising the financial backbone of people. This trailblazing can be done by the government alone as it is the only agency in India for incurring the scale of investment in welfare activities that is required to give a strong boost to the financial mechanism of rural areas through its multifaceted approach(Malhotra, 2023).

Firstly, it can create infrastructure for financial education, which should be provided equally without gender disparity. After that, the traditional banking structure should be overhauled for financing entrepreneurial and business activities in rural areas. These businesses can lead to employment in general in rural areas. Increased income of rural people due to higher employment can lead to higher consumption due to a very high propensity to consume in rural areas. This propensity to consume can lead to more profitability for extant enterprises. Profitability in enterprises can lure the private sector from urban areas and fundraising in rural areas can catch pace with more opportunities for investment in technology adoption and innovations. This can help upgrade the social and economic environment of rural areas, which have been responsible for holding back the technology adoption and entrepreneurial initiatives of rural people. This changing dynamism of the rural economy and uplifting the whole financial mechanism and technology adoption initiative are essential for creating entrepreneurial ecosystems. However, this operation can be a success only if the government of India takes up the cause of providing financial education, banking services, and infrastructural facilities in rural areas (Rao, 2008).

5.1 Theoretical Implications

The research contributes significantly to theoretical understanding, primarily by expanding the growing body of literature on Total Interpretive Structural Modeling (TISM). It achieves this by deciphering the complex hierarchical relationships among different variables, specifically the critical barriers to financial mechanisms for adopting innovative technologies in rural India. The study explicitly demonstrates the robustness of the TISM methodology, offering insights into both direct and indirect relationships between these barriers. This application of TISM in this specific context is noted as leading to methodological advances.

Furthermore, the study's findings contribute to the development of a conceptual framework. This framework is presented as adaptable, suggesting its potential applicability for investigating similar issues in other geographical and sector-wise contexts beyond rural India and technology adoption. The research is also stated to aid in a better understanding of technology adoption barriers in rural areas and enhance the understanding of innovative financial mechanisms within this specific setting. By synthesizing and integrating research findings, it examines how barriers impede innovation adoption and how their

interrelationship contributes to this process, underscoring the importance of considering the socioeconomic and strategic conditions of the innovation and entrepreneurial sector. The overall effort is described as theoretically impactful.

5.2 Practical Implications

The study presents several significant practical implications for various stakeholders involved in promoting technology adoption and entrepreneurship in rural India. Firstly, the study provides a valuable tool for strategic planning by non-governmental organizations (NGOs) and other development agencies that are engaged in promoting innovations and facilitating technology adoption in rural areas. The hierarchical structure and identified relationships among barriers can directly inform their efforts. For instance, the model can assist in designing capacity-building programs specifically aimed at enhancing financial literacy and awareness regarding innovative financial mechanisms among the rural populace. By understanding which barriers are most influential or dependent, NGOs can prioritize their interventions for maximum impact.

Secondly, the findings can serve as a guide for service providers and financial institutions. The model enables them to tailor their financial products and services to better meet the specific investment needs of rural entrepreneurs who are seeking to adopt technology and engage in innovation and entrepreneurial activities. A clearer understanding of the identified barriers allows these institutions to develop innovative terms for credit, collateral requirements, and repayment schedules that are more suitable for financing innovative activities in the rural context.

Finally, the insights from the model are expected to have a practical impact on the private sector and potential partnerships. By providing a better understanding of the challenges and their interconnectedness, the model is expected to encourage private-sector companies to increase their investment activities in rural areas. This enhanced understanding of the landscape of barriers and their drivers can potentially de-risk or clarify investment opportunities, thereby fostering the development of public-private partnerships aimed at addressing these critical impediments and promoting rural development through the adoption of technology.

6. CONCLUSION

The research reveals a hierarchical structure of these barriers, identifying the lack of investors as a root cause at Level VII, significantly influencing other barriers. The study underscores the importance of recognizing this hierarchical relationship and emphasizes that addressing these challenges effectively requires a multi-stakeholder approach. It suggests that government intervention is crucial for creating infrastructure, establishing entrepreneurial ventures, providing financial education, and reforming banking structures to attract investment and stimulate economic growth, ultimately improving rural financial mechanisms and technology adoption initiatives. The overall efforts of this research are considered to have both strategic and theoretical impact..

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