



DETERMINANTS OF DIGITAL ADOPTION AMONG WOMEN-OWNED VERY SMALL BUSINESSES IN INDIA: A MULTIVARIATE ANALYSIS

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ABSTRACT

The purpose of this study is to examine the factors influencing digital adoption among Women-owned very small businesses in India. This study examines the relationship between Digital Payment Tools Adoption and its factors Education and Age. The data was collected over a period of six months in Kolkata and its adjoining areas in West Bengal. The study used mixed research methods in collecting data and used SPSS for analysis. The results find that Education level is the significant predictor in Digital Adoption which is likely to facilitate better business. Age is found to be less significant in digital adoption. Thus, this study provides a deeper insight into the causes of delay in digital adoption to reap benefits of digital technology use in business. The findings of this research are required for those who are creating training programs to enhance digital skills among self-employed or self-proprietors.

KEYWORDS

Digital Adoption, Digital Infrastructure, Digital Literacy, Education Level

INTRODUCTION

There are many studies analyzing the factors influencing ICT adoption (Tarutė & Gatautis 2014) but very little focus is laid on educational level of very small businesses in the context of digital environment. Rapid changes happen when countries assimilate new technologies and innovations and similarly changes are happening after the launching of Digital India Programme in 2015 by the Ministry of Electronics and Information India (GOI). Technological innovations in Information and communication technology is an ongoing process and innovations like digital payment systems started since the developments took place in the context of financial transactions

between customers and businesses (Lie'bana-Cabanillas et. al., 2013). The knowledge, skills and abilities to handle Information Technology (IT) systems have become an indispensable asset and success factor. IT's significance remains unchallenged but SMEs have not exploited it successfully because of skills and competence deficits within the workforce (Lehner & Sundby, 2018). Adoption of technology benefits micro-units, but cash transactions are still popular among the aged, married, female and under-educated. Due to the pandemic, contact restrictions directly accelerated the adoption of digital payments, however, cash remains the 'king in India' as Rs 3,09,827 crore was in circulation in 2022 (Chadha, 2022).

The paper is divided into several sections such as Literature Review, Methodology, Results and Data Analysis, and Conclusion.

LITERATURE REVIEW

Very small businesses emerged in response to tackling poverty and unemployment across states in India. In 2024, West Bengal had the highest number of women owning MSMEs. The research location in this study is West Bengal which is underdeveloped economically, has high unemployment, and lacks the technological infrastructure needed for digital financial services. In this paper the author uses the term very small businesses, meaning sole proprietorship.

Very Small Business Or Sole Proprietorship

Department for Promotion of Industry and Internal Trade, India, defines sole proprietorship as a business that is owned and managed by a single person and can be set up for running within 10 days, which is predominantly found in the unorganised sector, particularly among small traders and merchants. There is no such thing as registration; proprietorships are recognised by other registrations. The very small businesses or VSBs in India are informal in nature and do not fit the definitions of MSME (2022). The digital divide, between the rural and the urban areas being noticeable, the Pradhan-Mantri-Gramin-Digital-Saksharta Abhiyaan (PMGDISHA) was launched to make people digitally literate in rural areas, across states and Union Territories. Various authors have identified different reasons behind digital transformation.

DIGITAL TRANSFORMATION FACTORS

According to the institutional theory, the adoption process is greatly affected by institutional pressures such a political and social including interaction with customers, fellow trading partners, and governments, which potentially affect a person's decision to adopt digital technologies (Omrani et. al, 2022). After the thorough analysis of the relationship between ICT adoption and its factors authors have found that perceived benefits, knowledge and skills and government support drive decisions for digital adoption. In order to benefit from ICT adoption, one should have a certain infrastructure, skilled ICT personnel and budget to invest in ICT (Consoli 2012, Tarut ea and Gatautis, 2013). Factors such as knowledge, skills, trust, customer needs and government policies can also influence digital adoption.

Demonetization And Covid 19

In 2014, demonetization was implemented by the government with the hope of delivering on the electoral promise of erasing corruption and terrorism in India. According to the government, demonetization policy was implemented to remove fake currency notes. By expanding the digital payment options, such as gpay, phonepe, paytm, and card payments, the risks associated with handling physical currency, such as theft or circulating counterfeit notes, have been mitigated. In spite of the government's demonetization strategy to push Indian economy towards a cashless economy, majority of the population are not using digital finance in India (Ghosh & Hom Chaudhury. 2020).

Though demonetization was a strong attack on cash use, this disruption was not enough until Covid-19 expediting the digital transformation process because physical distance was mandatory. Thus, pandemic is the cause behind the increased adoption of digital payment modes in India. According to the Impact Assessment Study done by IPA, it is mentioned that digital use growth has happened among the urban population while the rural areas have witnessed a very limited use and adoption of different digital technologies. This lag in the rural population is attributed to the lack of awareness and knowledge about the various beneficial digital tools and applications.

Ecommerce

Digitalization in India began with e-commerce start-ups. To increase online footprints, entry of the telecom giant, Reliance and increasing penetration of low-cost smartphones played a significant role. Digitalization offers a multitude of benefits like cost efficiencies and financial inclusiveness through registration in government schemes and banks. Digital media encompasses: audio, video, social media, advertising etc. and digital media usage is identified as an indicator of digital literacy or competency in this paper. Among many reasons, low digital literacy is cited to be the biggest challenge for Indian economy.

To face demonetization, public sector banks issued RuPay cards under the Prime Minister Jan Dhan Yojana (PMJDY) scheme. As low digital literacy, poses a barrier to cashless economy, government provides safe and secured environment with incentives to encourage adoption of cashless facilities. Under PMJDY, contrary to expectations, digital finance was not in use as expected Ghosh and Chowdhury (2020) and approximately 21 per cent account holders has turned inoperative by December 2024 (Kumar, 2024) despite the finance ministry's push to speed up the verification process to reduce dependence on cash transactions

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Digital Infrastructure Adoption And Management

In this study digital infrastructure includes internet facilities, smartphone, online platforms, a bank account, Paytm device and its speakers. Small businesses require affordable and reliable digital infrastructure to gain

access to customers and customized solutions to cater to their needs (Kosimov, 2023). There is a notable increase in e-payments since demonetization due to shortage of cash and convenience of not carrying cash.

However, the government started its 'The Digital Saksharta Abhiyan' (DISHA) or 'National Digital Literacy Mission' (NDLM) schemes to impart IT training to more than 52 lakhs of people spanning across government sectors and projects such as Anganwadi and ASHA, and authorized ration dealers so that the non-IT literate citizens become IT literate to participate in the developmental process for better opportunities by exploiting the digital financial services.

Digital Financial Services (DFS) include financial services offered and accessed via digital technology. It includes online banking – payments and savings. Digital channels refer to the internet, mobile phones, smartphones, ATMs and other digital systems (Abbasi & Weigand, 2017). During COVID-19, many 'micro-informal' businesses adopted digital payment platforms even when digital literacy is a challenge implying that during a crisis, digital technology helps in survival of the micro-sized businesses.

Turning to perceived trust in mobile payment systems, it is expected that increased use in digital finance can lead to more financial inclusion but low-income people do not trust banking services. Once their trust is built, using digital payments can improve their daily business operations, and they may start using digital financial services and recommend it to consumers and others.

Education And Digital Literacy

Research finds that the ability to use digital tools enhances one's learning outcomes. Most of the existing literature primarily focuses on specific demographics, such as students or professionals who require high levels of digital literacy. The definition of digital literacy varies across regions and decades as there is no consensus in the description, so for suitability, the investigator has used the definition of digital literacy as locating, consuming, and communicating digital content. 'The National Digital Literacy Mission defines digital literacy as the ability of individuals and communities to understand and use digital technologies for meaningful actions' (Bhattacharya, 2024). But this does not give the details to measure digital literacy because "meaningful actions" mean different to different people. According to IMAI (2023), data, compared to 59 per cent of men, only 29 per cent of women have achieved digitally literacy while digital literacy among adults over the age of 50 stands at 30 per cent when compared to 60 per cent of adults belonging to the age group, 18-29. In any situation implementing ICT into small businesses require a potential skill base and a considerable amount of start-up cost to set up the physical infrastructure.

Demography And Digital Awareness

Studies have also shown that there are awareness gaps among women entrepreneurs in terms of financial knowledge, business skills and technological challenges. It is very important for business owners to have knowledge or skills of ICT because those knowledge or previous experiences may influence their decision in adopting ICT in business (Alam & Noor, 2009). Despite various efforts by the government through development schemes and policies supporting women in entrepreneurship, the awareness level as well the digital competency remains low. The scale to measure digital literacy and competency is based on: the capacity or ability, or a skill/s

and the ability to operate at and beyond the functional level (UNESCO (2018)). The assumption is that when people have the device or infrastructure, they can use it to consume and produce information in all kinds of settings and roles. Based on the review of literature three hypotheses are built.

Digital Literacy Competency Framework

Web 2.0 tools are social and easy-to-use tools enabling users to communicate digital content using cell phones conveniently and immediately for any kind of communication (Spires, et.al, (2019)). The importance of social media in business cannot be denied as millions of people use mostly social media for the purpose of communication (David et al, 2018). Using social media applications such as Facebook, Twitter, and Instagram for business has become quite popular but these sites require users to understand keywords, search engine etc. and manipulate content in multiple formats safely. National Sample Survey Office (NSSO) in India measures literacy of an individual if they are able to read and write a sentence in any with proper understanding which perhaps means being able to be understood but experience says digital literacy also includes the ability to safely navigate the pages and links according to the onscreen instructions.

The Digital Literacy Competency framework has been used to determine the competency levels of the respondents and has been adapted from the original which was proposed by the European Commission in 2013, which is widely used for research on digital competence and developing digital competences in Europe (Schwarz et al, 2024). According to Digital Competence Reference Model there are five areas of digital competence: 1) gathering information, 2) communicating through digital technologies, 3) integrating information while understanding copyright issues, 4) understanding safety issues, and 5) using digital tools for innovation (Fonseca & Picoto, 2020). After the preliminary visits, the investigator realized that the WOVSBs are spread across various competency levels and the scale modified as per UNESCO, 2018 framework.

HYPOTHESIS FORMATION

A hypothesis is a statement created for testing by referring to empirical studies and are stated in the form that predicts either the differences or association between two variables under study (Churchill and Brown, 2004). It is useful in guiding analysis. Though a hypothesis comes in a pair, a null and an alternate, and a null hypothesis predicts if there is a difference or a relation between the tested variables or that there is no relationship between two variables (Malhotra, 2004). Null hypothesis in this research is noted as H_0 while alternate hypothesis is noted as H_a . It is important to note that a researcher can never actually prove that an alternate hypothesis is true (Malhotra, 2004) because of known or unknown errors involved in the measurement of variables. It is usual for the researcher to test whether the null is probably true or probably false to accept the alternate hypothesis as the alternate logical solution of the research problem.

The following hypotheses are derived from the relationships found from the literature review above.

Table 1: Hypothesized Relationships

No.	Null Hypotheses	Alternate Hypotheses
H ₀₁	Education level has no multivariate effect on Digital Tools and Applications Adoption and Digital Application Management	H _{a1} Education Level significantly affects Digital Tools and Applications Adoption and Digital Application Management
H ₀₂	Digital Infrastructure has no multivariate effect on Digital Tools and Applications Adoption and Digital Application Management	H _{a2} Digital Infrastructure significantly affects Digital Infrastructure significantly affects

H ₀₃	Age has no multivariate effect on Digital Tools and Applications Adoption and Digital Application Management	H _{a3} Age significantly affects Digital Tools and Applications Adoption and Digital Application Management
H ₀₄	There is no interaction effect between education level and age and digital payment tool usage and digital literacy outcomes.	H _{a4} There is a significant interaction effect between Education Level and Age

METHODOLOGY

The author has used non-probabilistic sampling, as this technique is appropriate when selecting individuals for the study based on certain characteristics, such as, individuals answering the questionnaire ought to be women first and owners or part-owners of the business and should have been conducting business at least for three years. The size of the businesses is very small and since they are informal in nature, the technical term micro has been avoided and the sample has been collected from women-owned-very-small businesses (WOVSB). In absence of formal data, the sampling size was calculated based on Raosoft calculator, and the number is 377 with 5 per cent margin of error and 95 per cent confidence level. However, the author received proper responses from 344 respondents only. The respondents could be reached by snowballing technique in and around South Dum Dum municipality and its nearby districts having proximity to metro, railways, road and river. Over six months field visit, 344 participants could be reached.

Both kinds of data such as primary and secondary data were collected for the completion of the study. The study used literature review, news analysis, surveys and focused group discussions to identify how digital payment system affects small businesses. The secondary sources used are journals, news articles and various reports from Government and non-government websites for data analysis and literature review.

Primary data were collected through survey by visiting and making phone calls and interviewing the female respondents of all the wards with the help of an unstructured questionnaire which is based on the literature review. The questionnaire covered questions related to demographics such as Age, Marital Status, Education, Type of Business, frequency of Internet usage, Ability to Use Smartphones for messaging and social media posts, and accessing Digital finance. The field visit took place between August 2023 and October 2023 and between January 2024 and March 2024. Wherever outright refusal occurred the investigator visited the field at different times to meet WOVSBS. Care was taken to explain the questionnaire in local language, Bengali, and after receiving informed consent, interviews were conducted. Open-ended questions were used to collect data regarding the respondents' choice of business, motivation to start a business, their perception and ability to use digital financial tools in their business. The entire questionnaire was segmented into sections according to the study's variables.

A multivariate analysis of variance (MANOVA) was conducted to examine the effects of **Digital Infrastructure, Education Level, and Age** on two dependent variables: *Digital Adoption* and *Digital Application Management*. **The dependent variables are:** Digital Tools and Applications Adoption and Digital Application Management and **the independent variables are:** Digital Infrastructure, Education Level, Age and

Education Level * Age (interaction term). All the collected data are tabulated through MS Office and interpreted using SPSS to arrive at the final conclusion.

RESULTS AND ANALYSIS

Preliminary assumption testing indicated no serious violations of normality, linearity, homogeneity of variance-covariance matrices, or multicollinearity.

The hypotheses have been tested for the Multivariate Test.

Table 2. Hypotheses Testing Results

No	Hypothesized Relationship	Result	Comment
H ₀₁	Education level has no multivariate effect on Digital Tools and Applications Adoption and Digital Application Management	Wilks' Lambda = .450, F = 39.52, p < .001 partial η^2 = .552	Significant effect Reject H ₀₁
H ₀₂	Digital Infrastructure has no multivariate effect on Digital Tools and Applications Adoption and Digital Application Management	Wilks' Lambda = .564, F = 124.22, p < .001 partial η^2 = .436	Significant effect Reject H ₀₂
H ₀₃	Age has no multivariate effect on Digital Tools and Applications Adoption and Digital Application Management	Wilks' Lambda = .882, F = 6.97, p < .001 η^2 = .119	Significant effect Reject H ₀₃
H ₀₄	There is no interaction effect between education level and age and digital payment tool usage and digital literacy outcomes.	Wilks' Lambda = .883, F = 1.73, p = .017 η^2 = .120	Significant effect Reject H ₀₄

Main Effects

There was also a significant multivariate effect of Education Level, Wilks' Λ = .450, $F(8, 644) = 39.52$, $p < .001$, partial η^2 = .552, indicating a very large effect. This suggests that education plays a critical role in influencing digital engagement in small businesses.

There was a significant multivariate effect of Digital Infrastructure on the combined dependent variables, Wilks' Λ = .564, $F(2, 322) = 124.22$, $p < .001$, partial η^2 = .436, indicating a large effect. This suggests that differences in digital infrastructure are associated with meaningful differences in the levels of digital adoption and application use among the participants.

Age showed a significant multivariate effect on the dependent variables, Wilks' Λ = .882, $F(6, 644) = 6.97$, $p < .001$, partial η^2 = .119, reflecting a moderate effect size. This indicates that age-related differences influence digital tool use and management.

Interaction Effects

There was a statistically significant multivariate interaction between Education Level and Age, Wilks' Λ = .883, $F(24, 644) = 1.73$, $p = .017$, partial η^2 = .120, suggesting that the influence of education on digital engagement is moderated by age.

Multivariate Analysis of Variance (MANOVA)

A multivariate analysis of variance (MANOVA) was conducted to examine the effects of Digital Infrastructure, Education Level, Age, and the interaction between Education Level and Age on Digital Adoption and Management of Digital Applications. The results of the multivariate tests revealed that Digital Infrastructure had a statistically significant multivariate effect on the combined dependent variables and these results suggest that all main effects and the interaction had statistically significant impacts on the combined dependent variables. Follow-up univariate ANOVAs were conducted for each dependent variable separately to further understand the specific effects:

Table 3: Tests of Between-Subjects Effects (Univariate Results)

Hypothesis	Statement	Result (F, p, η^2)	Supported or not	Comment
H1	Digital Infrastructure significantly affects Digital Adoption and Management of Digital Applications.	Multivariate: $F(2, 322) = 124.22, p < .001, \eta^2 = .436$ Univariate (Digital Adoption): $F(1, 323) = 246.88, p < .001, \eta^2 = .438$ Univariate (Management): $F(1, 323) = 3.50, p = .062$	Partially Supported	Strong effect on Digital Adoption; marginal effect on Management of Digital Applications.
H2	Education Level significantly affects Digital Adoption and Management of Digital Applications.	Multivariate: $F(8, 644) = 39.52, p < .001, \eta^2 = .552$ Univariate (Digital Adoption): $F(4, 323) = 59.52, p < .001, \eta^2 = .428$ Univariate (Management): $F(4, 323) = 36.74, p < .001, \eta^2 = .313$	Supported	Education level had a strong and consistent effect across both outcomes.
H3	Age significantly affects Digital Adoption and Management of Digital Applications.	Multivariate: $F(6, 644) = 6.97, p < .001, \eta^2 = .119$ Univariate (Digital Adoption): $F(3, 323) = 10.69, p < .001, \eta^2 = .087$ Univariate (Management): $F(3, 323) = 3.44, p = .017, \eta^2 = .031$	Supported	Age has a significant but smaller effect, particularly on Digital Adoption.
H4	There is an interaction effect between Education Level and Age on Digital Adoption and Management of Digital Applications.	Multivariate: $F(24, 644) = 1.73, p = .017, \eta^2 = .120$ Univariate (Digital Adoption): $F(12, 323) = 2.30, p = .008$ Univariate (Management): $F(12, 323) = 1.16, p = .309$	Partially Supported	Significant interaction for Digital Adoption but not for Management.

DISCUSSION

Impact of Digital Infrastructure, Education and Age on Digital Adoption

Explanation for the relationship: Digital Adoption - Digital Infrastructure, had a significant effect on Digital Adoption, $F(1, 323) = 246.88, p < .001$, partial $\eta^2 = .438$. Education Level also significantly affected Digital Adoption, $F(4, 323) = 59.52, p < .001$, partial $\eta^2 = .428$. Age had a significant but smaller effect, $F(3, 323) = 10.69, p < .001$, partial $\eta^2 = .087$. The interaction between Education Level and Age was statistically significant, $F(12, 323) = 2.30, p = .008$, partial $\eta^2 = .079$, suggesting that the effect of education on digital adoption varies across different age groups.

Education encourages women to use digital financial services because it gives them the confidence to manage digital money in absence of cash, use cheaper mode of communication such as whatsapp etc. For those who are less educated there are paytm speakers but poor network is a challenge. Apart from network, the battery life and technical problems often put the VSBOs in difficulty. Sometimes they themselves fail to charge the speakers. The usage of digital devices for social networking via WhatsApp, Facebook, X are relatively higher than that for other usage but these are hardly used or maintained for business purpose by owners of very small businesses. Using digital payment system assures sales and facilitating purchase from customers not carrying cash, so this is a form of customer retention. Earlier, they used to lose customers because they did not use digital financial services like paytm, phonepe, Gpay, and Bhim UPI. However, they are not able to manage these services on their own. A family member, or a business colleague mostly helps them out.

Impact of Digital Infrastructure, Education and Age on Management of Digital Apps

Explanation for the relationship: Management of Digital Applications - Education Level had a strong effect, $F(4, 323) = 36.74, p < .001$, partial $\eta^2 = .313$. Age also had a smaller but significant effect, $F(3, 323) = 3.44, p = .017$, partial $\eta^2 = .031$. Digital Infrastructure did not reach statistical significance, $F(1, 323) = 3.50, p = .062$, although it approached the threshold. The interaction effect between Education Level and Age was not significant, $F(12, 323) = 1.16, p = .309$, indicating no combined effect on management of digital apps.

Education and access to technology develops confidence to adopt new technologies. The digital payment system was adopted due to the shortage of cash and followed by covid rules. Low levels of literacy reduce safety in the usage of Digital Payment System because they are not able to ensure payment completion without speakers connected to paytm. With high literacy levels one can use social media tools to engage their customers but with low digital literacy the VSBOs depend on other people and are unable to troubleshoot. Not owning phones indicates a person's inaccessibility to digital tools. Any business requires skill, education, tools and capital. Using digital tools and application require certain amount of expertise.

The results of the MANOVA and subsequent univariate tests demonstrate that Digital Infrastructure, Education Level, and Age significantly influence both Digital Adoption and Management of Digital Applications, though the strength of the effects varies. Education appears to be a particularly strong predictor, with consistent and significant effects on both dependent variables. Additionally, there is evidence of an interaction between Education Level and Age in influencing digital adoption, suggesting nuanced dynamics across demographic groups.

CONCLUSION

It may be concluded that better education facilitates enable one to operate and use ICT device(s) with and reduces barriers to digital adoption as statistically proved that education levels positively affect ICT adoption and capability to use (Asrani, 2020). Therefore, the factors affecting digital adoption and digital competency are one's own level of education, illiteracy, or limited access to digital infrastructure, high costs of infrastructure, old habits, or perceptions (Kaushal et.al, 2022). The PMGDISHA Scheme provides training to individuals and to groups so that people can operate digital devices such as computers, tablets, or smartphones; set up an email,

send and receive e-mails; browse the internet to access Government services or use the search engines for information, and make digital payments. The financial situation during the lockdowns presented low revenues and WOVSBS looked at digital payments with suspicion. Many WOVSBS had reluctantly adopted digital payment system expecting imposition of fees for their financial transactions (Kumar & Chaubey, 2017).

RECOMMENDATIONS

The government should focus on educating the urban WOVSBS about the advantages and costs of digital systems. The reasons for their concern in integrating digital payment services in their business are: 1) the cost involved to installing it, and 2) the reliability of the mechanism (Ahmed & Sur, 2023). Though digital payment system is becoming normal among both consumers and sellers due to cash crunch and ease of use in digital payment, in business cash is still important as the supplier may not deliver goods without cash.

Therefore, a similar kind of training that of PMGDISHA is required for the urban low-income group to bridge the educational gap responsible for adoption of technology. As digital finance depends on the strength of one's digital literacy, there is a need for advocacy on digital literacy initiatives specifically targeting women.

COMPETING INTERESTS

The author(s) declare no competing interests.

DATA AVAILABILITY

Data will be available once the work is totally complete.

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