

Framework to bridge the gender gap in mobile phone usage among women in microbusinesses: A cross-sectional expert-based UTAUT assessment in Mbarara City, Uganda.

Ivan Ninsiima*, Dr. Job Kalema, Miss. Sarah Nahwera
Bishop Stuart University, Mbarara, Uganda

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Abstract

Introduction

The gender digital divide limits women's ability to use mobile phones for business, financial services, communication, and market access. This study evaluated a Gender Digital Inclusion Framework designed for women entrepreneurs in Mbarara City, Uganda, using the Unified Theory of Acceptance and Use of Technology (UTAUT) as an assessment lens.

Methodology

A cross-sectional expert evaluation was conducted within the rigor cycle of a Design Science Research approach. Fourteen purposively selected experts from academia, government, mobile network operators, financial institutions, NGOs/civil society, and local IT intermediaries assessed the framework. A five-point Likert-scale questionnaire measured validity, completeness, practical applicability, performance expectancy, effort expectancy, social influence, and facilitating conditions. Descriptive statistics and one-sample t-tests were used for quantitative data, while open-ended responses were analyzed thematically.

Results

The overall mean rating was 3.94 (SD = 0.73). Validity had the highest mean (4.21), followed by performance expectancy (4.14) and completeness (4.07). Facilitating conditions had the lowest mean (3.64). All seven criteria were significantly above the neutral midpoint of 3 ($p < .05$). Experts identified disability inclusion, funding sustainability, monitoring and evaluation, youth-specific needs, and implementation planning as areas requiring refinement.

Conclusion

The findings indicate that experts considered the framework valid, complete, and practically applicable, while identifying implementation conditions that require strengthening. UTAUT provided a structured basis for examining the framework's potential adoption conditions before field implementation.

Recommendation

Future implementation should incorporate disability-inclusive training and assistive technologies, a sustainable financing mechanism, strengthened monitoring and evaluation, youth-responsive strategies, and clearly assigned implementation responsibilities.

Keywords: Gender digital divide; Unified Theory of Acceptance and Use of Technology; Expert evaluation; Design Science Research; Digital inclusion framework; Women entrepreneurs; Uganda; Mbarara City

Submitted: September 10, 2026 Accepted: September 27, 2026 Published: October 01, 2026

Corresponding author: Ivan Ninsiima*

Email: ninsiimaivan73@gmail.com

Bishop Stuart University, Mbarara, Uganda

Introduction

The gender digital divide remains a persistent challenge in Sub-Saharan Africa. Women face barriers to mobile technology use that include affordability of handsets and data, digital literacy, socio-cultural norms, availability of relevant content, and online safety and privacy. These barriers can restrict women's ability to use mobile technologies for business activities and participation in the digital economy.

The digital divide involves more than ownership of a device. Van Dijk's (2005) conceptualization distinguishes motivational, material, skills, and usage access, highlighting the importance of addressing the conditions that enable people to translate possession of technology into meaningful use. Similarly, the Capability Approach distinguishes between resources, conversion factors, capabilities, and achieved functionings (Sen, 1999). These perspectives are relevant to women entrepreneurs because access to a phone

does not necessarily mean autonomous, confident, or productive use.

Gender relations also shape technology access and use. Techno-Feminism emphasizes the relationship between technology and gendered power relations (Wajcman, 2004), while the Social Construction of Technology perspective emphasizes the role of social groups in shaping how technology is understood and used (Bandyopadhyay et al., 2021). In the Ugandan context, barriers may therefore include household and community expectations as well as material and technical constraints.

The Unified Theory of Acceptance and Use of Technology (UTAUT) identifies performance expectancy, effort expectancy, social influence, and facilitating conditions as key determinants of technology acceptance and use (Venkatesh et al., 2003). In this study, UTAUT was adapted as an expert assessment lens rather than as a direct end-user acceptance model. The purpose was to examine whether the proposed framework addresses factors likely to influence adoption and sustained use before field implementation.

The study developed a Gender Digital Inclusion Framework with four integrated pillars: Access; Skills; Policy and Safety; and Content and Value. The framework also includes a multi-stakeholder coordination mechanism involving government, mobile network operators, financial institutions, NGOs, local intermediaries, and women's associations. The study addressed the research question: How effective and appropriate is the designed framework for bridging the gender gap in mobile phone usage among women in small business enterprises, based on the UTAUT model and expert evaluation?

Mbarara City provides the study context. The original manuscript describes it as a major urban centre in Western Uganda and a secondary-city context characterized by variable connectivity, electricity constraints, and comparatively limited technical support services. The framework was designed for women entrepreneurs operating in this context.

Methodology

Research design

The study used a cross-sectional expert evaluation design embedded within a Design Science Research (DSR) methodology. The DSR process comprised a Relevance

Cycle for identifying barriers and requirements, a Design Cycle for developing the framework, and a Rigor Cycle for evaluating the resulting artifact. This article reports the cross-sectional expert evaluation undertaken during the Rigor Cycle. Expert assessments were collected using a structured instrument at one stage of the framework evaluation rather than through repeated measurements over time.

Study setting and data collection period

The study was conducted in Mbarara City, Western Uganda. The setting was selected because the framework targets women operating microbusinesses in a secondary-city environment.

Gender digital inclusion framework

The evaluated framework comprises four integrated pillars and a stakeholder coordination mechanism. The Access pillar addresses device and connectivity barriers through device financing, data subsidies, public Wi-Fi in markets, and solar charging stations. The Skills pillar addresses digital literacy through Basic, Intermediate, and Advanced learning levels, Runyankole learning materials, peer-led sessions, and intermediary training. The Policy and Safety pillar addresses institutional and safety concerns through gender-responsive bylaws, reporting mechanisms for online gender-based violence, male champion programmes, and women-only learning spaces. The Content and Value pillar addresses the availability of locally relevant content through Runyankole content development and communication of the business value of mobile technology. A Multi-Stakeholder Platform links government, MNOs, financial institutions, NGOs, local intermediaries, and women's associations.

Participants and sampling

Fourteen experts were purposively selected based on their professional expertise and institutional roles. Eligibility included expertise in ICT4D, gender studies, or information systems; decision-making responsibilities in government; management experience in mobile network or financial services; programme management experience in women's empowerment or digital literacy; or direct experience as local IT intermediaries working with women entrepreneurs.

Table 1: Expert panel composition

Institutional category	n	%
Academia	3	21.4
Government	3	21.4
Mobile network operators	2	14.3
Financial institutions	2	14.3
NGOs/civil society	2	14.3
Local IT intermediaries	2	14.3
Total	14	100.0

Note. Percentages are calculated from the 14 experts reported in the original manuscript.

The available manuscript reports institutional categories but does not provide the experts' age or sex distribution. These variables should be added if they were collected. They should not be reconstructed from the institutional categories.

Data collection instrument

A semi-structured evaluation questionnaire contained closed-ended five-point Likert-scale items and open-ended questions. Experts rated the framework on validity, completeness, practical applicability, performance expectancy, effort expectancy, social influence, and facilitating conditions, where 1 represented strongly disagree and 5 represented strongly agree. Open-ended questions elicited strengths, weaknesses, gaps, and recommendations for refinement. Experts were also invited to participate in follow-up interviews.

Data analysis

Quantitative responses were summarized using means, medians, and standard deviations. One-sample t-tests compared each criterion with the neutral midpoint of 3. Criteria with mean ratings below 3.5 were identified for particular attention. Qualitative responses and follow-up

interview material were analyzed thematically following Braun and Clarke's (2006) six-phase approach, with coding conducted using NVivo.

Ethical considerations

Ethical approval was obtained from the Bishop Stuart University Research Ethics Committee (BSU-REC). All experts provided informed consent before participation. Confidentiality and anonymity were maintained throughout the evaluation.

Results

Characteristics of the expert panel

The 14-member panel included experts from six institutional categories. Academia and government each contributed three experts (21.4% each), while mobile network operators, financial institutions, NGOs/civil society, and local IT intermediaries each contributed two experts (14.3%). The manuscript does not report age or sex, so these characteristics cannot be presented without the underlying participant records.

Overall expert evaluation

Table 2: Expert evaluation ratings

Evaluation criterion	M	SD	Min	Max	Interpretation
Validity	4.21	0.58	3	5	Strong agreement
Completeness	4.07	0.62	3	5	Strong agreement
Practical applicability	3.86	0.77	2	5	Agreement
Performance expectancy	4.14	0.66	3	5	Strong agreement
Effort expectancy	3.93	0.73	2	5	Agreement
Social influence	3.71	0.83	2	5	Agreement
Facilitating conditions	3.64	0.91	2	5	Moderate agreement
Overall	3.94	0.73	—	—	Strong agreement

Note. Ratings used are those reported in the original manuscript.

The overall mean rating was 3.94 (SD = 0.73). Validity received the highest mean rating (M = 4.21), followed by performance expectancy (M = 4.14) and completeness (M = 4.07). Facilitating conditions received the lowest mean

rating (M = 3.64), although the rating remained above the neutral midpoint.

One-Sample t-Test Results

Table 3: One-sample t-test results using a test value of 3

Criterion	t	df	p	Mean difference	95% CI
Validity	7.82	13	< .001	1.21	[0.88, 1.54]
Completeness	6.45	13	< .001	1.07	[0.71, 1.43]
Practical applicability	4.18	13	.001	0.86	[0.41, 1.31]
Performance expectancy	6.46	13	< .001	1.14	[0.76, 1.52]
Effort expectancy	4.77	13	< .001	0.93	[0.51, 1.35]
Social influence	3.20	13	.007	0.71	[0.23, 1.19]

Facilitating conditions	2.63	13	.021	0.64	[0.11, 1.17]
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Note. All seven criteria were statistically significantly above the neutral midpoint of 3 at $p < .05$.

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All seven criteria were significantly above the neutral midpoint of 3. The largest t value was observed for validity ($t = 7.82$, $p < .001$), while facilitating conditions had the smallest t value ($t = 2.63$, $p = .021$).

UTAUT-based findings

Performance expectancy ($M = 4.14$, $SD = 0.66$) indicated agreement that the framework could generate tangible business benefits, including improved sales, market access, and business efficiency. Experts associated mobile money and digital marketing with practical business value.

Effort expectancy ($M = 3.93$, $SD = 0.73$) indicated agreement that the framework could reduce complexity through tiered training, icon-based learning, and Runyankole content. However, experts raised concerns about accessibility for women with no formal education and suggested considering voice-based applications. They also emphasized the importance of trainer quality.

Social influence ($M = 3.71$, $SD = 0.83$) indicated agreement that the framework addresses social dynamics affecting mobile use. Experts highlighted male champion programmes and community engagement, particularly the involvement of husbands and community leaders.

Facilitating conditions ($M = 3.64$, $SD = 0.91$) was the lowest UTAUT-related rating. Experts raised concerns about the feasibility and sustainability of device financing and public Wi-Fi. They emphasized the need for clear investment, maintenance, and financing arrangements.

Qualitative Findings and Framework Refinement

Experts identified the framework's holistic and contextual approach as a major strength. They highlighted its integration of supply-side and demand-side barriers and the role of local intermediaries. The four pillars were viewed as addressing interconnected challenges affecting women's mobile phone use.

The main gaps identified were disability inclusion, governance of savings groups, funding and sustainability, monitoring and evaluation, and implementation detail. Experts recommended adding disability-inclusive strategies, strengthening monitoring and evaluation, specifying funding and sustainability mechanisms, adding a youth-specific component, and developing a detailed implementation plan.

The framework was subsequently refined by adding disability-inclusive training and assistive technologies; a monitoring and evaluation framework; a funding and sustainability strategy; youth-responsive approaches; and a phased implementation plan. The proposed implementation phases were: Phase 1 (Months 1–6), stakeholder engagement, baseline assessment, and pilot design; Phase 2

(Months 7–18), pilot implementation in two divisions; and Phase 3 (Months 19–24), scaling and sustainability planning.

Discussion

The cross-sectional expert evaluation produced an overall mean of 3.94 ($SD = 0.73$), with all seven assessment criteria significantly above the neutral midpoint. The findings therefore provide expert-based evidence supporting the internal validity, completeness, and practical applicability of the proposed framework at the pre-implementation stage. This interpretation is limited to expert assessment and should not be equated with demonstrated effectiveness among women entrepreneurs in actual field use.

Validity received the highest rating ($M = 4.21$), suggesting that the experts considered the framework to correspond well with the problem it was intended to address. Performance expectancy was also high ($M = 4.14$), indicating that experts perceived potential business value in interventions addressing mobile money, digital marketing, market access, and business efficiency.

The lower rating for facilitating conditions ($M = 3.64$) identifies implementation conditions as an important area for further attention. Concerns about financing, connectivity, public Wi-Fi maintenance, technical support, and sustainability show that a framework can be conceptually acceptable while still requiring practical mechanisms for implementation. The findings therefore support the iterative logic of DSR, in which evaluation results inform refinement of the artifact.

The UTAUT constructs also provided a structured way to examine adoption-related conditions before field implementation. Effort expectancy was supported by the proposed tiered curriculum and localized content, while social influence was addressed through community engagement and male champion approaches. The expert concerns about women with disabilities, trainer quality, and women with limited formal education indicate that future implementation should test whether these design features actually reduce effort and improve sustained use.

The qualitative findings further strengthened the quantitative assessment by identifying issues not fully captured by numerical ratings. Disability inclusion, funding, monitoring and evaluation, youth needs, and implementation responsibilities were subsequently incorporated into the refined framework. This illustrates the value of combining structured ratings with qualitative expert feedback during ex-ante artifact evaluation.

Recommendations

Based on the findings, the study recommends that implementation of the Gender Digital Inclusion Framework

should incorporate disability-inclusive training materials, assistive technologies, and targeted outreach. This is necessary because experts identified disability inclusion as an area requiring additional attention.

A sustainable financing and maintenance mechanism should be established before large-scale implementation. The framework should specify potential funding sources, financial responsibilities, maintenance arrangements for shared infrastructure, and mechanisms for sustaining activities after initial project support.

The monitoring and evaluation system should include measurable indicators covering participation, training completion, device access, mobile phone use, confidence, and business-related outcomes. Baseline and follow-up measurements should be used during field implementation. Implementation should include youth-responsive approaches and should assign clear responsibilities, timelines, milestones, and reporting arrangements to participating stakeholders. Community leaders, husbands, women's associations, local intermediaries, government institutions, NGOs, financial institutions, and MNOs should have clearly defined roles.

Finally, the framework should be field-tested among women entrepreneurs before claims about real-world effectiveness are made. Future studies should use larger samples of women users and, where feasible, longitudinal or quasi-experimental designs to assess changes in mobile phone use and business outcomes.

Conclusion

This cross-sectional expert evaluation assessed a Gender Digital Inclusion Framework designed to bridge the gender gap in mobile phone usage among women entrepreneurs in Mbarara City. Using the Unified Theory of Acceptance and Use of Technology as an assessment lens within a Design Science Research approach, experts rated the framework positively across validity, completeness, practical applicability, performance expectancy, effort expectancy, social influence, and facilitating conditions. The overall mean was 3.94 (SD = 0.73), and all criteria were significantly above the neutral midpoint.

The findings provide expert-based support for the framework's pre-implementation validity and applicability, but they do not establish its real-world effectiveness among women entrepreneurs. The main implementation concerns were facilitating conditions, disability inclusion, funding sustainability, monitoring and evaluation, youth-specific needs, and implementation planning. These issues were used to refine the framework. Field implementation and evaluation are therefore required to determine whether the refined framework improves women's actual mobile phone use and related business outcomes.

Acknowledgements

The author acknowledges the experts from academia, government, mobile network operators, financial

institutions, NGOs/civil society, and local IT intermediary organizations who participated in the evaluation and provided feedback used to refine the framework. The author also acknowledges Bishop Stuart University and the Bishop Stuart University Research Ethics Committee for institutional and ethical support.

If research assistants, supervisors, translators, data analysts, or other individuals contributed to the study, their names and specific contributions should be added before publication.

List of abbreviations

BSU-REC – Bishop Stuart University Research Ethics Committee

DSR – Design Science Research

ICT4D – Information and Communication Technologies for Development

M&E – Monitoring and Evaluation

MNO – Mobile Network Operator

NGO – Non-Governmental Organization

SCOT – Social Construction of Technology

SME – Small and Medium Enterprise

UTAUT – Unified Theory of Acceptance and Use of Technology

Author contributions

Ninsiima Ivan: conceptualization of the study; development and refinement of the Gender Digital Inclusion Framework; methodology; development of the expert evaluation instrument; data collection and/or coordination; data analysis; interpretation of findings; manuscript preparation; and final approval of the manuscript. If additional authors contributed, their full names and specific contributions should be inserted here.

Author biography

Ninsiima Ivan is affiliated with Bishop Stuart University, Mbarara, Uganda. His work in this manuscript focuses on digital inclusion, mobile phone usage among women in microbusinesses, Design Science Research, and the application of the Unified Theory of Acceptance and Use of Technology to framework evaluation. A fuller institutional biography, including academic qualifications, position, research interests, and professional affiliations, should be added if required by the target journal.

Dr. Job Kalema and Miss Sarah Nahwera are research supervisors at Bishop Stuart University, Mbarara.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interest

The author declares no conflict of interest.

Ethics approval

Ethical approval was obtained from the Bishop Stuart University Research Ethics Committee (BSU-REC). All participating experts provided informed consent, and confidentiality and anonymity were maintained.

Page | 6 Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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