Comparative Usability of Fintech and Agritech Applications for Inclusive Digital Services

Serif Oyindamola Oyesiji[1], Chukwunonyelum Rosalyn Ezeako[2], Emmanuel Larbi Adjei[3], Okeoghene Elebe[4*], Leonard U. Agwuna[5]

[1] University of Lagos, Lagos, Nigeria
[2] JAUIT, Nigeria
[3] Kwame Nkrumah University of Science and Technology, Kumasi, Ghana
[4] Access Bank PLC, Lagos, Nigeria
[5] University of Zululand, KwaDlangezwa, South Africa
*Corresponding author: okeelebe01@gmail.com

Abstract

Fintech and agritech applications increasingly mediate payments, credit, market access, advisory services, and farm decisions. Their usability cannot be inferred from adoption because users may persist despite errors, poor accessibility, high data costs, or weak alternatives. This comparative integrative review synthesizes 289 publications across human-computer interaction, digital finance, agricultural services, accessibility, trust, and technology adoption. The analysis examines task effectiveness, learnability, accessibility, trust and risk, low-bandwidth performance, and inclusive user research. The evidence indicates that successful experience design depends on the fit between interface demands, user capability, task consequence, device conditions, and recourse when errors occur. Fintech places particular weight on security, transparency, and transaction recovery, while agritech requires stronger accommodation of intermittent connectivity, contextual advice, and seasonal decisions. The paper contributes a comparative usability framework, evaluation indicators, and propositions for testing inclusive performance across user groups and operating conditions.

Keywords: user experience; usability; fintech; agritech; mobile; application; financial technology

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1 Introduction

Fintech and agritech applications increasingly mediate payments, credit, savings, market information, agricultural advice, input purchasing, and other consequential decisions. Their interfaces often serve users with varied literacy, language, device quality, connectivity, disability, and prior digital experience. Mobile-usability research shows that user experience depends on more than visual appeal; effectiveness, efficiency, accessibility, learnability, and satisfaction must be examined together [1-5]. A service may record high adoption while still imposing avoidable errors, confusion, data costs, or dependence on informal assistance. Usability evaluation must therefore focus on completed tasks and consequences, not download or registration counts alone.

Fintech tasks carry financial and identity risks. Users need to understand fees, transaction status, permissions, security steps, and available remedies when a payment fails or an account is compromised. Heuristic evaluation of cryptocurrency applications and research on mobile-banking

accessibility illustrate how interface defects, terminology, and accessibility barriers may exclude users or increase error exposure [6,7]. Broader fintech research links continued use to trust, service experience, and the perceived value of digital financial tools [8-14]. These findings support transparent confirmation, clear error recovery, proportionate authentication, and accessible support as core experience requirements.

Agritech applications operate under related but distinct conditions. Farmers and market actors may rely on intermittent networks, shared devices, seasonal information, localized language, and advice whose usefulness depends on timing and place. Research on mobile technology for agricultural income and financial access, mobile-for-agriculture services, and mobile agriculture in African contexts shows why connectivity and contextual relevance shape service value [15-17]. Interface quality must therefore be evaluated alongside offline functionality, information freshness, local applicability, and the user's ability to question or verify recommendations.

Comparative research remains fragmented. General mobile-interface guidelines explain consistency, feedback, navigation, and user-centered development [5,18-23], while sector studies emphasize trust, inclusion, and domain-specific outcomes. Fintech evaluation often foregrounds security and transactions; agritech evaluation often foregrounds connectivity and advisory relevance. Yet both domains require inclusive research with representative users, realistic devices, ordinary network conditions, and high-consequence scenarios. Average satisfaction scores are insufficient when failures concentrate among users with disabilities, limited literacy, older devices, or weaker connectivity [1,7,24,25].

This review asks which experience dimensions support effective use, how their importance changes across fintech and agritech tasks, and which evaluation practices reveal exclusion and failure. It synthesizes 289 publications through six dimensions: task effectiveness, learnability, accessibility, trust and risk, low-bandwidth performance, and inclusive user research. The paper contributes a comparative usability framework, practical indicators, and propositions linking interface demands, user capability, task consequence, device conditions, and recourse. This structure supports evaluation of sustained and equitable use rather than adoption alone, while preserving the distinct operational requirements of financial and agricultural services [7,11,15,16].

2 Usability Foundations for Inclusive Digital Services

2.1 Task Effectiveness

Task effectiveness concerns whether users complete the intended financial or agricultural activity accurately and without avoidable assistance. Fintech tasks often involve payments, identity verification, transfers, or credit decisions, where an error may produce immediate financial harm. Agritech tasks may involve input selection, market information, production records, or advisory services, often under weaker connectivity and greater variation in digital literacy. Mobile interfaces are central in both settings, but screen size, interrupted sessions, and device sharing change the design problem. Evaluation should use representative tasks and users, then report completion, critical errors, recovery, and abandonment. A high completion rate does not offset severe errors among vulnerable groups. Comparative claims need matched task complexity and consequence, rather than a simple comparison of average completion time [1-4].

2.2 Learnability

Learnability determines how quickly first-time or infrequent users form a workable mental model of an application. Fintech interfaces benefit from familiar transaction sequences and explicit confirmation, while agritech services must often explain specialized terms, units, seasons, or recommendations. Repeated use may improve speed, yet memorability declines when tasks occur only at planting, repayment, or reporting intervals. Researchers should separate first-attempt performance from improvement across trials and later retention. Helpful measures include time to first successful completion, requests for assistance, navigation reversals, and errors after a delay. Tutorials are useful only when users notice and understand them. Design should place guidance at the point of uncertainty, use consistent labels, and allow safe practice or reversal for consequential actions [5-8].

2.3 Accessibility

Accessibility and inclusion extend beyond technical compliance. Users may face low vision, limited literacy, motor constraints, language barriers, shared devices, low bandwidth, or intermittent electricity. Fintech and agritech applications should support readable contrast, scalable text, screen readers, clear focus order, plain language, and alternatives to audio or image-only information. Inclusion also requires testing with people who experience these constraints, because automated checks do not reveal whether a workflow is understandable or dignified. Performance should be disaggregated by device, connectivity, language, age, disability, and experience where ethical and feasible. An interface is not inclusive when average success improves while a subgroup loses access to an essential transaction or advisory service [9-12].

2.4 Trust and Risk

Trust, privacy, and security shape usability because protective controls influence whether users understand and complete a task. Fintech users need assurance about money movement, identity data, fees, and dispute routes. Agritech users may question who receives farm, location, or production information and how recommendations are generated. Strong authentication protects accounts but creates exclusion when recovery depends on a lost number or inaccessible identity document. Designers should explain data use, minimize collection, display transaction status, provide receipts, and offer a credible correction path. Testing should examine comprehension of consent and warnings, response to suspected fraud, and successful account recovery. Security should be evaluated as part of the journey rather than added after usability decisions [13-16].

2.5 Low-Bandwidth Performance

Resilience under constrained conditions separates a successful demonstration from a dependable service. Mobile users may switch networks, lose power, receive calls during a transaction, or share a device. Interfaces should preserve safe progress, prevent duplicate submission, distinguish pending from failed actions, and synchronize without corrupting records. Agritech content may need offline access, while financial transactions require careful handling of stale balances and replay risk. Evaluation should simulate latency, dropped connections, low storage, older devices, and interrupted authentication. Results should report data loss, duplicate actions, recovery time, and user understanding of system status. Designing only for stable broadband produces misleading usability results and transfers operational risk to users least able to absorb it [17-20].

2.6 Inclusive User Research

Comparative usability requires equivalent tasks, transparent sampling, and attention to consequence. Fintech and agritech applications should not be ranked through one composite score when their user goals and error costs differ. Researchers should define each task, recruit participants who resemble the

target population, record device and network conditions, and combine observation with post-task explanation. Completion, time, error severity, assistance, perceived effort, trust, and accessibility should be reported separately. Qualitative evidence is needed to explain why a failure occurred, while quantitative evidence shows its frequency. A defensible comparison identifies transferable design principles and domain-specific requirements instead of declaring one sector more usable on the basis of unmatched products or convenience samples [21-23].

2.7 Gaps in Fintech and Agritech Usability Studies

The strongest evidence on user experience in fintech and agritech applications identifies interacting mechanisms rather than a single dominant tool. Results depend on the fit among the decision problem, data quality, implementation capacity, user behavior, and the consequence of error. Studies that isolate one performance indicator therefore provide only partial support for practice.

Usability findings vary when studies test different tasks, devices, levels of user experience, network conditions, and consequences of error. Satisfaction, task completion, accessibility, trust, and low-bandwidth resilience describe different aspects of use. The comparison therefore retains the task and operating context attached to every result.

Comparative studies often rely on satisfaction or adoption intention while omitting observed task completion, recovery from error, accessibility, connectivity failure, and the consequences of an incorrect transaction. This produces an incomplete account of usability.

The review retains six dimensions because each represents a separate point of failure: task effectiveness, learnability, accessibility, trust and perceived risk, low-bandwidth resilience, and inclusive user research. Negative and inconsistent findings define moderators and limits rather than being discarded. This approach supports propositions that later studies may confirm, refine, or reject.

2.8 Comparative Synthesis and Design Gaps

Evidence relevant to user experience in fintech and agritech applications spans several research traditions, but those traditions do not provide equal forms of support. Direct domain studies establish the focal problem. Measurement and methodological studies clarify how constructs should be assessed. Governance and implementation studies identify controls and operating conditions. Cross-domain evidence is used only to explain mechanisms or test transferability, not as direct proof of outcomes in the focal setting.

Evaluation needs a defined user group, task, device, connectivity condition, and error consequence. Average completion scores should be accompanied by abandonment, recovery, accessibility barriers, misunderstanding, and support demand. Comparisons must also distinguish a successful demonstration from dependable use during financial or agricultural decisions.

The synthesis therefore treats task effectiveness, learnability, accessibility, trust and perceived risk, low-bandwidth resilience, and inclusive user research as linked requirements. The framework predicts weak results when one requirement advances while another remains underdeveloped. This configuration logic explains why technically competent interventions may fail after implementation and why favorable pilot results may not persist at scale.

Fintech and agritech interfaces share design principles, but their users, task frequency, transaction consequences, data sensitivity, and connectivity conditions differ. The review therefore supports comparison by task and risk profile rather than sector-wide ranking.

Future field studies should recruit users with varied literacy, language, disability, device, and connectivity profiles. Researchers should publish task scripts, failure definitions, assistance rules, completion distributions, and qualitative explanations. Longitudinal designs would show whether learnability and trust persist beyond first use.

Table 1. Evidence integration map for user experience in fintech and agritech applications

Evidence domain	References	Role in synthesis
Task effectiveness	[1-8,18-57]	Defines the focal construct and its principal outcome.
Learnability	[15,58-104]	Clarifies mechanisms, competing explanations, and performance conditions.
Accessibility	[9-14,16,105-145]	Informs measurement validity, comparison criteria, and analytical design.
Trust and perceived risk	[17,146-192]	Tests contextual transfer, implementation capacity, and operational constraints.
Low-bandwidth resilience	[193-240]	Supports governance, assurance, accountability, privacy, and risk controls.
Inclusive user research	[241-289]	Informs cross-domain interpretation, boundary conditions, and future validation.

3 Comparative Usability Review Method

3.1 Comparative design and usability questions

The study used a comparative usability review because the research questions concern mechanisms, interactions, measurement, and implementation rather than a pooled treatment effect. The analytical corpus comprised 289 publications spanning conceptual, empirical, methodological, and institutional work relevant to fintech and agritech services used through mobile devices, agent networks, and low-bandwidth environments. Eligibility required a clear connection to at least one research question, identifiable methods or conceptual reasoning, and enough detail to evaluate the claim advanced.

Screening excluded duplicate reports, product advertising, laboratory demonstrations without user evidence, and studies lacking a relevant fintech or agritech task. Retained work addressed effectiveness, learnability, accessibility, perceived risk, connectivity, and inclusive research. Findings were compared by user group and operating condition.

3.2 Coding tasks users and operating conditions

Extraction recorded the application type, user population, task, device, network condition, study design, usability measure, error pattern, assistance provided, and limitation. Quality appraisal assessed

whether the test reflected consequential use and whether accessibility, trust, and connectivity were measured rather than assumed.

Open coding identified recurring problems and mechanisms. Axial coding organized relationships among inputs, processes, controls, outputs, and outcomes. Integrative coding consolidated the evidence into six dimensions: task effectiveness, learnability, accessibility, trust and perceived risk, low-bandwidth resilience, inclusive user research. Negative cases and inconsistent findings were retained to identify moderators, failure modes, and limits to transfer. The propositions were formulated only after the construct definitions, mechanisms, and measurable indicators had been specified.

3.3 Application scope and evidence limits

The review compares design mechanisms rather than products. Empirical validation should use matched tasks, representative users, device conditions, and consequence-sensitive measures. The synthesis therefore reports mechanisms, trade-offs, and testable propositions rather than universal effects. Future validation should use preregistered measures, transparent sampling, subgroup analysis, sensitivity tests, and longitudinal outcome assessment where feasible.

4 Comparative Usability Findings

4.1 Inclusive usability assessment framework

Table 2. Comparative dimensions and evaluation rules

Dimension	Operational definition	Primary indicators	Decision risk
Task effectiveness	The observable capability represented by task effectiveness in the proposed model.	completion rate; error rate; recovery success	Weak validity or unmeasured outcome
Learnability	The observable capability represented by learnability in the proposed model.	time to proficiency; assistance requests; retention	Inconsistent interpretation or control
Accessibility	The observable capability represented by accessibility in the proposed model.	assistive access; language coverage; readability	Misleading average or hidden failure
Trust and perceived risk	The observable capability represented by trust and perceived risk in the proposed model.	abandonment; confirmation comprehension; perceived control	Delay, overload, or unstable response
Low-bandwidth resilience	The observable capability represented by low-bandwidth resilience in the proposed model.	offline completion; retry integrity; data consumption	Misuse, exclusion, or weak accountability

Dimension	Operational definition	Primary indicators	Decision risk
Inclusive user research	The observable capability represented by inclusive user research in the proposed model.	user-group coverage; severity of uncovered failures	Learning failure or unsupported scaling

Inclusive usability depends on task completion, learnability, accessibility, trust, low-bandwidth performance, and representative user research. A service that works in controlled tests may still exclude users who face unstable connectivity, limited digital experience, disability-related barriers, or uncertainty about financial and agricultural data. Table 2 therefore evaluates performance under the conditions in which users complete consequential tasks [124-126].

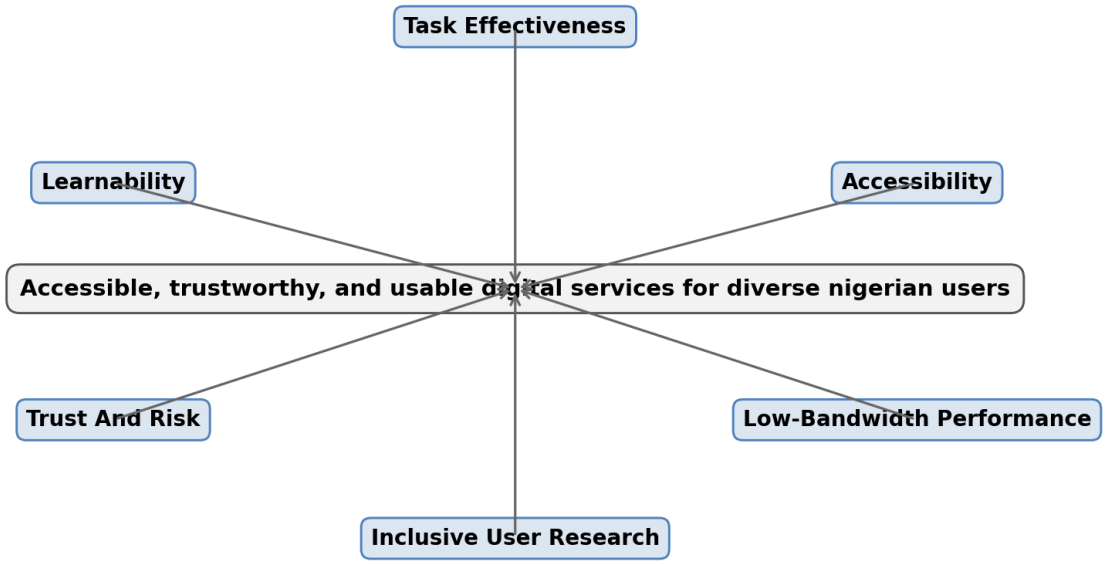

Figure 1. Integrated analytical framework

Figure 1 shows how effectiveness, learnability, accessibility, trust, connectivity, and user research jointly shape inclusive usability. Evidence from real tasks should feed back into interface design, support, risk controls, and performance requirements. The framework evaluates services across user groups and operating conditions. [127-130]

4.2 User barriers trust and recovery failures

Fintech tasks often carry immediate monetary consequences, while agritech tasks more often combine information, advisory, market, and transaction functions. Usability thresholds should reflect these different error costs. [131-134]

Learnability depends on task frequency. Infrequent seasonal agritech tasks require stronger recognition and guidance, while repeated payment tasks benefit from speed without sacrificing confirmation. [10,135,136]

Accessibility includes language, literacy, device constraints, and assistive technology. A visually simple interface may still exclude users when concepts, units, or instructions remain unfamiliar. [137-139]

Trust is shaped by visible control, confirmation, recovery, and recourse. Security cues alone do not compensate for unexplained failure or irreversible action. [11-13,44,140]

Low-bandwidth resilience requires transaction integrity, not only fast loading. The system must prevent duplicate submission, preserve state, and explain retry status. [14,141,142]

Inclusive research must sample users by task, capability, location, device, and risk exposure. Average satisfaction can conceal severe failures among vulnerable groups. [143-145]

4.3 Usability propositions and test conditions

P1: Error-recovery quality has a stronger effect on trust for high-consequence fintech tasks than for informational agritech tasks.

Validation of this proposition requires a defined unit of analysis and prespecified indicators. Researchers should report the proposed mechanism, competing explanations, subgroup results, and uncertainty. Core indicators include completion rate; error rate; recovery success. [53,146-149]

P2: Task infrequency strengthens the importance of recognition-based design and contextual guidance.

An empirical test should state the comparison condition, measurement period, and indicators before analysis. Reporting should include null results, alternative explanations, and sensitivity to key assumptions. Core indicators include time to proficiency; assistance requests; retention. [150-152]

P3: Language and conceptual accessibility mediate the effect of visual simplicity on task completion.

Researchers should test this relationship with transparent measures and a credible baseline. The analysis should distinguish the proposed pathway from confounding influences and report variation across relevant groups. Core indicators include assistive access; language coverage; readability. [153-155]

P4: Perceived control mediates the relationship between confirmation design and user trust.

Assessment should link the proposition to observable process and outcome measures. A defensible test reports effect size, uncertainty, adverse results, and the conditions under which the relationship weakens. Core indicators include abandonment; confirmation comprehension; perceived control. [57,156-159]

P5: State preservation moderates the effect of poor connectivity on successful task completion.

Prospective evaluation is preferable because it fixes the prediction, intervention, and outcome windows in advance. Results should include implementation fidelity, competing mechanisms, and sensitivity checks. Core indicators include offline completion; retry integrity; data consumption. [17,160-162]

P6: User-group diversity improves failure detection during formative usability testing.

Testing should combine quantitative outcomes with process evidence explaining how the proposed relationship operated. Replication across settings is needed before treating the proposition as general. Core indicators include user-group coverage; severity of uncovered failures. [53,146-149]

4.4 Inclusive design and field evaluation

Table 3. Staged implementation and evaluation pathway

Stage	Required action	Decision output
1 Diagnose	Define decision, unit, baseline, users, and failure costs	Approved problem statement and baseline
2 Govern	Assign owners, definitions, access, review, and escalation	Accountable operating design
3 Prepare	Assess data quality, workflow fit, capacity, and safeguards	Readiness evidence and test plan
4 Pilot	Test normal cases, edge cases, subgroup effects, and failure recovery	Pilot results with uncertainty
5 Scale	Expand only when reliability, usability, equity, and workload thresholds are met	Controlled implementation
6 Learn	Monitor outcomes, drift, exceptions, complaints, and corrective action	Revised rules and sustained learning

Design begins with task and user research under realistic constraints. Teams then prototype the critical flow, test accessibility and low-bandwidth behavior, revise risk communication, and repeat field evaluation. Release decisions should depend on successful completion and safe recovery across user groups.

5 Conclusion for Inclusive Application Design

This comparative usability review developed a task-and-risk comparative framework for evaluating usability across fintech and agritech applications. Its central finding is that safe, accessible, and usable digital services depends on the interaction of task effectiveness, learnability, accessibility, trust and perceived risk, low-bandwidth resilience, inclusive user research, rather than on one tool, metric, or control.

The paper frames inclusive usability as the interaction of task success, learning effort, accessibility, trust, connectivity, and representative user evidence. Its evaluation questions support direct comparison across user groups and reveal where aggregate usability scores conceal exclusion.

Product teams should select a consequential task and test it with users who reflect expected language, literacy, disability, device, and connectivity conditions. Pilots should measure errors, abandonment, recovery, time, confidence, and support use before broader release.

The review compares design mechanisms rather than products. Empirical validation should use matched tasks, representative users, device conditions, and consequence-sensitive measures. Future research should test the propositions prospectively, compare alternative specifications, report null and adverse outcomes, and examine whether benefits persist after initial implementation.

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