



Technology adoption and entrepreneurial orientation for rural women: Evidence from India

Susmita Chatterjee^a, Sangita Dutta Gupta^{b,*}, Parijat Upadhyay^c

^a Department of Economics, Maharaja Manindra Chandra College, Kolkata, West Bengal, India

^b Institute of Finance and International Management, 8P & 9p, KIADB Industrial Area, Electronics City Phase-I, Bangalore 560100, Karnataka, India

^c Institute of Management Technology, Nagpur, Maharashtra, India



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ABSTRACT

Information and communication technology (ICTs) have been proven to be an enabler for women empowerment, particularly for marginalized women. Policies have been formulated to link ICT with gender issues. The success of such policy initiatives largely depends on adoption intention because only 'transplanting' will not work. This evidence-based article with primary data established the covariance structure between the dimensions of access, ICT adoption intention and entrepreneurial orientation. This study highlights that different types of access like mental, material, skill and usage contribute significantly towards the adoption of ICT among rural women. Adoption of the ICT leads to innovation. Adoption intention is a booster for entrepreneurial orientation which aids micro-entrepreneurship. The findings of this study are significant because it connects technology adoption with the entrepreneurial intention of women micro-entrepreneurs.

1. Introduction

The United Nations formulated the Millennium Development Goals (MDGs) for eradication of poverty in 2000. After completion of 15 years, they were succeeded by 17 Sustainable Development Goals (SDGs). SDGs have been adopted to further strengthen the agenda of development and secure a better future for member countries. SDGs are aimed to address the root cause of poverty. Information and communication technologies (ICTs) have been incorporated in the SDGs keeping in mind that ICT and its various tools will contribute towards the advancement in education, health care among other sectors. Over the past decade, ICT has become an essential part of life in almost all types of economies. ICT can be defined as dissemination of information by electronics means. Diffusion of ICT results in rapid changes in industry and business (Giotopoulos et al., 2017). Use of ICT is important for prosperity and business activity (Jorgenson and Vu, 2007; Levendis and Lee, 2013; Qureshi, 2013a), increasing productivity (Jorgenson et al., 2008), enhancing living standards (Chevula, 2013), sustainable development (Byrne et al., 2011) and overall socioeconomic progress (Bayes, 2001; Dey et al., 2018; Kapoor et al., 2015; Pick et al., 2014). Access and usage of the Internet improves the livelihood of individuals and increases the rate of economic growth (Kelly et al., 2010;

Milek et al., 2011). Information technology (IT)-based applications can significantly reduce the cost of information and enhance inclusion (World Bank, 2016). ICT also plays an important role in women empowerment (Joseph, 2013). There are multiple SDGs that have gender-based objectives, but SDG 5 is devoted specifically to gender issues. It talks about achieving empowerment of women and gender equality. Gender inequality is probably the most widespread form of injustice. Hence, SDG 5 is devoted for the improvement of women through improved life quality. Access to education, elimination of gender gap and representation in decision-making are the rights of a woman. However, women face challenges and these challenges are more pronounced in case of rural women, especially in the developing and underdeveloped countries. India is of special interest among the developing countries because of its significant rural population. In spite of high economic growth, rural India especially women continue to struggle. Socio-cultural norms do not encourage education among rural women. If rural women are empowered, poverty can be alleviated, and it can also fuel economic growth. One way to promote empowerment is by helping women identify ways to generate income. This is possible with the development of women micro-entrepreneurs in rural areas (Bullough et al., 2015; Pines et al., 2010). It provides opportunities for employment, particularly in the rural areas which helps in alleviation of

* Corresponding author.

E-mail address: sangitadgpt@gmail.com (S. Dutta Gupta).

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poverty. Entrepreneurial venture provides women flexibility and also ensures avenues for empowerment (Babbitt et al., 2015). Socio-cultural constraints prevent women from getting information, including opportunities for funding (Powell and Eddleston, 2013). The challenges faced by women include time constraints, limited access to the loan and other sources of capital (Kuada, 2009). One way to eliminate this limitation is by providing information to women through IT-based tools and applications. ICT can play a significant role in developing an entrepreneurial orientation among women by providing information about business opportunities. It helps in greater acceptability of women and helps give stronger voice in their community. One major advantage of ICT is that it provides time flexibility to women. It is particularly helpful to those women who are facing social isolation, especially in the developing countries. ICT can be beneficial to the rural community by providing information about market and lowering transaction cost. It helps women speak to their clients, in market expansion, to build business network and to obtain skills and strategy (Venkatesh et al., 2017). Social norms in rural India sometimes make it difficult for women to visit public places. Women can solve that problem by connecting with their clients through the phone. ICT can help in meeting the SDG targets (Ericsson, 2015). However, rural communities are sometimes unable to reap the benefit of ICT due to the lack of awareness and access (Rao, 2004). The success of ICT-based initiatives is low in such areas (Gichoya, 2005). Access to ICT increases the chance of economic inclusion and results in economic, political and social empowerment (UNDAW, 2003). In the remote areas of the developing countries, gender division can be observed in usage and access of ICT. A study showed that the probability of women benefiting from the usage of ICT is one-third that of men (Mottin-Sylla, 2005). Access and usage of ICT can have positive influence on the well-being of women. However, access and usage depend on a lot of other factors. Thus, we can see that ICT can result in significant enhancement of empowerment of rural people if implemented properly. However, there are limitations as well. Our study identifies the determinants of ICT adoption and how such adoption can lead to entrepreneurship orientation. It also identifies the possible limitations. The article is structured as follows. The second section contains review of the existing literature thereby identifying the research gap. Section 3 discusses the theoretical background, resulting in identification of determinants of ICT adoption. It also discusses the objective of the study. The methodology is discussed in section 4. The section after that deals with the findings. The last section summarizes the findings of this study and concludes while highlighting the possible limitations and the future scope for research.

2. Review of literature

The impact of ICT can be found extensively in literature, but there are contradictory views on the outcomes of ICT adoption. There are many factors that have an impact on ICT adoption. Parameters such as lifestyle (Fitzallen and Brown, 2006), age and gender (Venkatesh et al., 2004) are important determinants of ICT adoption. The intentions of these adoptions are especially important for marginalized section like women in the rural areas (Calàs et al., 2009; Boehe and Cruz, 2013). They derive greater benefit out of it. Access to information helps rural women increase their income (World Bank Report, 2009). Increased participation, improved communication and dissemination of information can happen when modern communication technologies are applied to rural people (Narula and Arora, 2010). Sassen (2002) pointed out that technology provides opportunities to women entrepreneurs within the cultural and social limits. Adoption of ICT can create an environment which women find comfortable.

Impact was noticed in the behavioural aspects of those women who are involved in ICT industries or government or non-government ICT-based industries. It has an impact on the society as well. Ashraf et al. (2008) pointed out that rural people were keen about ICT adoption but were also worried about the probable impact of it on their

society. The study also showed that ICT intervention had a positive impact on the rural people in general and women. London and Hart (2011) discussed the Bottom of the Pyramid (BoP) 2.0, which reveals about generating opportunities for rural people at the bottom of the pyramid. Opportunities can be generated through entrepreneurship for rural population, especially women. A significant role can be played by ICT in creating and enhancing opportunities for marginalized women. ICT has the power to positively impact the lives of marginalized women especially in the developing countries. Kabeer (1999) indicated that women at the base of the pyramid can use ICT to access resources, which will have a positive impact in the future. Chen (1997) pointed out that the development of ICT skills can enhance the self-respect and confidence of women. Hence, there is enough research that talks about the importance of ICT in improving the lives of marginalized women. This improvement can happen through the development of entrepreneurship.

Technology fosters entrepreneurship (Dosi, 1982). Reliance on ICT has increased considerably due to the rapidly changing business environment in recent times.

Chao et al. (2015) pointed out that the return on physical investment is less than digital investment as far as ICT's effects on the productivity of a firm are concerned. ICT helps reduce information asymmetry. It provides timely information that is important for rural women micro-entrepreneurs. Technological innovations can help in increasing market efficiency (Donner and Escobari, 2010). Popa et al. (2018) have pointed out that electronic business is positively associated with organizational innovation. Digital technologies have impact on new business ventures (Elia et al., 2020). Manufacturing companies adopt e-business technology to lower cost and improve productivity (Jardim-Goncalves et al., 2012). Bharadwaj (2000) showed that firms with superior IT capability have high profit ratios. ICT and innovation are the key elements of entrepreneurship and have positive interdependence (Yunis et al., 2018). ICT generates a number of opportunities that are useful for entrepreneurship (Stam and Gamsey, 2007). Chew et al. (2011) concluded that mobile phones used for the business purpose by women microentrepreneurs can develop self-esteem among women. Chew et al. (2015) pointed out that women entrepreneurs find mobile phones extremely beneficial for business. ICT provides women to expand their social networks which can create new opportunities for business (Hust and Miller, 2005). Ajumobi and Kyobe (2017) tried to understand the adoption of ICT-led entrepreneurial success of MSMEs led by women. Barriers to entrepreneurship can be addressed by the adoption of ICT (Malhotra et al., 2012). Access to ICT can help women gathering information about financing and markets (Hinson, 2011). Rural citizens especially women can derive benefit out of ICT adoption. (Best and Maier, 2007; Sharma, 2013). Access to information can help in entrepreneurship. This can improve the lives of underprivileged in the rural areas (Crabtree, 2016). Thus, we can see that in the recent years some studies have been conducted on ICT adoption and its impact on entrepreneurship. However, we do not find many studies connecting ICT adoption with women micro-entrepreneurship in rural areas (Asongu and Nwachukwu, 2018).

This study was undertaken to ascertain the adoption intention and use of ICT by women of self-help groups (SHGs) in the eastern region of India. ICT has been instrumental in transforming people's lives and has paved the way for social, economic, political and psychological attainments of underserved and marginalized populations. As pointed out earlier, adequate literature support is not present to connect ICT with micro-entrepreneurship in rural areas, but literature support can be found to connect ICT with corporate entrepreneurship. Very few studies are available that connect ICT with micro-entrepreneurs and that too with women entrepreneurship in rural areas. This research gap is addressed in this study. The study identifies the determinants of adoption intention of women in rural areas and how ICT adoption results in an entrepreneurial orientation for rural women micro-entrepreneurs. There is literature on the adoption intention of ICT and also some

literature support relating ICT to entrepreneurship. However, there is no study that connects both. This study attempts to bridge both the aspects.

3. Theoretical background

IT is a significant tool that can enhance the productivity and competitiveness of a company or an individual. Generally, two approaches of research have been observed dealing with the issues in this domain. The first approach focuses on factors that focus on the adoption of IT at the level of organization (Leonard-Barton and Deschamps, 1988). The second approach focuses on the individual level where usage or intention to adopt is a dependent variable (Compeau and Higgins, 1995; Davis et al., 1989). Diffusion of innovation (DOI) theory (Rogers, 1995) and technology, organization and environment (TOE) framework (Tornatzky and Fleischer, 1990) are prominent models at the firm level. As per DOI theory, levels of willingness to adopt innovation depend on individuals. Innovativeness of an organization depends on certain characteristics which are both internal and external. As per TOE framework, different contexts like technological, organizational and environmental are important determinants of the adoption of technological innovations. This study deals with marginalized women and the factors affecting their ICT adoption. Therefore, we wanted to focus on the acceptance of technology by an individual. Technology acceptance model (TAM), motivational model (MM), theory of planned behaviour (TPB) and unified theory of acceptance and use of technology (UTAUT) are the various models that have been extensively cited by researchers analysing technology adoption at individual level. Ease of use and observed usefulness are important constructs of the TAM (Davis, 1986, 1989; Davis et al., 1989). Extrinsic and intrinsic motivations are the core constructs in case of MM (Ajzen, 1985, 1991). Extrinsic motivations such as performance in a job, pay and promotion along with intrinsic motivations are important factors of technology adoption (Davis et al., 1992). TPB is an extension of the theory of reasoned action (TRA). TRA is inspired from social psychology. An individual's feeling about performing a task may be positive or negative. This is considered to be an important determinant. Perceived behavioural control is added to extend TRA to TPB. In the UTAUT model (Venkatesh et al., 2003), social influence, facilitating conditions along with expectancy from performance and effort are important determinants. Performance expectancy gives the confidence that the technology adoption will help enhance the productivity and help complete the task quickly. Effort expectancy is considered to be the belief that the system would be clearly understood which will help in easy use. Social influence is the belief that people who are important and can influence their behaviour encourage them to make use of the system. Facilitating conditions in terms of resources and knowledge are also important for technology adoption. Based on the theoretical models discussed above, four constructs have been presented in this study that influence adoption intention.

Access can be considered as the opportunity to use the resources and information. There are certain constraints to access, which are lack of knowledge about computer and language barrier. Poverty and illiteracy add to these problems. Although these are constraints for the rural population in general, women face greater difficulties. In addition to the above-mentioned constraints, societal structure and predefined gender roles also make it difficult for women to access ICT.

Mental access, material access, usage access and skills are the four constructs that we have used in our model. Unlike the UTAUT model, it is not moderated by gender and age. We have considered only women. Age-wise dispersion is also not significant. We have considered mostly middle-aged women. The constructs that pertain to mental access are extrinsic motivation of MM and performance expectancy of UTAUT (Venkatesh et al., 2003). The root constructs for material and usage construct are derived from the facilitating conditions and attitude towards using technology in the UTAUT model. Digital social innovation

is triggered by ICT adoption. Digitization provides a platform to social entrepreneurs, non-government organizations (NGOs), businesses and agencies of the government to create social impact using digital technologies. Technology can help solve social problems (Reinecke and Ansari, 2016). Digital technologies help in co-creation of knowledge and provide solutions through collaboration of different stakeholders for addressing the social needs of marginalized and socially disadvantaged groups.

Based on the above considerations, the following hypotheses are formulated:

H1: Elements of access positively influence adoption intention.

H1a: Mental access is related to adoption intention.

H1b: Material access is related to adoption intention.

H1c: Usage access is related to adoption intention.

H1d: 'Skills' is related to adoption intention.

This article studies and analyses the impact of ICT adoption on entrepreneurship. Introduction and the subsequent adoption of IT have revolutionized the way the business is conducted and open up new avenues of opportunities (Kohli and Tiwari, 2016). Entrepreneurship is a vehicle for economic growth (Aderinto et al., 2018). Literature has revealed that ICT has led to empowerment of women in many countries (Melissa et al., 2015; Macueve et al., 2009). Entrepreneurial orientation is considered to be a firm-level phenomenon (Zhu and Matsuno, 2016).

Women entrepreneur can be considered as a firm. There are factors that can affect entrepreneurial orientation. Technological dynamism is one of them (Cruz-González et al., 2015). Technological dynamism leads to entrepreneurial orientation, making them more innovative, proactive and risk-takers (Kilenthong et al., 2016; Villaverde et al., 2018). ICT provides access to websites, which helps access new markets and save time (Macueve et al., 2009). IT tools help women to keep themselves updated about current business opportunities.

Based on extant literature, the following hypothesis is formulated:

H2: ICT adoption helps in entrepreneurial orientation.

ICT adoption leads to digital innovation, which in turn leads to increase in capabilities. Digital innovation can effectively lower the entry barrier, disarticulate value chains and create openings for focused and fast-paced competitors. Collings (2014) emphasized about the significance of digital technology to business operations. To maintain competitive advantage, organizations can effectively use digital technology to re-invent and re-think their business models. There is evidence that ICT can be leveraged to enhance entrepreneurship. Adoption of ICT enables access to markets, training and opportunities, which in turn can enhance the livelihood of women micro-entrepreneurs.

Women can enjoy freedom of expression and improve their networking through online space which provides business opportunities. The Multimedia Caravan project in Senegal is an example where rural women developed their ideas on the importance of ICT in sustainable development (UN Report, 2005). In Kenya, women had the opportunity to learn about prices and weaving techniques of their products through the Internet. Training about the usage of the internet was imparted to men and women to understand the pricing of products and weaving techniques (UN Report, 2005). A radio program called Mama FM is extremely popular in Uganda. It is run by the Uganda Media Women's Association. Women participate and learn about important issues such as government policies and their rights to facilitate entrepreneurial orientation (Masubika, 2011).

4. Research methodology

4.1. Data collection

In India, The Ministry of Rural Development launched National

Rural Livelihood Mission (NRLM) scheme on 1 April 2013. NRLM is a major program by the government of India targeting poverty eradication and the creation of income opportunities. The primary objective of NRLM is working to form women SHGs and integrate them with entrepreneurial ecosystem. Most of the micro-entrepreneurs originating from SHGs have obligations towards the society. They fulfill that by creating opportunities for employment and contributing to wealth generation of marginalized people. To understand the technology adoption of rural women and their entrepreneurial orientation, qualitative and quantitative researches have been done to ascertain the adoption intention of ICT by women entrepreneurs and how it helps in the development of micro-enterprises.

The study period was from October 2016 to December 2018. The total sample size was 631. The researchers interacted with 2,000 women from various SHGs located in different districts of the state of West Bengal in the eastern region of India. The objective was to include as many districts as possible. Out of 2,000 women, 631 were running small or micro-enterprises. They were involved in various kinds of businesses such as handicraft items making, incense stick making, garment manufacturing, soft toys manufacturing and spice making.

4.1.1. Instrument translation

The questionnaire was administered in the local language for the benefit of the respondents. The authors conducted the pretesting of the questionnaire in areas other than the study area. Based on the interviews of government officials and local NGOs and the feedback received from them, the questionnaire was finalized and the revised one was administered to the participants of the study group. Apart from the socio-economic and demographic characteristics, the respondents were asked questions regarding their perception about the usefulness of ICT and aspirations and factors that are conducive for ICT adoption. A total of 631 SHG members from the eastern part of India were interviewed for the purpose. The eastern part of India was chosen as SHGs are very active in this part of the country. Researchers obtained verbal consent from all the study group participants, and confidentiality of individual data was maintained.

4.1.2. Instrument validation

Pretesting had been done for proper articulation of questions. In this study, experts from universities, Indian Statistical Institute, Kolkata, were asked to pinpoint measurement issues, for assessing the face validity and constructing the validity of the measurements. The selection of 20 women for (all SHG members and having small businesses) pretesting was done. The selected group constituted five women from the North 24 parganas district (Kumra I block), five women from South 24 parganas district (Baruipur block), five from Birnhum district (Bolpur-Sriniketan block), two from Alipurduar district (Alipurduar I) and remaining three from Howrah district (Bagan block). In the pilot study, 200 women were interviewed, including two women from Alipurduar and two from the North 24 parganas (participated in pretesting). The study period was from October 2016 to December 2016. All the above-mentioned districts were included in the pilot study as well.

4.1.3. Field approach

The Final administration of the questionnaire was done on 631 women (including 200 women who participated in the pilot survey) from districts including Alipurduar, Birnhum, Bankura, North 24 Parganas, South 24 Parganas, Howrah and Hooghly. This survey continued till December 2018. For all the districts, SHGs were selected and contacted by consulting with the Block Development Office, Corporation Bank officials, Local Panchayat Office. SHG members were assembled in particular locations (for their meetings, training programmes, marketing, product exhibition); one of the authors periodically visited those places and interviewed them (from October 2016 to December 2018). The method used is convenience sampling.

Face-to-face interview (631 women selected for the study) was

Table 1

Sample respondents' profile.

Source: Primary data collected through questionnaire

Household characteristics of respondents	
Socioeconomic conditions	
Per capita income overall (median), INR	4250
Percentage of land in the name of the respondent	11.5
Percentage of gold in the name of the respondent	40
Percentage of respondents with primary education	71.5
Financial inclusion	
Percentage of respondents with bank account (nationalized bank) other than SHG bank linkage	60
Percentage of respondents with accounts in private banks	5
Percentage of respondents who can take decision about spending their own income	60

conducted with SHG members who were engaged in micro-entrepreneurship to collect data. It was conducted with individual members and not as a group because each one had a different story to tell. Active participation was observed from focus group women who enthusiastically filled up the questionnaire. Authors recorded all the interviews and transcribed them after that.

4.2. Data analysis

The sample composition of this study is reported in Table 1.

Table 1 shows the characteristics of the SHG members in the study area. In general, SHG members are literate and nearly 72% of the respondents attended the primary school up to the fourth standard, 5% of the respondents could only write their names and the rest of them were having secondary education up to class 12. The property rights of women were identified by their land and gold ownership. It was noted that only 72 women had land or house in their own legal possessions (with sale rights) and 1 with her brothers and sisters (cannot sell on her own!). About 40% of the women owned gold ornaments. These SHG members maintained accounts with banks in accordance to their membership. About 60% of them had a bank account with state and cooperative banks, and 5% had savings accounts in private banks with their spouse.

The pilot survey was done with 200 respondents. Confirmatory factor analysis was applied to establish the covariance structure of adoption intention with a prior estimation of measurement models for three access latent and one skill latent constructed to cause the adoption intention latent factor in the first stage. Entrepreneurial ability was taken as the outcome factor in the second stage.

The research model is given in Fig. 1. Structural and path coefficients are shown in Fig. 2.

5. Results and discussion

Structural equation model (SEM) was used for validating and testing the model. SEM is generally used for testing complex models that use latent variables (Popa et al., 2018). SEM estimates the impact of ICT adoption of a latent, constructed by different dimensions of access and skill latent on entrepreneurial ability. The considered access latent factors encompass mental access, material access and marketing access. These unobserved latent factors are measured by a set of observed ordinal variables. These variables report ordinal categories, and for this reason specifying a value of the numerical scale is inappropriate. To satisfy with the assumption of multinormal distribution with data in Likert scaling, we estimate polychoric correlations for each category of the observed ordinal variable. This complexity in establishing the causal relationship is the rationale behind the use of SEM. Parameter estimates and fit indices are presented in Table 2 and Table 3 respectively. These are standardized coefficients which are the path weights showing the covariance structure of the latent factors (Garson, 2016).

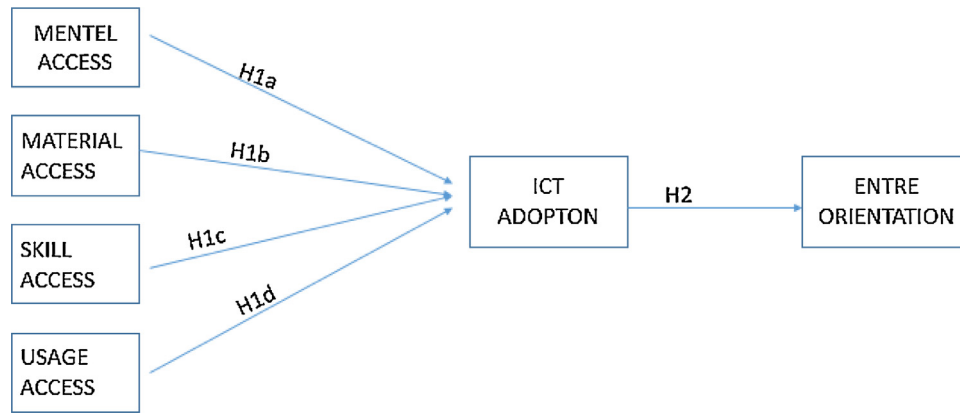


Fig. 1. Research model.

They need to be interpreted on magnitude and significance. In the structural model, the path coefficients and the nature of significance are discussed (Wong, 2013)

The results reveal that indicators of different dimensions of access are statistically significant. ICT adoption intention is also linked to an entrepreneurial ability that resonates the existing theory and has been reported in few previous studies as well. The results conform to Bratton's observation that the usage of the Internet and the adoption of ICT have positive economic consequences resulting in sociocultural, political and economic changes (Bratton, 2013). The constructs and factors are provided in Appendix 1.

Perceived usefulness and ease of use are important constructs of the TAM (Davis, 1986, 1989; Davis et al., 1989). The first part of the study reveals that mental access that means the person believes that technology is important is helping the adoption of ICT. This particular finding conforms to the TAM theory where perceived usefulness is an important construct. Similarly, usage and skill access are important. Our study also finds that material access is also important. The availability of the device can play an important role in adoption along with other constructs. This finding can help in the technology adoption model in the rural sector. This is extremely important for creating

opportunities for the rural population at BoP 2.0.

The second part of the study reveals how the adoption of ICT helps develop entrepreneurship by taking into account women narratives from interviews. All the participants were asked the same set of questions. However, each had a different story to tell. Hence, they were encouraged to share and elaborate their experiences. One respondent mentioned that she has set up a small manufacturing business. The Smart phone with WhatsApp helped her to connect with suppliers from other districts of West Bengal, such as Habra, Barasat and New Barrackpore. She also got help from local block development office to improve her computer skills, which helped her understand the current trends and manufacture products as per current requirement. Another respondent who is into manufacturing of garments employs 150 women. She explores and gathers information about online stores, trade fairs and exhibitions with the help of smartphones. She has been able to expand her business to the neighbouring states like Bihar and Orissa. Mobile phones helped her reach out to customers in the neighbouring states. Other respondents mentioned that mobile phones have helped them connect to clients and suppliers in other states of India. Some other respondents mentioned that they received computer training at the block development office, which helped them develop requisite

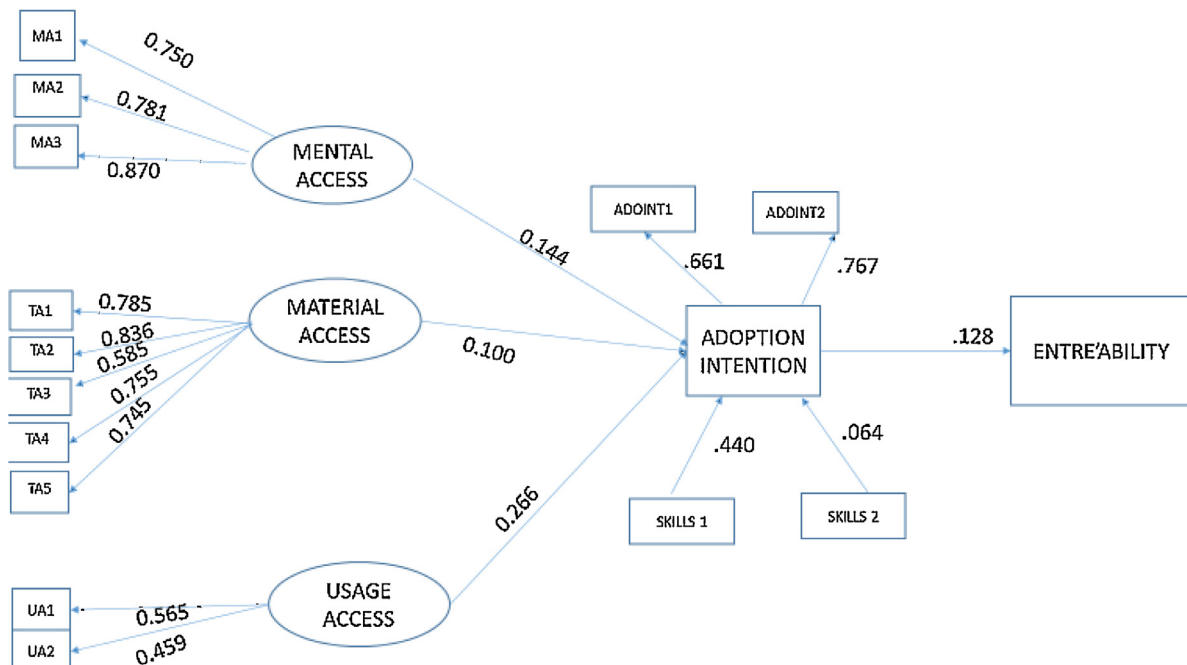


Fig. 2. Structural and path coefficients.

Table 2
Estimates of structural model.

			Estimate
Adoption intention	←	Mental access	.144***
Adoption intention	←	Usage access	.266***
Adoption intention	←	Skill 2	.064***
Adoption intention	←	Skill 1	.440***
Adoption intention	←	Material access	.100***
MAA1	←	Material access	.785***
MAA2	←	Material access	.836***
MAA3	←	Material access	.585***
MAA4	←	Material access	.755***
MAA5	←	Material access	.745***
MEA1	←	Mental access	.750***
MEA2	←	Mental access	.781***
MEA3	←	Mental access	.870***
ADOINT1	←	Adoption intention	.661***
ADOINT2	←	Adoption intention	.767***
USA1	←	Usage access	.565***
USA2	←	Usage access	.459***
ENTREABILITY	←	Adoption intention	.128***

*** Statistically significant

Source: Primary data collected through questionnaire

Note: Authors' calculations

Table 3

Fit indices of full structural model.

Source: Primary data collected through questionnaire

Model	
CFI	0.790
RMSEA	0.10

CFI: confirmatory fit index; RMSEA: root mean square error of approximation

Note: Authors' calculations

skills and build their entrepreneurial ability. Women are now in a position to take challenges associated with business because they are connected to the outside world through mobile phones. This aspect has been revealed from the in-depth interview conducted among women. The networking facility is being achieved, which is essential for entrepreneurs to build their business. This is extremely important for women micro-entrepreneurs who are trying to establish their business. Considering the social structure of rural India, it is not always possible for women to meet and network. These include the loss of their daily wage, responsibility of children and household work. For such women, mobile phones could be effectively used as communication and conferencing system.

Mobile phones give them the opportunity to network within the confines of their home. Uncertainty and risk can be minimized as these micro-entrepreneurs are now able to reach out to more customers who are located outside their locality and even outside their state.

Women are now having access to social sites that are fueling innovation among these women. Innovation is crucial for entrepreneurship. This is boosted by frequent use of web-based services.

5.1. Theoretical and practical implications

The study primarily examined the facilitating role of technology (through several technology adoption models) in abetting rural micro-entrepreneurs. It can be considered as an extension of the extensively researched TAM. This model can be considered as a sustainable model for the development of the developing economies. The problem with most of the developing economies is that the growth experienced by them has very little trickle-down effect. That is why inclusive growth is hard to achieve. ICT adoption can lead to entrepreneurial intention that

can create opportunities for marginalized rural women. Women becoming self-sufficient are from economic point and social point of view. Financially independent women are empowered to bring in social change.

Thus, the study established that adoption of ICT enhances the managerial capabilities of women entrepreneurs and they are doing their businesses in an organized way although the size of business is very small. The use of computers and mobile phones helps gather information to reach out to new markets and also possibilities of access to finance.

Thus, it can be seen that the adoption and the usage of ICT can be extremely helpful to achieve the goals of sustainable and inclusive development. For emerging economies like India where still a very significant number of people are below the poverty line, this model of development can be very effective. This can be an effective model of development not only for India but also for other emerging economies. We are of the view that government alone cannot achieve this. Civil society has an important role to play. Covariance between different agents can play an effective role.

6. Conclusion and limitations of this study

Thus, the study has examined the factors that can result in the adoption of ICT by rural women micro-entrepreneurs. ICT adoption plays a significant role in the entrepreneurial orientation of women micro-entrepreneurs at the base of the pyramid. The empirical results provided support to the hypothesis. Overall findings from the study indicate that mental access, material access, skill and usage access have significantly contributed towards ICT adoption which in turn leads to innovation and entrepreneurial orientation.

This evidence-based study will facilitate the policy dialog on women entrepreneurship and ICT issues. The outcome of the research will give direction to policymakers about action plans on women's access in ICT. However, the change will happen if it is acknowledged that ICT is an inevitable tool for entrepreneurial development, especially for rural women micro-entrepreneurs of the developing economies. Policy response to ICT opportunity for women entrepreneurship should stem from this understanding. The limitation of the study is that the study was undertaken in a certain region in context to a developing economy like India.

6.1. Scope for future research

Future researchers can try to replicate and possibly validate the findings of this study in context to other types of economies as well. One interesting aspect that can be explored is the impact of business disruptions (due to events like pandemic outbreaks or geo-political disturbances) on business continuity of such entrepreneurial ventures by women. However, despite the limitations, the findings of study will encourage future researchers to develop a generalized model for emerging economies as well.

CRediT authorship contribution statement

Susmita Chatterjee: Conceptualization, Data curation, Methodology, Formal analysis, Writing - original draft. **Sangita Dutta Gupta:** Conceptualization, Methodology, Validation, Visualization, Writing - original draft, Writing - review & editing. **Parijat Upadhyay:** Validation, Visualization, Project administration, Writing - review & editing.

Appendix

Elements of access

1. Elementary digital experience and attractiveness of the new

- technology (mental access)
- 2. Possession of devices and network connections (material access)
- 3. Digital skills due to user-friendliness and adequate education or social support, presence of advisors and state help (skill access)
- 4. Significant usage opportunities including state help (usage access)

Factors of access

Mental access

- 1 I believe that new technologies are attractive (MEA1).
- 2 I use computer without any difficulty (MEA2).
- 3 I can use mobile phone and apps in-built in it (MEA3).

Material access

- 1 I have access to radio and television (MAA1).
- 2 I have access to mobile phone (MAA2).
- 3 I have uninterrupted Internet on phone (MAA3).
- 4 I have access to print media (MAA4).
- 5 I have access to computer with Internet (MAA5).

Skill usage

- 1 I have computer skills (SKILL1).
- 2 I can use Internet (email web browsing) via (a) computer and (b) mobile phone (SKILL2).

Usage access

- 1 Presence of state financial helps presence and presence of advisors with IT competence (USA1)
- 2 Ease of use (operations and language) (USA2)

ICT adoption intention

- 1 Intend to use ICT for my enterprise (ADOINT1)
- 2 I believe that I will at some point of time use ICT-enabled devices/training will be helpful in expanding my business (ADOINT 2).

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Dr. Susmita Chatterjee

Dr. Susmita Chatterjee is currently at the Maharaja Manindra Chandra College Kolkata as Assistant Professor in Economics and Visiting Professor of Department of Commerce for MPhil- Ph.D. Course Work. Educated from Multipurpose Government Girls' School and graduating from Lady Brabourne College, Kolkata (1997), she completed M.Sc in Economics from Calcutta University through Presidency College (1999) and M.phil from Calcutta University (2006). She has done Ph.D Dissertation in Department of Economics, Calcutta University in 2013. She has done postdoctoral research from IIMC. She has a number of publications to her credit with reputed publishers such as Springer, Emerald, Sage etc.

Dr. Sangita Dutta Gupta

Dr. Sangita Dutta Gupta is an educator and researcher with more than 19 years of teaching experience in undergraduate and post graduate level. She has done her Ph.D. in the area of Economics from Jadavpur University.. Research Interests are broadly in the areas of Development Economics, Financial Economics, Gender Economics and Entrepreneurship having published scholarly papers in peer reviewed journals with reputed publishers like Emerald, Sage, Springer etc. She is in the editorial board of two journals and reviewer of reputed journals. She is currently associated with IFIM Business School as Associate Professor of Economics and Chairperson -Centre for Research.

Dr. Parijat Upadhyay

Dr. Parijat Upadhyay is an experienced Information Technology Professor. He is currently working as Associate Professor of Information Systems in IMT Nagpur. He has demonstrated history of working in the information technology and services industry. Skilled in Analytical Skills, Coaching, Lecturing, Team Building, and Curriculum Development. Strong information technology professional with a Ph.D. focused in ERP Implementations Issues from West Bengal University of Technology and a course on Supply Chain Management from XLRI Jamshedpur.