Road Signs for Digital Payments

Designing an OIM Version of GNU Taler in Freetown, Sierra Leone

Stage 2 Research and Usability Testing

| Glossary and Definitions

FGD – Focus group discussion

Indo-Arabic notation – the standard symbolic system for writing numbers (e.g., 4,650)

MOVE – My Oral Village – the Canadian project leaders.

NSW – New Salone Woman – the contracted implementing partner for field work in Sierra Leone

'Numerate' - able to read a 4-digit ordinal number

'Semi-numerate' - able to read a 2-digit ordinal number

'Innumerate' - unable to read a 2-digit ordinal number

OIM – oral information management

SUS – System Usability Scale

Oral Information Management (OIM)
Generically, the ways in which people store, retrieve and share vital information without text. Specifically for this project, the ways in which our team

Financial Numeracy
The numeracy skills required to conduct financial transactions with understanding, in real time, without help from a third person.

Space/Timing Mapping
The methods of mapping time onto space that are characteristic of literate culture (clocks, calendars, etc) are learned in school, and as an empirical fact, are not familiar to, or used by, most unschooled adults.

| Acknowledgements

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You have all been essential for our progress to date, and we owe you our heartfelt gratitude.

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SECTION 1:

Background

Project Overview

The Road Signs for Digital Payments project is aimed at creating safe, usable financial interfaces for poorly-schooled adults.

Project Goal:
To develop a system for financial transactions and mobile money using GNU Taler, a FOSS payment that does not depend on literacy (analogous to Europe's iconographic road signs).

Project Implementation:

- Leveraging OIM to test "road signs" for mobile money in Sierra Leone
- The project has 3 different phases – with the first phase completed in May 2025, and the second phase coming to an end in August 2026.
- Includes conducting focus group discussions, design, and usability testing

Project Partners

Organization	Roles
My Oral Village (Canada)	Lead the OIM research and innovation processes, design and develop field research tools and iterative design processes
Taler Systems (Luxembourg)	Advise on all relevant aspects of GNU Taler, prepare and refine software builds, test OIM frontiers for smartphones
New Salone Woman Organisation (Sierra Leone)	Community engagement and participant recruitment, and guided focus group facilitation and field usability testing
New Salone Design Company	Co-develop icons, illustrations, layouts and interface designs.

Project Evolution

STAGE 1

MAY 2025

- Orienting participants on OIM Taler App
- Initial design of currency icons
- Testing focused on currency recognition, counting money, balance display, transaction type and payment purpose

STAGE 2

JUNE 2026

- Design of 3 different, unique features (account history, merchant payment, sandbox)
- Usability testing of different tasks under each of the features

STAGE 3

TBD

- FGDs for error messages, bank account set-up
- Testing of new and revised features

Objectives of Stage 2

STAGE

2 **Objectives**

The objectives of Stage 2 were to:

- Design icons and interfaces for 3 new features
- Evaluate the usability of newly developed features
- Identify areas where users experienced confusion
- Measure task completion success
- Generate recommendations for future interface improvements

A New OIM Frontier

OIM has developed a long way since My Oral Village first started testing icons written numeracy skills. Transitioning from paper-based OIM to digital presents many opportunities, and a few challenges that are less familiar. However, the essential design frontier presented by Roadsigns was revealed in Stage 1 by the ways in which mobile money enables users to quickly and easily access transaction details over many months and years in the past.

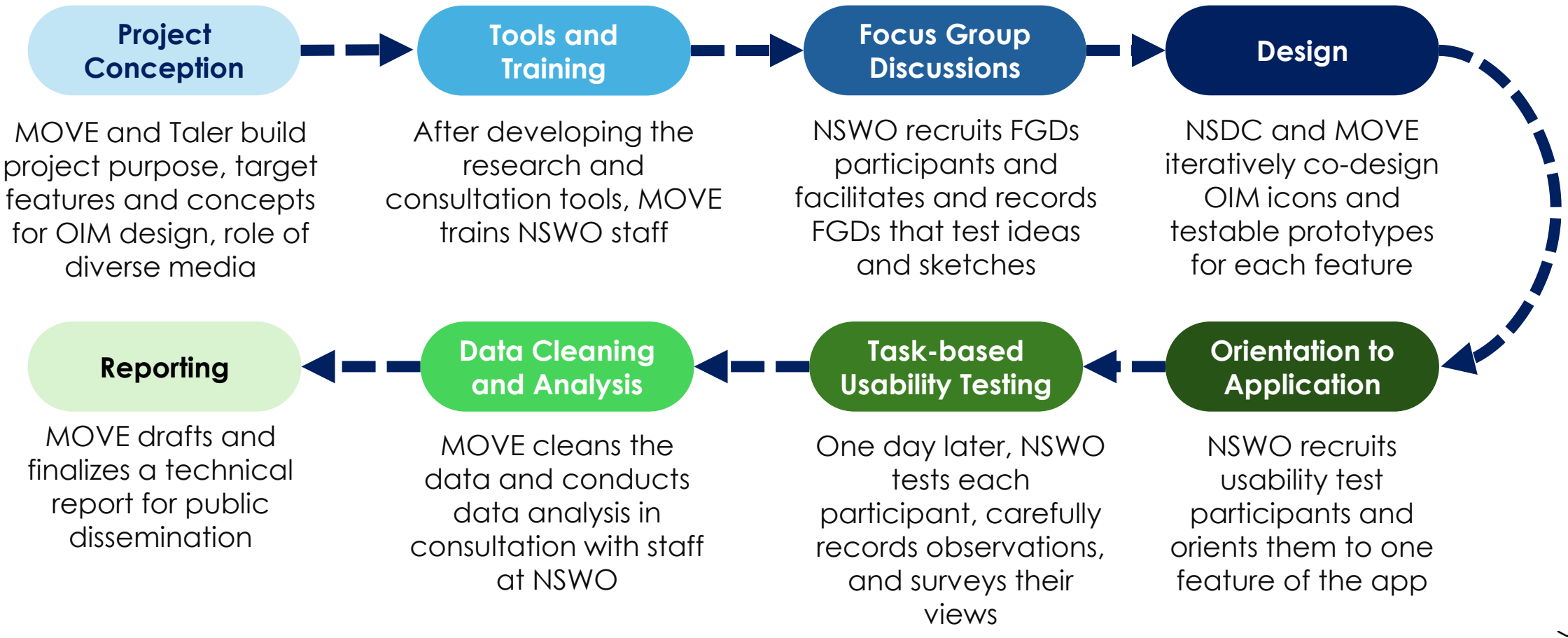
The **mapping of time into space** is central to usability in any digital account history feature, and depends on a level of schooled, abstract knowledge of a cluster of tools for such mapping that are deeply unfamiliar to unschooled and poorly-schooled adults. The concept of mapping time onto space is intuitive to our species and has an ancient archeological history. However, the tabular format that underlies the modern abstract calendar, the numeric date format (xx/yy/2026) enabling history search, and the alphabet encoding the names of counterparties and transaction types are all products of a highly literate culture, and not usually learned in the absence of schooling.

As a result, an important goal of Stage 2 has been to craft a time > space mapping that is intuitive and easily learned.

SECTION 2:

Methodology

Stage 2 Methodology



OIM Design

This phase of the project focused on three features of the GNU Taler payment app: account history, merchant payment and the learner 'sandbox', where potential users who are not yet comfortable with the interface can explore it without risking loss of money.

- My Oral Village collaborated with New Salone Woman to sketch concepts.
- Canva whiteboards were shared for each feature, and various draft sketched prepared and iterated.
- Where there were gaps in the team's knowledge, lines of inquiry were channeled into focus group discussions and individual interviews with members of the oral segment. Accompanied by a skilled sketch artist, the team found and qualified FGD participants.
- Draft interface designs were shared with FGDs when this could further aid team insight.
- Following the FGDs, the team reflected on learnings and brought these back to collaboration on the Canva designs before beginning the usability testing process.
- MOVE programmed an 'OIM digital design system' for Claude Design, then vibe coded testable applets for account history and learner sandbox. NSW prepared a paper-based testing proxy for the merchant payment feature.

Usability Testing

To test usability, a prototype of each of the three features (account history, merchant payment, learner sandbox) was prepared.

- The team then drafted a line of inquiry to explore how quickly and easily key components of each feature could be learned.
- From the line of inquiry, a list of 6-10 tasks for each feature was debated and finalized to check learning outcomes.
- Once the testing materials were ready, NSW visited fresh communities in Waterloo, a satellite town outside of Freetown, and qualified individuals for participation.
- Eight qualified participants received a 15-minute orientation on each feature on Saturday.
- On Sunday, keeping a minimum 24 hour interval from orientation, they were tested on their recall by being asked to perform the pre-planned tasks.
- One team member conducted the testing, while a second took careful notes on how participants responded, and where they found tasks relatively easy or hard.

Limitations

Findings are based on 24 participants recruited purposively in three communities, with eight testing each interface.

- Participants tested one interface only, so comparisons between interfaces are between-subjects.
- Two testing interfaces were digital, shared with participants on a tablet, while one (Merchant Payment) used a paper medium.
- The subgroup analyses in Section 7 are exploratory, not statistically significant.
- Self-report instruments, including the System Usability Scale (SUS), were administered orally to participants with no formal schooling and may be subject to acquiescence bias.

SECTION 3:

Focus Group Discussions

Focus Group Discussions

In June 2026, focus group discussions (FGDs) were held in 2 communities in Freetown and 2 communities in Lungi. Participants of the FGDs were asked to complete a diagnostic qualifier to determine their numeracy levels.

The objectives of the FGDs, conducted with qualified respondents, were to:

(1) Gather more information and understanding on how the women interact with financial transactions in the daily lives

(2) Gain insights on design features for icons and refine existing icons to develop user interfaces for each of the different features.

Two FDGs were held for the Sandbox interface, and one FDG each for the Account History and Merchant Payment interfaces.

Community Descriptions:

Congo Town (Freetown): A residential and commercial neighbourhood in Western Freetown

Bololo (Freetown): A densely populated, low-income community

Suctar (Lungi): A peri-urban community near airport, with residents engaging in small-scale trading, fishing

Kamasondo Town (Lungi): Rural community; subsistence agriculture and small-scale trading

What is the Diagnostic Qualifier?
Participants were asked to read a series of 12 ordinal numbers, ranging from 1-4 digits in length.

'Numerate' = able to read a 4-digit ordinal number
'Semi-numerate' = able to read a 2-digit ordinal number
'Innumerate' = unable to read a 2-digit ordinal number

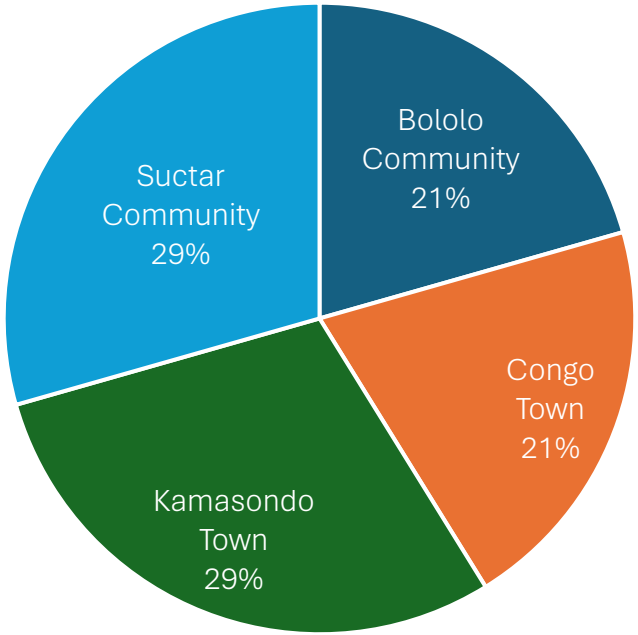
Numerate respondents were disqualified from the FGD.

Focus Group Discussions (cont'd)

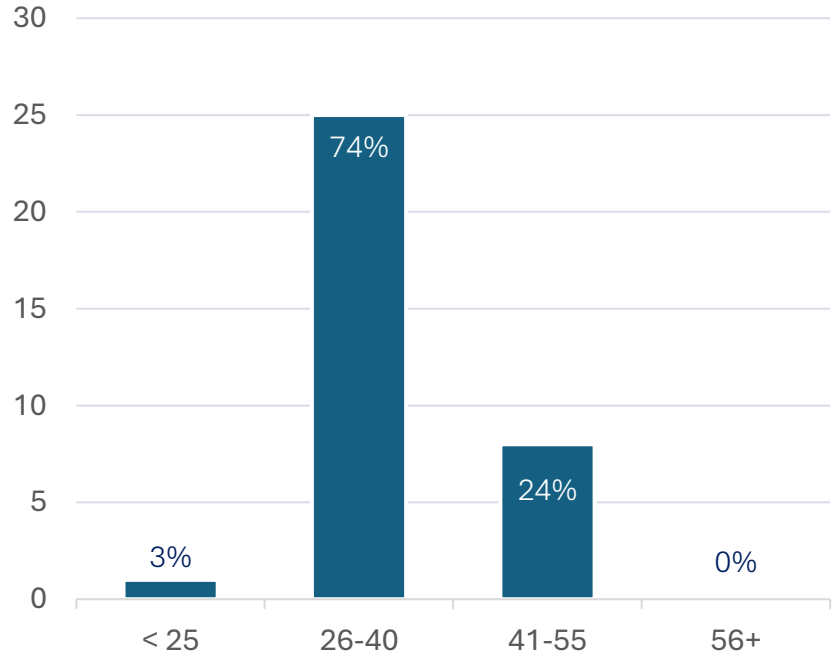
A total of **34 women** across four FGDs participated in four different communities across Sierra Leone. All participants spoke Krio with 76% also speaking Temne. To ensure consistency and accessibility, all discussions were conducted in Krio.

Nearly three-quarters of participants (74%) were between 26 and 40 years of age, representing the primary economically active population, and a key target group for leveraging digital financial services.

Geographic Distribution (n=34)



Age Range (n=34)

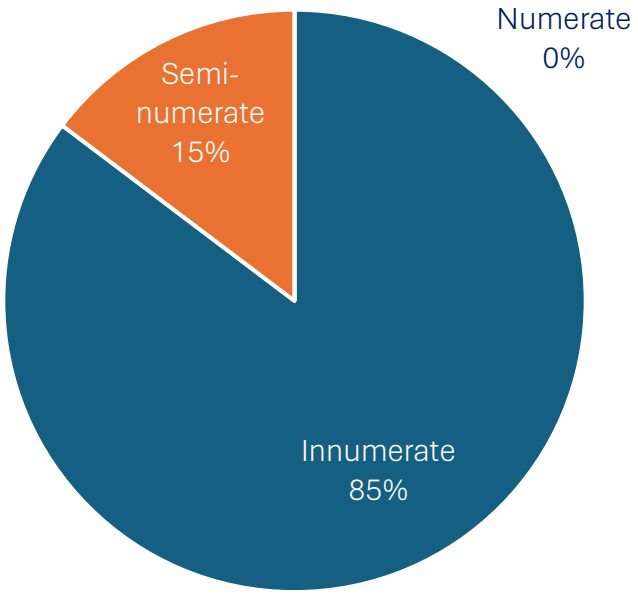


Focus Group Discussions (cont'd)

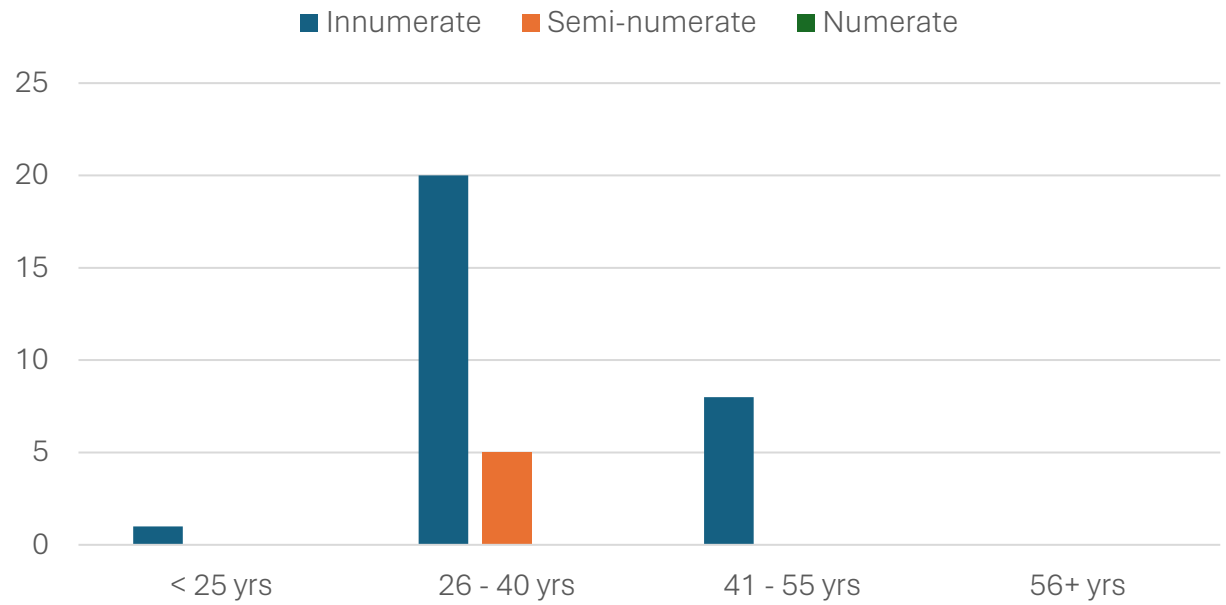
Baseline diagnostic testing confirmed very low numeracy levels among participants. Overall, **85% were classified as "innumerate"** (unable to read 2-digit numbers), and none demonstrated full numeracy by successfully reading four-digit numbers.

This pattern was observed across all represented age groups, reinforcing the need for financial interfaces that do not rely on conventional text or numerical representations.

Numeracy Level (Diagnostic) (n=34)



Numeracy Levels by Age Category (n=34)



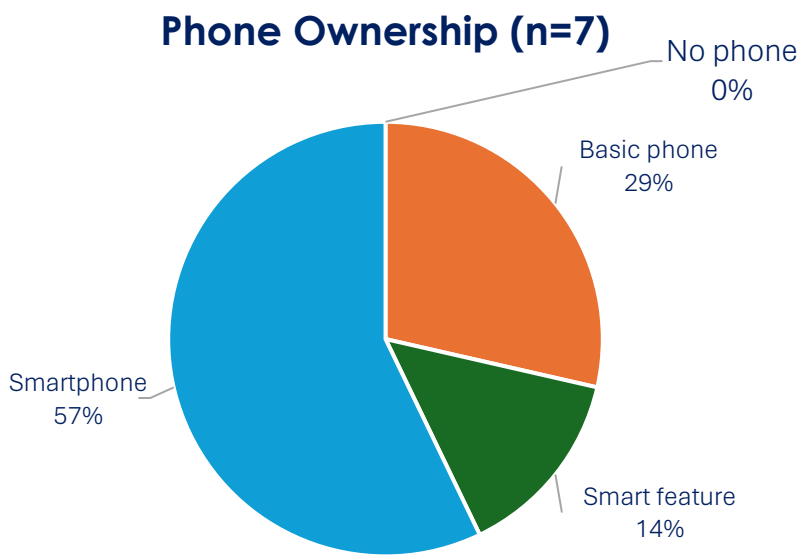

Account history FGD, Lungi

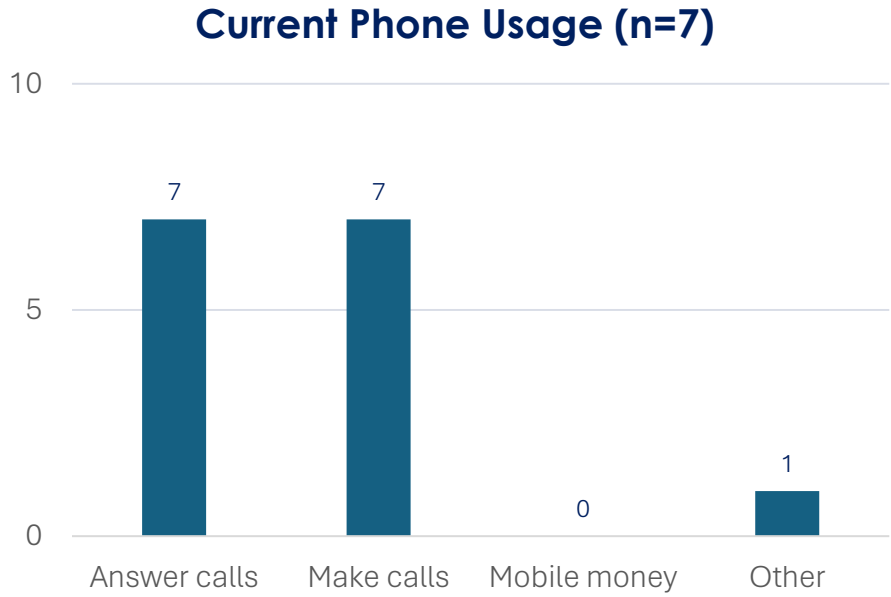
| FGD Takeaways: Account History

A FGD of 7 women in the Suctar Community was held to identify key themes and insights on how women use money and identify and understand transactions.

While all participants had a phone, and 4 out of 7 had a smartphone, phones were primarily used for answering and making calls. Other features, like address books, calendars and calculators, were not used.

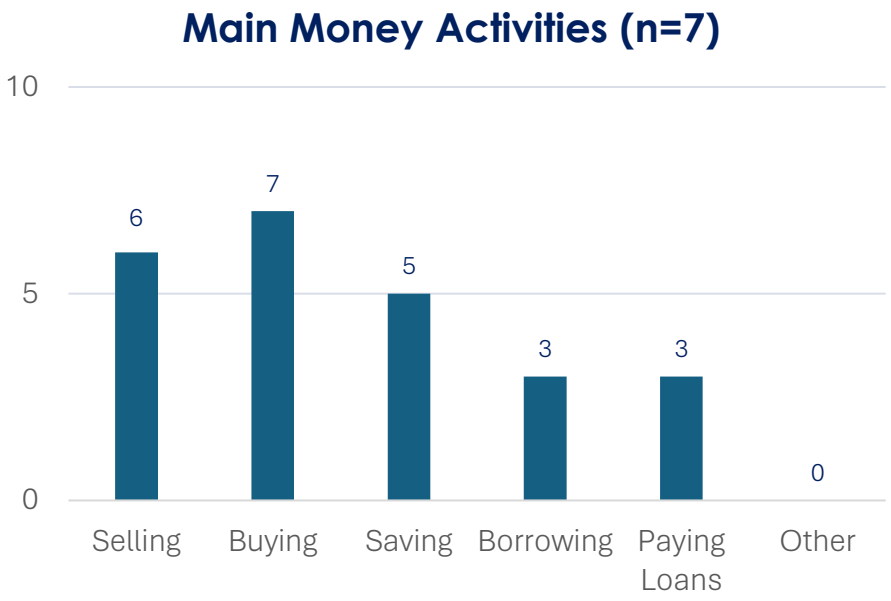
Phone Ownership & Usage:

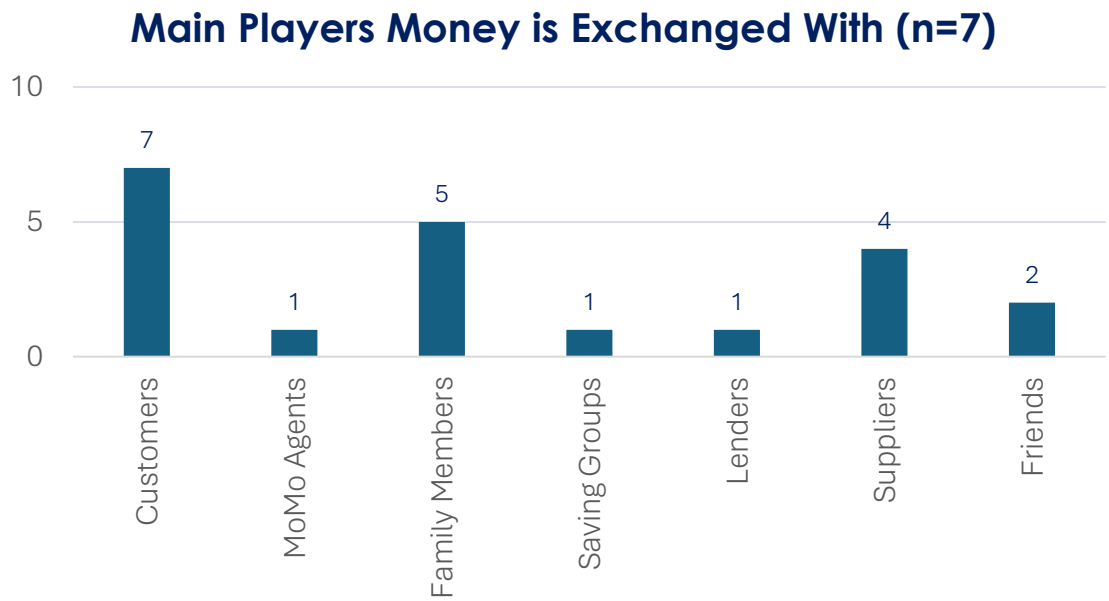




| FGD Takeaways: Account History

Using Money:





Participants were engaged in a various money transacting activities, primarily related to their business (e.g., selling, buying) and savings.

Only 1 participant used mobile money but mentioned that someone helps her make transactions (e.g., send/receive) through mobile money, and having to go to an agent is the hardest part of this experience.

| FGD Takeaways: Account History

Key themes from Account History FGD:

How participants organize financial transactions

- All 7 participants mentally earmark money into purpose-based buckets like savings, market revenue, transportation costs, household costs, etc.)
- One participant explicitly described transactions through **"the people and purpose of each money movement"**
- Financial activity is organized around purpose not just around when the transaction occurred

How participants understand and conceptualize time

- Time is not a numerical concept but is understood through lived experiences
- 4 out of 7 of individuals described time as the changing of a day (e.g., sunrise, sky changing)
- 1 participant mentioned that time is like a river, always flowing

How participants remember transactions over time

- Recency was important in remembering transactions (e.g., can remember yesterday's transactions because it was fresh in their mind)
- Older transactions are remembered through contextual events (e.g., market days, purpose, counterparties)
- 5 of 7 women preferred seeing today's transaction **above** last month's on a vertical mapping

Accessible interface design for low-literacy users

- Visual and audio communication is strongly preferred as 6 of 7 participants mentioned photo and/or voice as an important design feature
- A few participants mentioned, colour, having local language and familiar imagery of farming, market, trading as distinct features to help understand


Merchant Payment FGD, Lung

| FGD Takeaways: Merchant Payment

A FGD of 7 women in the Kamasondo Town was held to identify their experiences with transactions, making payments and using money.

The most important goal of this FGD was to evaluate familiarity or comfort with the general process for making or receiving mobile payments. Another goal was to identify some key features that identify sellers, merchants, and transaction confirmation.

When paying for something, 6 of the 7 participants claimed that having the purpose for the payment first is helpful. 5 out of the 7 women also mentioned they normally keep their money in their bag or purse before needing to use it.

General transaction process as per participants:

Price discovery & agreement

Participants first ask for the price and agree on an amount

Check available money

3 participants noted they check how much money they have before paying

Money exchange

Money is given to the seller; buyer receives it

Verification of amount

5 participants confirmed they count and verify the money once given

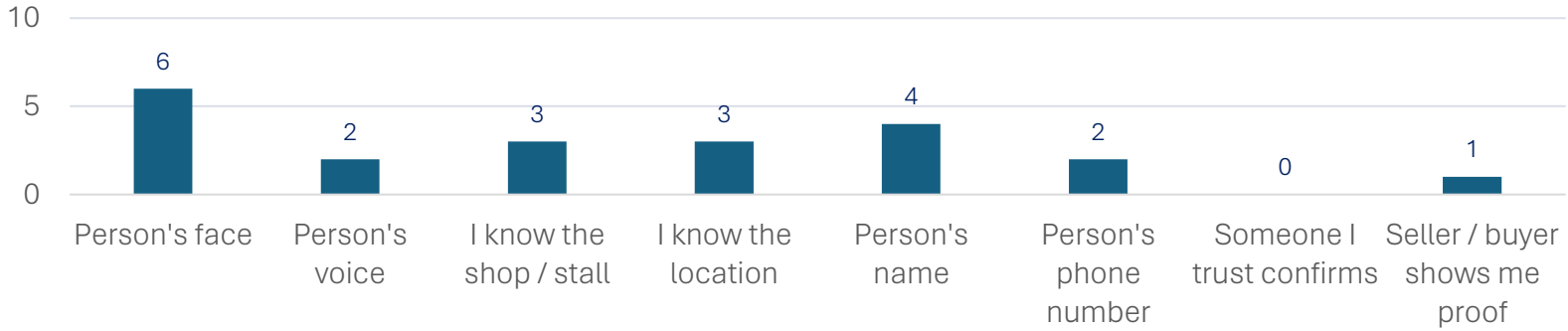
Confirmation of completion

Majority of participants knew the transaction was completed when they received / gave the goods

| FGD Takeaways: Merchant Payment

When making a transaction / payment, trust was established through familiar, observable cues. For example, 6 out of the 7 participants relied on recognizing the person's face, 5 of 7 relied on inspecting the goods the seller sells. Very few rely on formal verifications such as phone numbers or proof of identity.

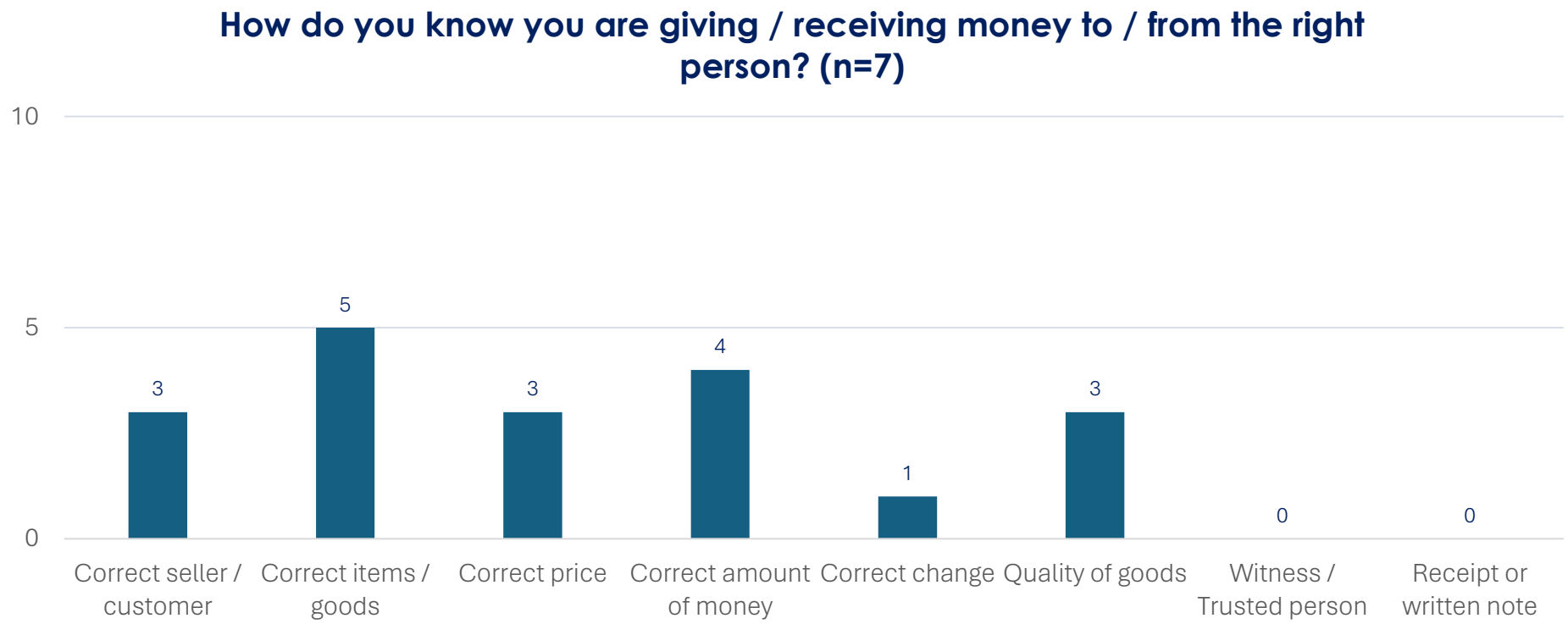
How do you know you are giving / receiving money to / from the right person? (n=7)



When paying a seller, what helps you know this is the correct seller / business? (n=7)

| FGD Takeaways: Merchant Payment

Payment is also verified on the transaction itself. When asked about what they check before making a payment, 5 of 7 individuals checked the items/goods purchased, and 4 of 7 checked the amount of money.



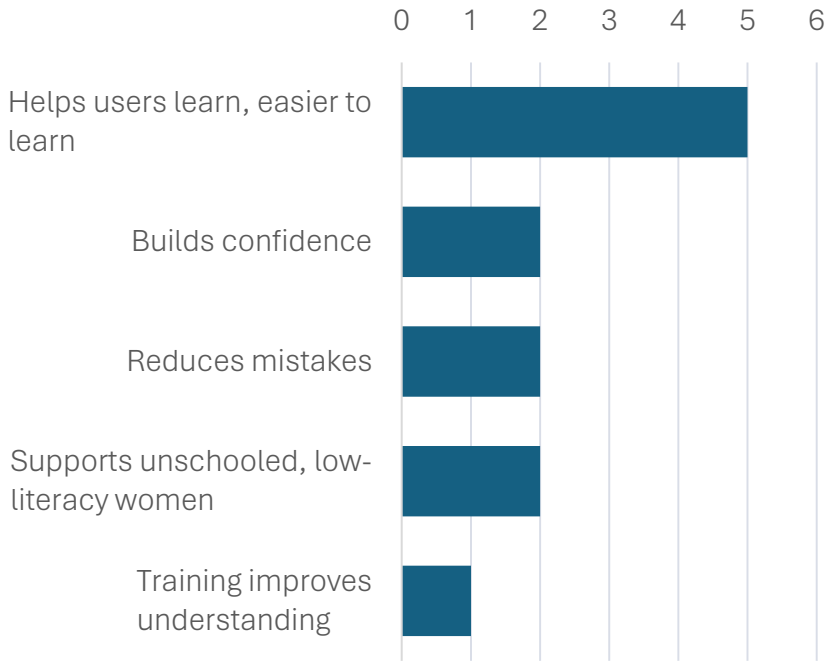

Sandbox FGD, Bololo

| FGD Takeaways: Sandbox (1)

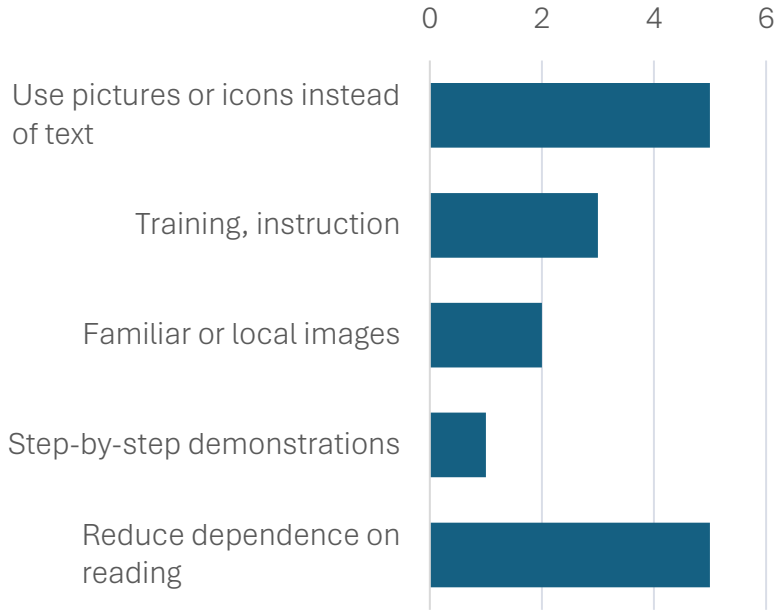
An initial FGD was held with 7 women in the Congo Town community. The purpose of this FGD was to gather insights on the importance of a Sandbox and how sample icons should be developed.

All 7 participants believed a practice environment would help them learn to use mobile money safely before making real transactions. 5 of 7 respondents believed that pictures or icons would help them to learn mobile money more safely, and that there should be less emphasis on text in mobile money.

Why is the Sandbox Useful? (n=7)

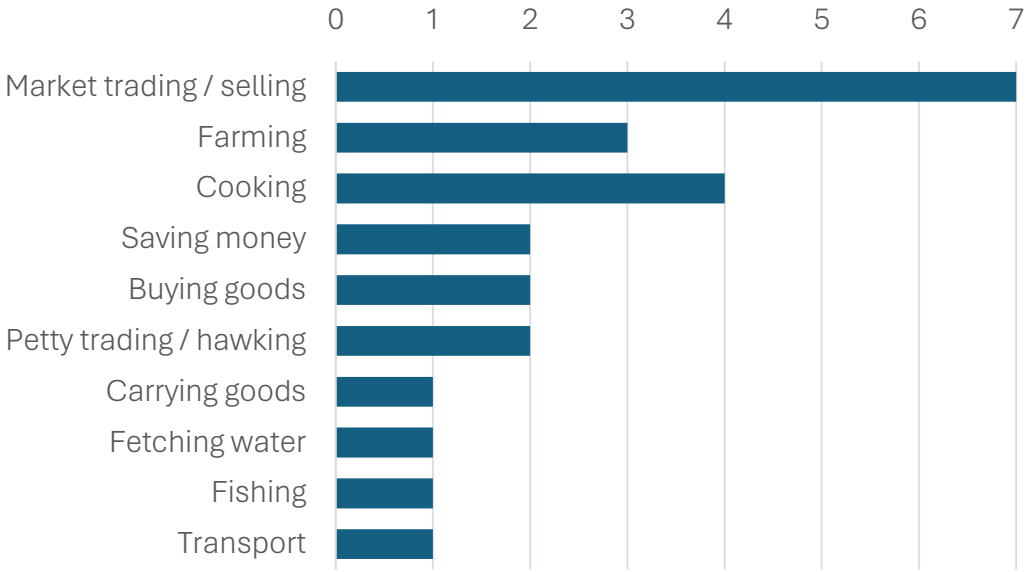


What Would Help Women Learn Mobile Money More Safely? (n=7)



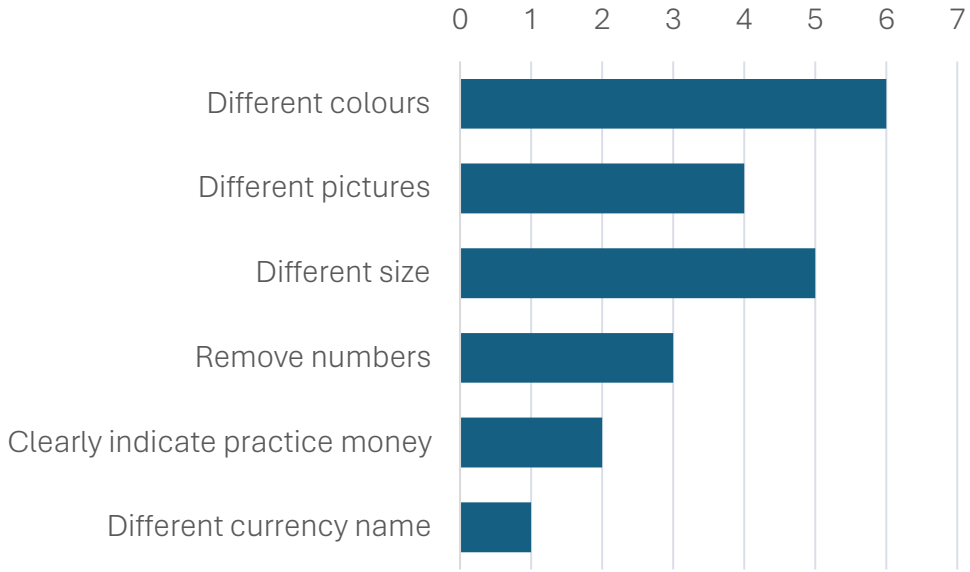
| FGD Takeaways: Sandbox (1)

What Everyday Activities Should Be Shown? (n=7)



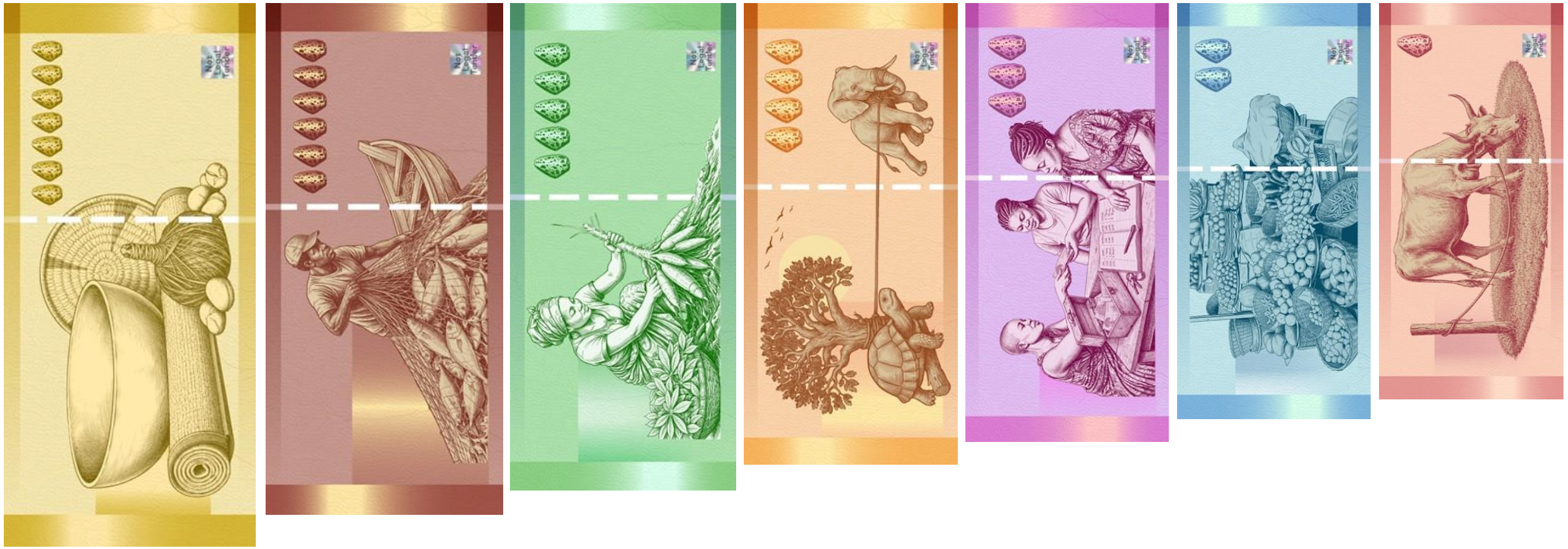
Design Implication: The interface should depict everyday economic activities, particularly market trading, which was universally recognized by participants.

How Should Practice Money Be Different From Real Money? (n=7)



Design Implication: Practice currency should be visually distinct from real Leone notes while remaining intuitive and easy to recognize.

| FGD Takeaways: Sandbox (2)



Sandbox currency co-designed by NSDC and MOVE after first FGD consultation.

| FGD Takeaways: Sandbox (3)

A follow-up FGD was held in Bololo Community, Freetown to test the validate different uses of "play money" and the Sandbox. Participants were shown paper versions of the newly designed currency units to assess understandability and

All 7 participants were able to successful arrange the coins from smallest value to the largest value and attributed to the size of the coin as the reason they were able to do so.

6 of 7 participants correctly arranged the notes from the smallest value to the largest. They were able to do so because they counted the number of stones on the notes.

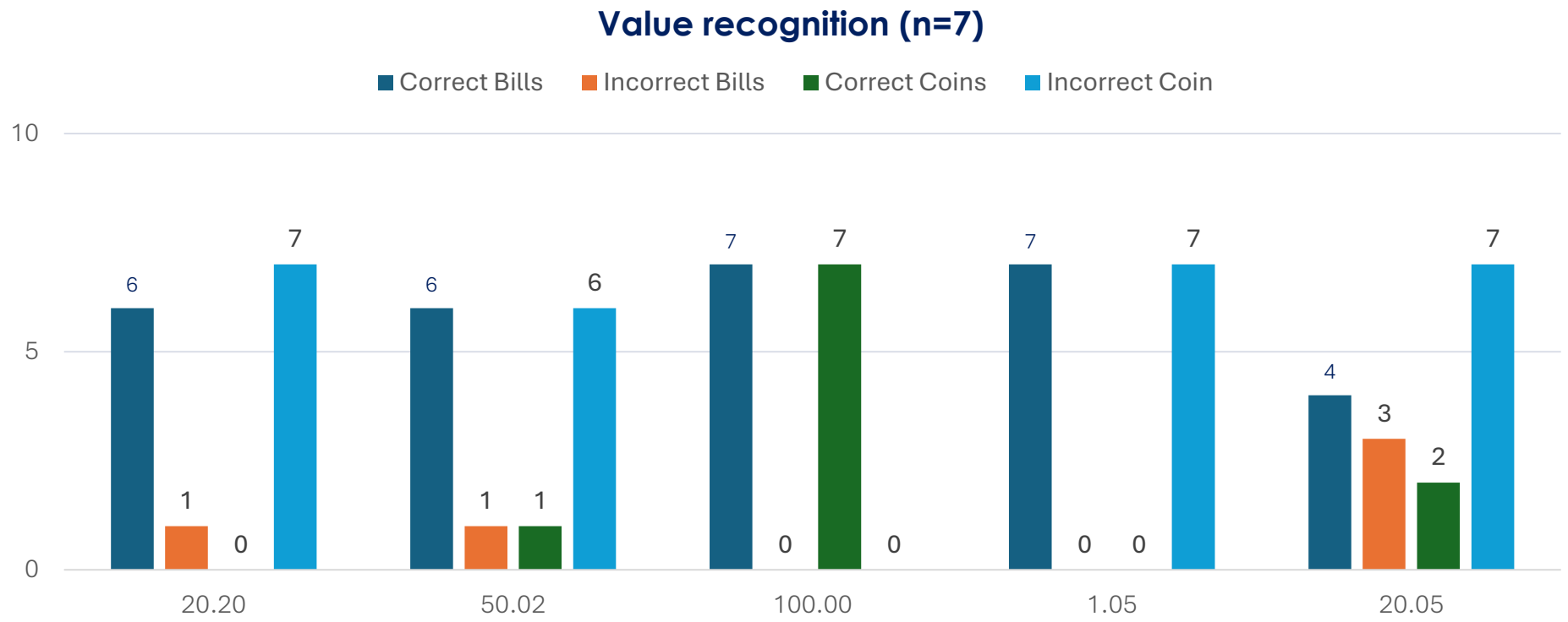
Majority of **participants (6 of 7) also use colours as a distinguishing factor to identify notes and** determined that the colours of the play money should be different from real money. The facilitator also noted that colour was the most common reason for confusion for 3 of the participants.

Feedback from the facilitator also noted that the size of the currency items, and number of stones on them, were the most common reasons for correct responses across 6 of the 7 participants.

| FGD Takeaways: Sandbox (4)

Value Recognition

Participants were given an economic value, such as 20 leones and 20 cents, and asked to select the correct bills and coins from the paper samples. While most could correctly identify the bills, they struggled to identify the coins accurately. Common mistakes were 0.01 vs 0.10 or 0.05 and 0.50.



SECTION 4:

Usability Testing

Participant Profile

A sample of 24 women was surveyed before and after usability testing on July 24-25, 2026. Sampling was done between 3 communities, one in Songo (Port Loko) and two in Waterloo.

Community Descriptions:

Songo (Port Loko):

A rural interior town located in Port Loko District where agriculture, petty trading, and small-scale commerce are primary sources of livelihoods. Relative access to peninsula roads and major transport routes, but still face constraints to accessing financial services, education, healthcare, etc.

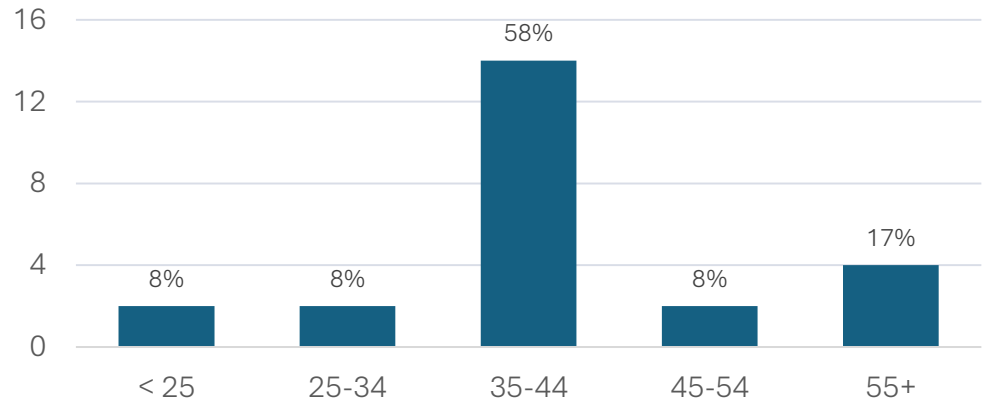
Benguma (Waterloo):

Rapidly growing peri-urban community on the outskirts of Freetown in the Western Area Rural District. Home to diverse population engaged in small businesses, agriculture, and informal employment.

Key Demographic Data:

- All 24 spoke Krio while 13 also spoke Temne. These were the most common household languages in the sample.
- All women were economically active.
- Most (14) were between 35-44 years old.
- Participants had zero years of formal education, and demonstrated low levels of numeracy
- 23 of 24 women in the sample were very small traders

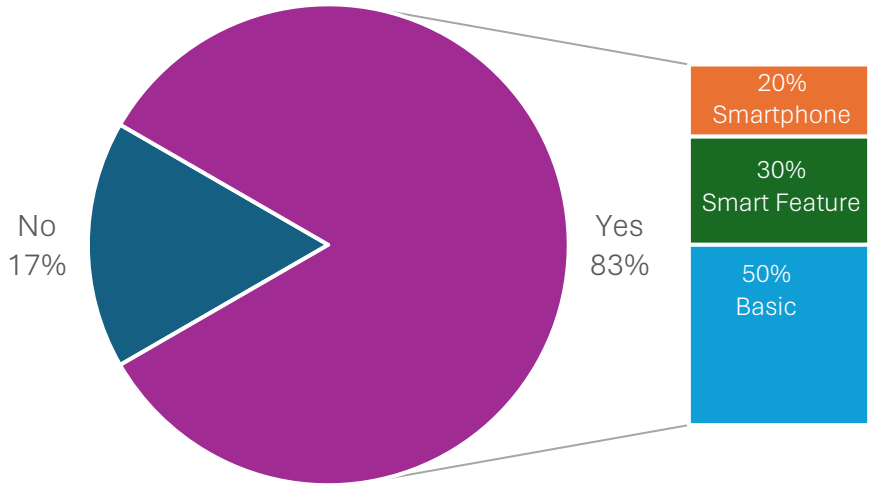
Sample by Age Range (n=24)



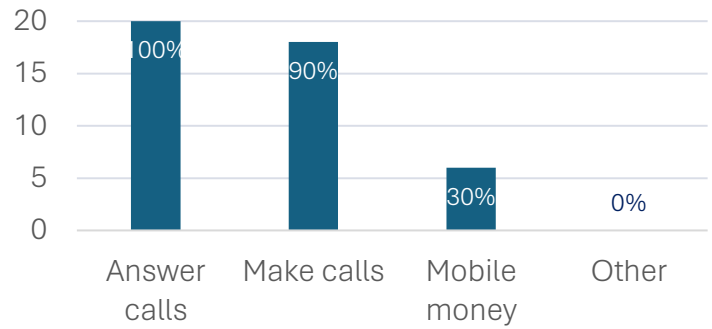
| Digital Skills Profile

While 20 out of 24 participants were phone owners, most uses basic feature phones and only 5 owned smartphones. This hardware constraint inherently restricts users to USSD/SMS operations and voice calls rather than any app-based digital interfaces.

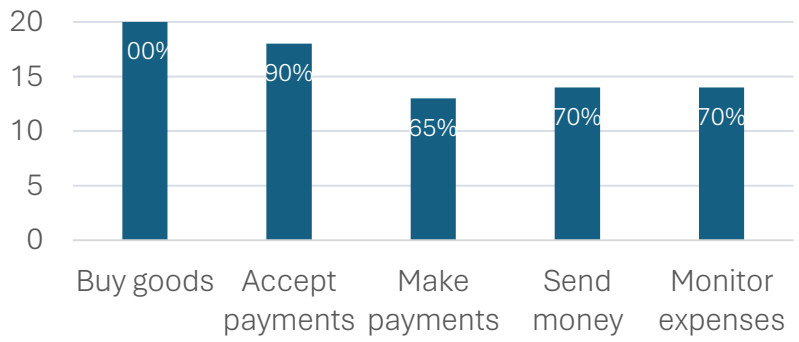
Phone Ownership (n=24)



Current Phone Usage (n=20)



Desired Use of Mobile Money (n=20)



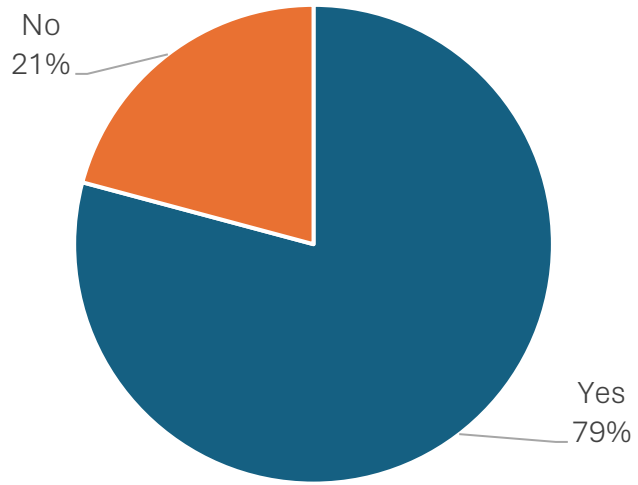
- **Basic Functional Literacy over Digital Fluency** – Current usage is dominated by essential communication (e.g., answering and making calls), while only 7 use phones for mobile money.
- **High Interest in Merchant & Financial** Capabilities – despite low digital payment activity, there is high interest in mobile money, especially to make transactions.

Numeracy Skills Profile

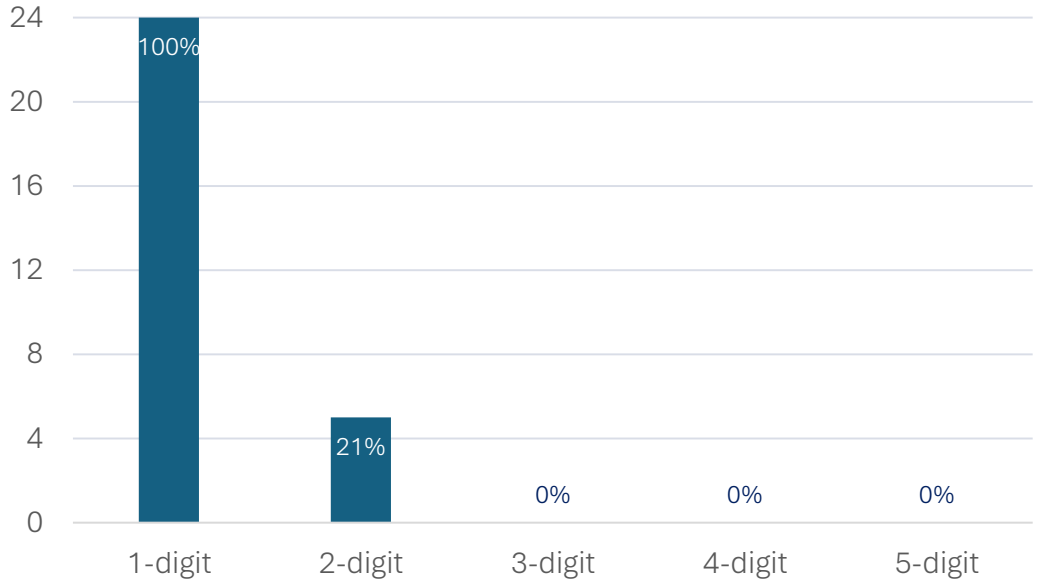
Participants were asked to read a series of 12 ordinal numbers, ranging from 1-4 digits in length.
'Numerate' = able to read a 4-digit ordinal number
'Semi-numerate' = able to read a 2-digit ordinal number
'Innumerate' = unable to read a 2-digit ordinal number

Numerate respondents were disqualified by testing protocol. In practice, all participants were classified as 'innumerate'.

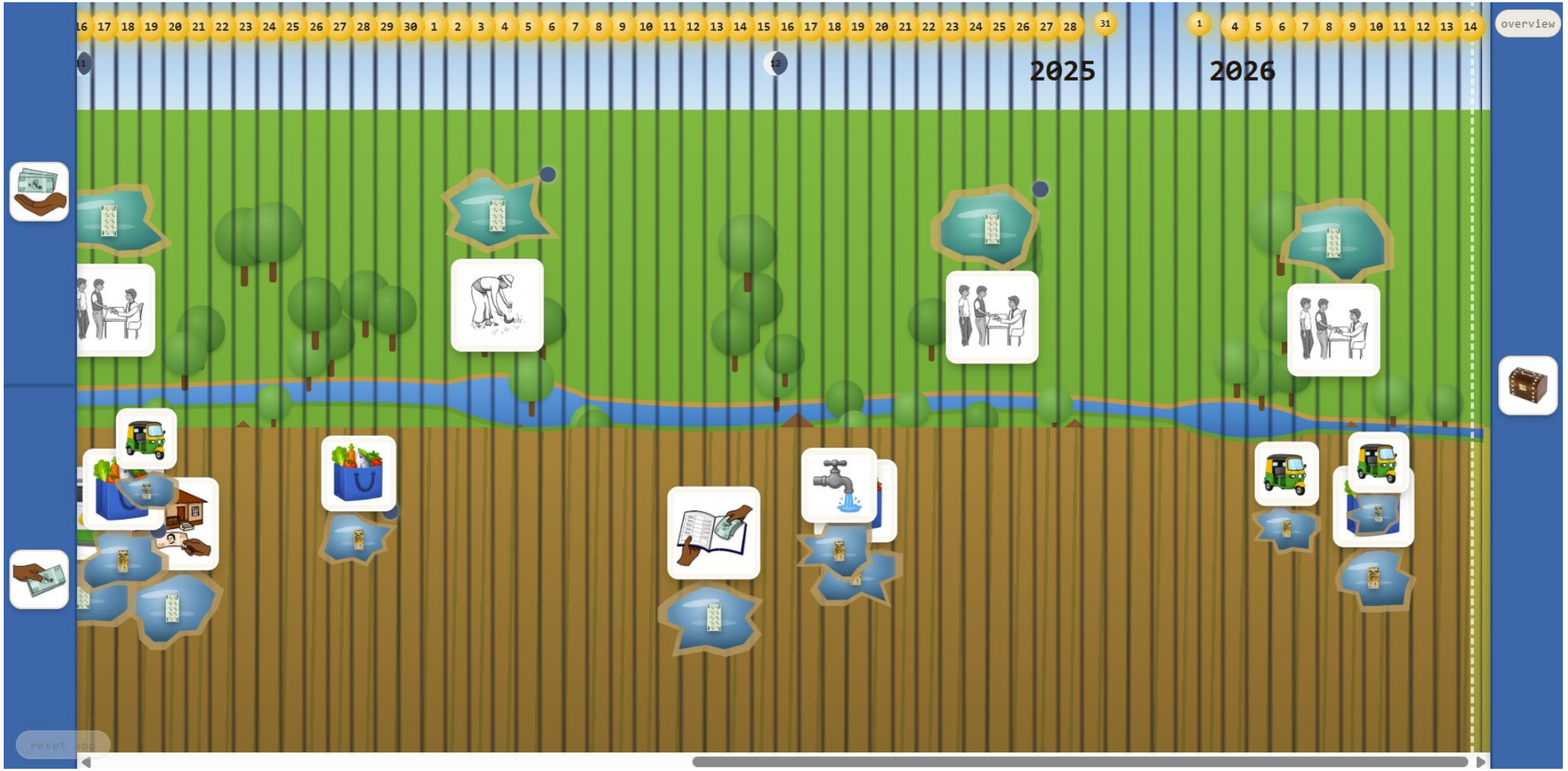
Ability to read all numbers from 0-9 (n=24)



Ability to read multi-digit numbers (n=24)



| Account History (https://myoralvillage.org/roadsigns/history1-v22/index.html)



| Account History (2)

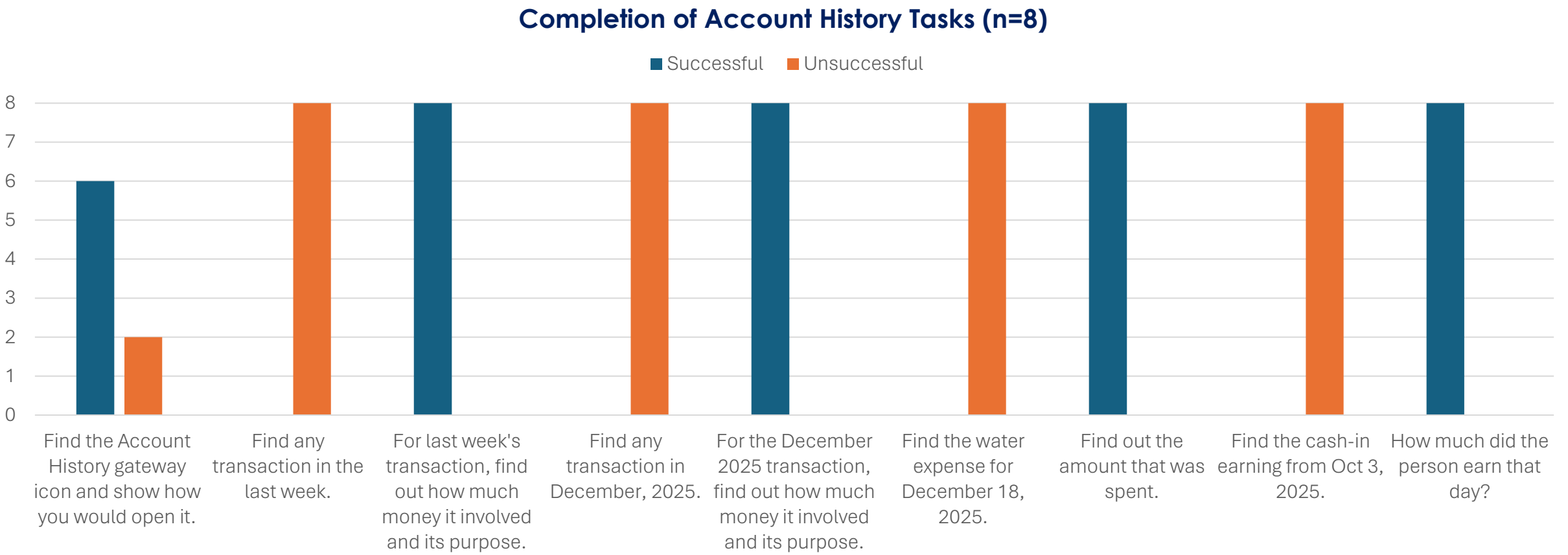
Prototype Description

Because unschooled adults have not learned formal or abstract methods of mapping time onto space, such as those utilized in calendars and clocks, the mapping is kept free of literate abstractions.

- The present is at the far right of the interface, where the user's savings box is located;
- the horizontal axis on top shows the passage of numbered days, with the left in the past;
- as the transaction history lengthens, months (moons) and then years (stars) are added, but the basic initial page will always represent a much shorter period, measured in days;
- the only numbers on the top axis will be 1-2-digit numbers (either familiar already or aspirational for unschooled users) and year numbers (fixed and often seen in daily life);
- to reach an earlier time before the opening screen, the user scrolls right, bringing earlier times into view;
- the left-side vertical axis shows that cash-in activities (e.g. income) are located above the river, while cash-out activities (e.g. groceries) are located below the river;
- to find a transaction, a user can access four cues:
    - cash-in vs. cash-out;
    - counting the days backwards (or reading off the numbers, if able);
    - icon for the purpose of the transaction (groceries, school fees, remittance etc); and
    - Relative size of the body of water – the larger the area the larger the transaction.

| Account History (3)

Usability testing was done with 8 women in the Waterloo area, and all participants were given a clickable, digital prototype.



| Account History (4)

Feedback & Observations:

Participant Feedback	
What part felt the easiest?	• All participants noted that reading amounts and identifying the purpose of the transactions was simple and easy to understand. • Easy to understand that money-in was at the top, money-out was at the bottom, and size of lake represented value. • Familiar note and purpose images were clear.
What part felt the most difficult?	• Finding transactions by week, month, or exact date. • All participants mentioned that there was a lot going on and could not connect the date markers to specific transactions.
How can the task be made easier?	• Making the division between month/year clearer, stronger date markers and less visual crowding.

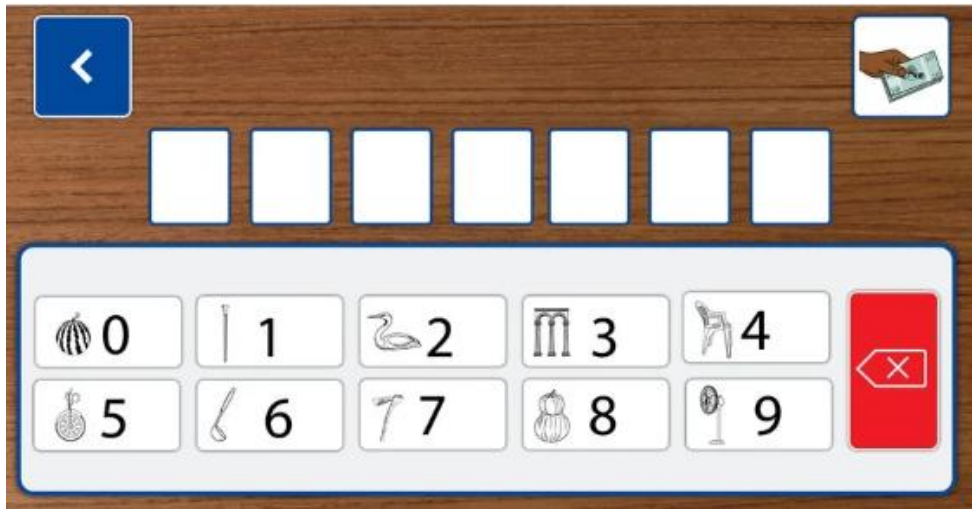
Facilitator Feedback – Top 3 Findings
• Majority of participants recognized the gateway icon, with 3 of them needed some repeat instructions.
• All participants were able to understand money-in/out placement, time direction, lake size, amounts and purpose icons with little or no help.
• The biggest challenge was the visual density; all participants were unable to locate specific dates after 3 attempts.

| Account History (5)

Feedback & Observations:

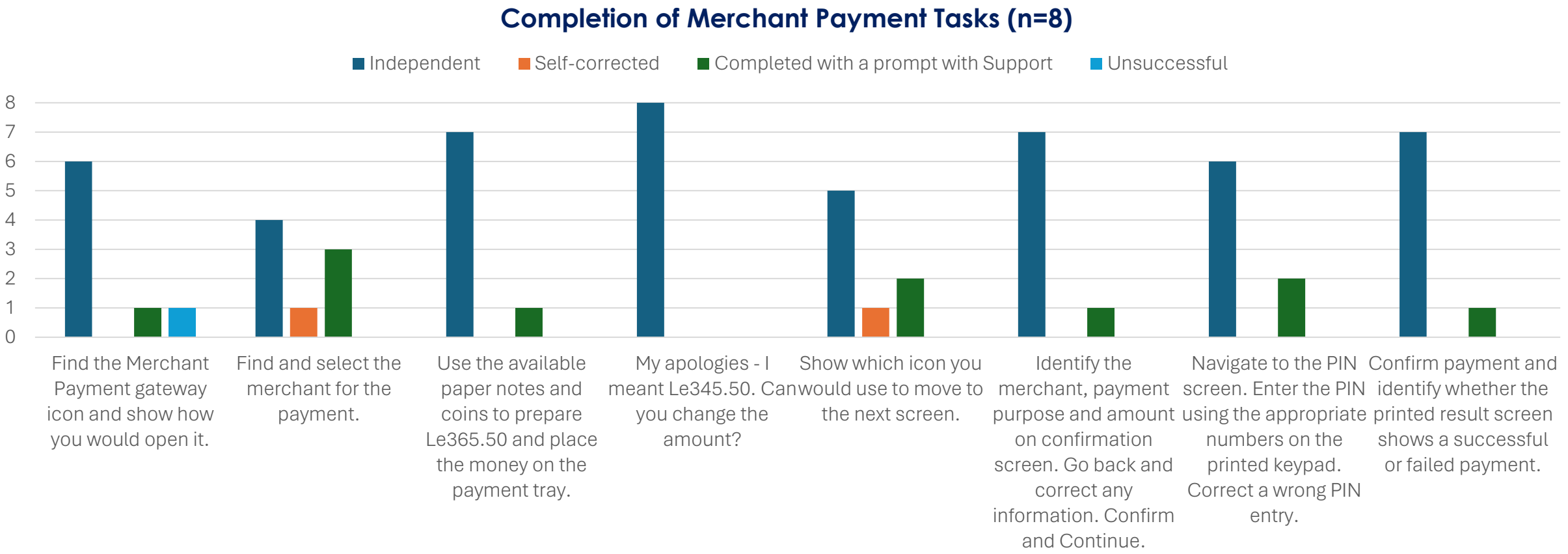
Observer Feedback	
Gateway Icon	• Most participants were able to correctly identify the account history gateway icon on their first time without any difficulty or assistance. • Two participants felt the icon did not clearly community its purpose to them.
Identifying Past Transactions	• Users were able to scan through the recent / past transactions 3 or more times but still were unable to identify last week's transactions. • They could recognize the month and year at the top but could not isolate "December 2025" even after 3 attempts. • When trying to find a specific transaction on a given date, users searched through the money-out/in areas but could not isolate the date. • There was difficulties connecting the transaction type to the given date.
Identifying Amount and Purpose of Transaction	• The familiarity of the currency-note images made the amount of money clear and easy to understand. • In all tasks related to identifying the amount and purpose of the transaction, users were able to correctly read the amount earned. • Users were able to correctly point out to the amount and purpose when a visible transaction was indicated.

| Merchant Payment



| Merchant Payments (2)

Usability testing was done with 8 women in the Songo community, and all participants were given paper-based prototypes.



My Oral Village // Road Signs for Digital Payments

| Merchant Payments (3)

Feedback & Observations:

Participant Feedback	
What part felt the easiest?	• 4 out of 8 participants mentioned that the whole process was easy to follow and relatable • All participants found that placing the money from the payment tray was the easier part and similar to how business is done
What part felt the most difficult?	• 6 participants indicated no difficulties throughout the process. • One participant noted that entering the PIN was hard since they have never had any experience with it • One user noted they were new to business so not yet confident with money calculations.
How can the task be made easier?	• No notable feedback was given, but it was mentioned that part of the process is to just get familiar / used to the interface.

Facilitator Feedback – Top 3 Findings
• Majority of participants were comfortable with the layout and navigation of the app.
• There was strong visual clarity, as users were able to clearly understand the pictures, icons apart from one (gas icon by one participant).
• The image-based approach made the app feel more accessible, comfortable and less frightening to use

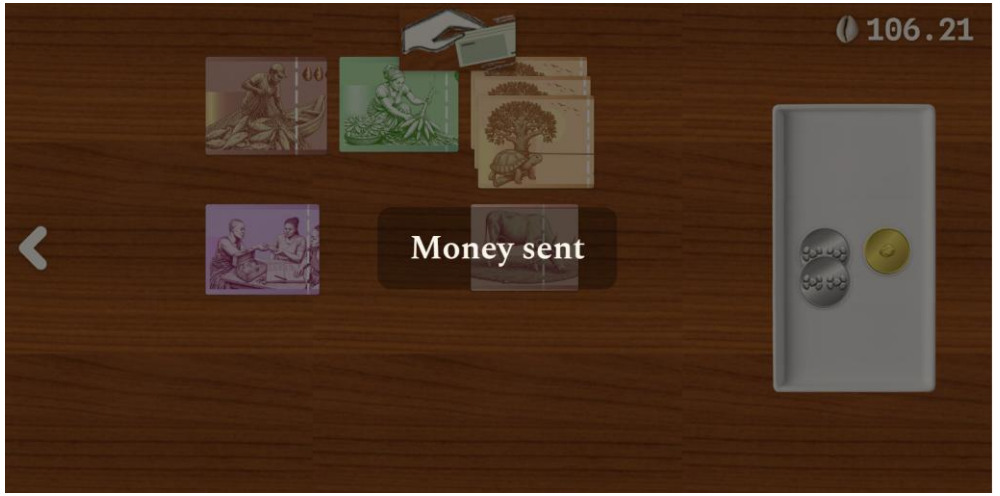
| Merchant Payments (4)

Feedback & Observations:

Observer Feedback	
Gateway Icon	• 6 out of 8 users recognized the gateway icon as a shop and opened it immediately. • The icon resembled a familiar local shop.
Identification of Icons	• Majority of participants were able to quickly and independently identify different icons such as “merchant” and “next screen”. • All users were also able to verify all the payment summary details and confirm it correctly without any notable difficulty because the pictures provided a clear visual understanding.
Using Money	• Users were able to count and place money confidently; relatable to daily business. • One participant seemed to have low confidence with money calculations, repeatedly paused and appeared worried about making a mistake while counting
PIN Transactions	• 7 out of 8 users were able to enter the PIN without any difficulty and indepentently, The keypad and correction controls were easily understood. • One participant appeared anxious and needed several attempts to enter the unfamiliar PIN.
Payment Confirmation	• Users were able to confirm and identify the payment confirmation result. Many of them seemed pleased, relieved and comfortable.

Learner Sandbox

(https://myoralvillage.org/roadsigns/sandbox2-v3/counting-table.html)



Learner Sandbox (2)

Prototype Description

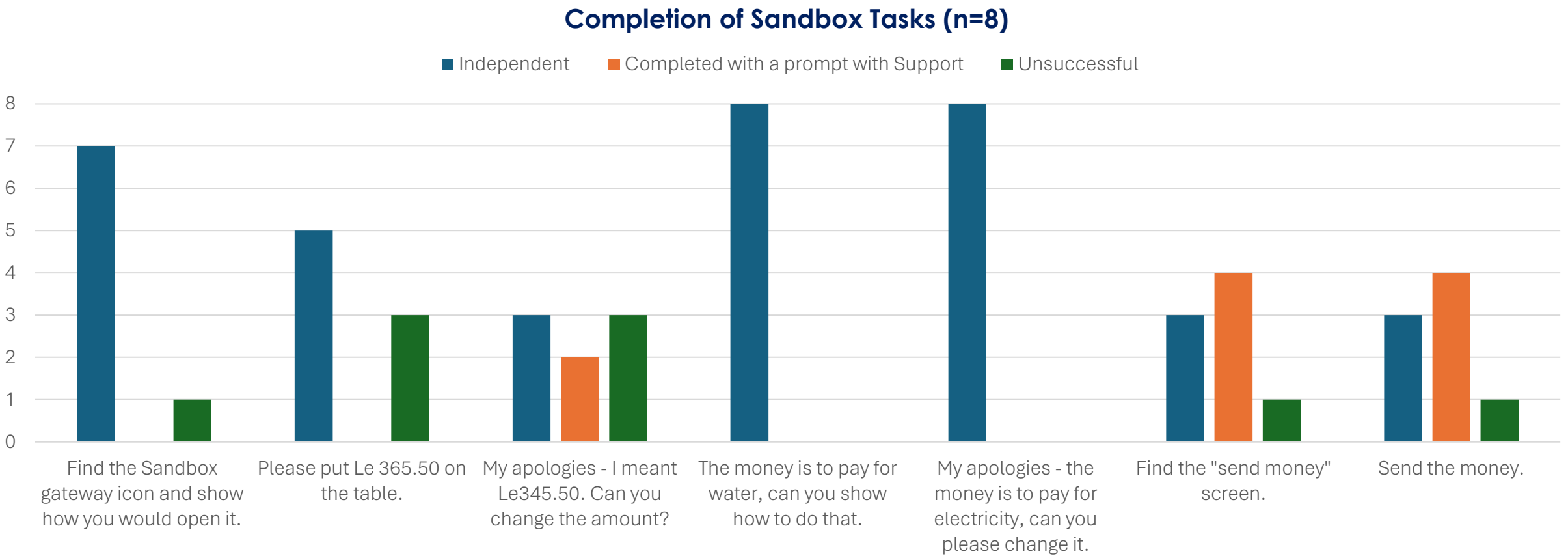
The learner sandbox challenges the learner to send money, using the same procedure as they would on GNU Taler, but without using actual money.

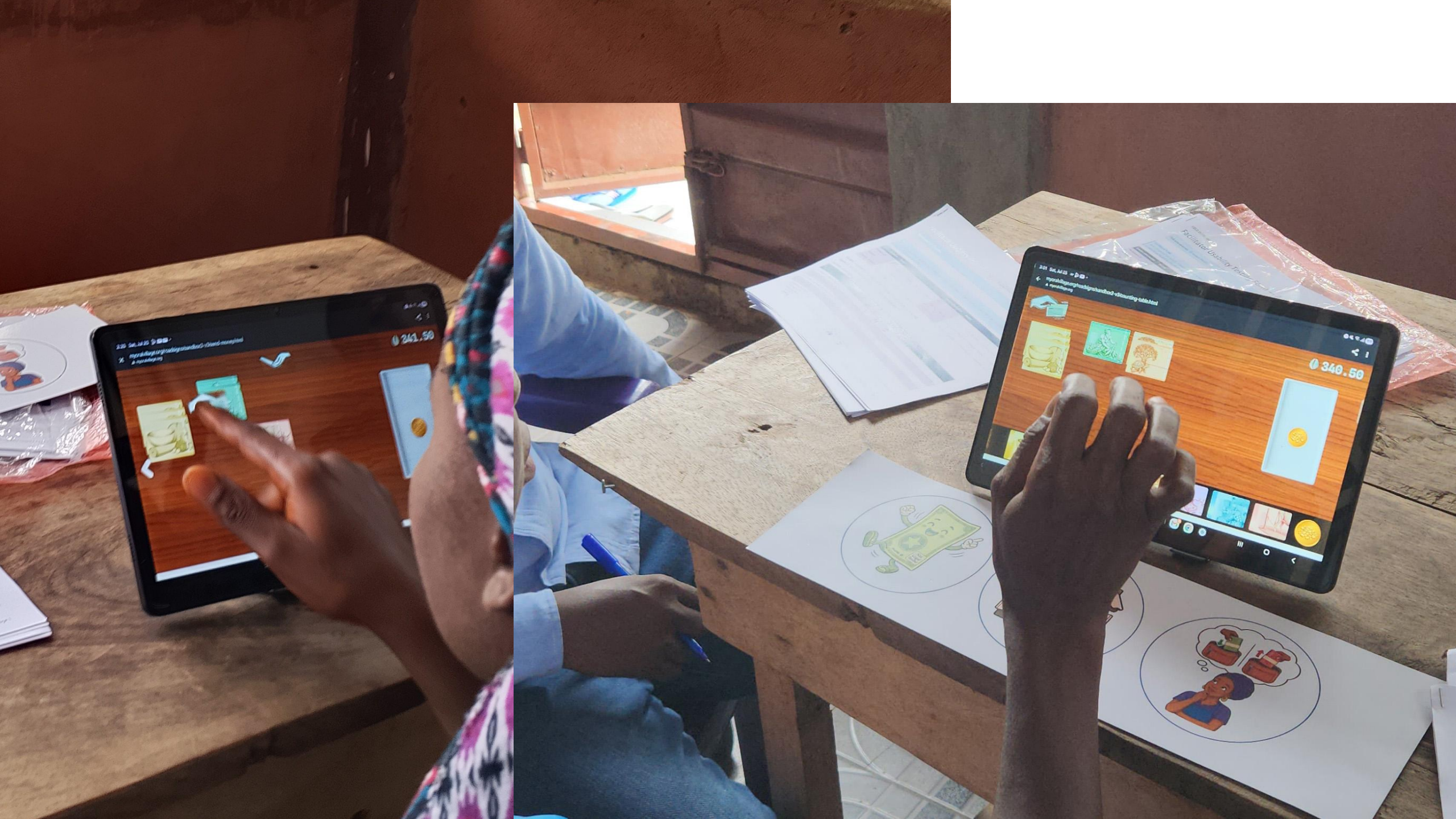
Steps:

1. Counting table appears, with scrollable cash display bar at the bottom, a 'send money' icon in the upper left corner, an Indo-Arabic counter in the upper right corner, a cedar table for the notes and a white ceramic tray for coins.
2. User places notes and coins on the table to indicate the sum to be sent.
3. User taps the 'send money' icon on the upper left.
4. The Purpose screen appears, showing an empty input field and a cluster of possible purposes the user may wish to file the transaction under.
5. User selects a purpose applicable to the payment.
6. User taps the 'send money' icon on the upper left.
7. Send money screen appears looking like the Counting table screen but already populated with the correct of money and without the scrollbar, and with a hand outstretched gesturing to receive money located in the upper middle.
8. User moves the 'send money' icon and places it over the 'receive money' icon to finalize the payment.

| Learner Sandbox (3)

Usability testing was done with 8 women in the Waterloo area using a clickable, digital prototype.




241.50
340.50

| Learner Sandbox (4)

Feedback & Observations:

Participant Feedback	
What part felt the easiest?	• 7 participants found selecting the payment process the easiest. • Participants also found placing the money onto the payment table was easy to understand and relatable.
What part felt the most difficult?	• 5 participants had some issue when putting NLe365.50 on the payment tray or trying to correct it. • Similarly, 5 participants could not locate the send-money screen or complete the send-money action.
How can the task be made easier?	• Almost all participants noted that additional practice recognizing, comparing and combining the sandbox notes would be helpful to construct and adjust numbers, and be more confident. • 4 testers noted the send-money icon required a stronger visual reinforcement or clearer connection to the action.

Facilitator Feedback – Top 3 Findings
• Majority of participants correctly recognized the gateway icon.
• Participants struggled with constructing 365.50 and 345.50 demonstrating more time and practice is needed to familiarize with sandbox notes / coins
• The payment purpose icons were relatable, but the send-money icon was not as clear to many participants

| Learner Sandbox (5)

Feedback & Observations:

Observer Feedback	
Gateway Icon	• 7 out of 8 participants immediately selected the dancing-money gateway icon and confidently described it as "play-play money". • Only 1 user repeatedly selected the wrong icon and appeared uncertain.
Using Money	users were able to place the appropriate amount onto the table accurately and confidently, but some needed additional attempts when adjusting or corrections. • 2 participants tried repeatedly but appeared frustrated and was unsuccessful; it seems like more time to compare, and review note and coin values was needed
Selecting Purpose	• All participants were able to independently and confidently select the appropriate payment purpose and make the adjusting transaction to correct the purpose type.
Identify Send Money	• 4 participants could not find the send-money icon initially, and looked confused or uncertain, while the other half was able to find the screen immediately. • Navigation worked well once the icon was recognized after a few attempts; the send-money icon seems like it lacked immediate meaning or connection to the action.
Selecting Send Money	• Once the icon was identified, users were able to complete the action confidently, even if after the first attempt. • One participant could not complete the send-money action and appeared concerned.

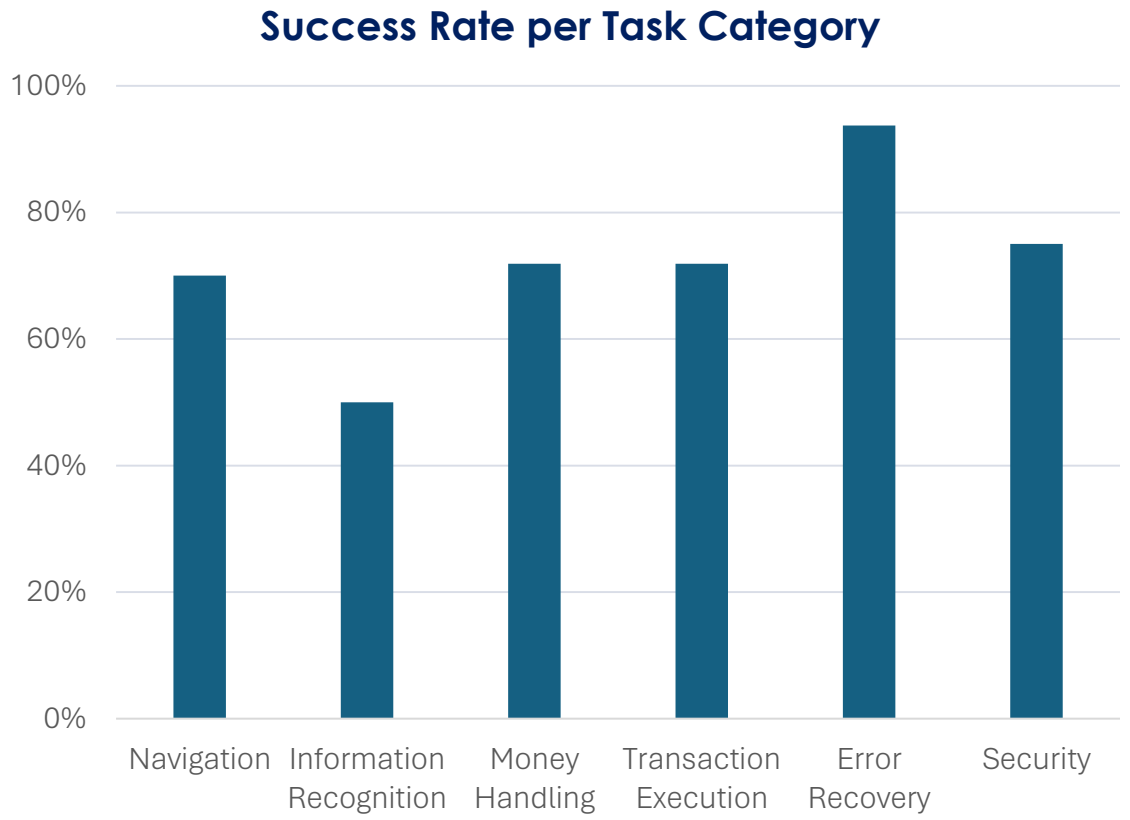
SECTION 5:

Test Results

| Summary of Test Results

A total of 24 tasks were tested between all three interfaces. Tasks can be categorized in the following way:

Theme	Description	No. of Tasks
Navigation	Finding screens and moving through the interface	5
Information Recognition	Reading/interpreting information shown on the screen	8
Money Handling	Counting, assembling, modifying, and understanding monetary values	4
Transaction Execution	Selecting merchants, payment purposes, sending payments, completing workflows	4
Error Recovery	Recovering from workflow mistakes (changing merchant, correcting PIN, editing transaction details)	2
Security	Authentication and PIN interaction	1



| Summary of Test Results

	Account History	Merchant Payment	Sandbox
Ease of navigation	**Difficult:** Users were able to scroll past the transactions and found the lake sizes helpful but were unable to locate transactions, and found the interface visually dense	**Easy**: Users found the process of using money very familiar and relatable to their daily lives	**Moderate:** Users were familiar with many of the icons and using the money, but required some additional support, prompts, or multiple attempts to be successful
Least successful task	All tasks that required identifying or finding a past transaction	Finding the right merchant	Finding the "send-money" icon
Common challenge	Hard to connect the day/month with the transaction, visually confusing with lots of lines	Required some repetition and clarity to understand the task	Unable to connect with the "send-money" icon
Most successful task	Identifying the purpose of the transaction	Selecting the value of money to place on table	Selecting money and placing it on table
Common success factor	Icons for purposes and money, lake sizes, and money-in/out was relatable	Process of selecting money was similar to daily lives	Interface and icons of the money was relatable

| System Usability Scale

The System Usability Scale (SUS) is used to provide a quick snapshot of user experience, a variable that is independent of usability. Each prompt in the SUS was answered on a standard 1-5 Likert scale with 5 being the most usable.

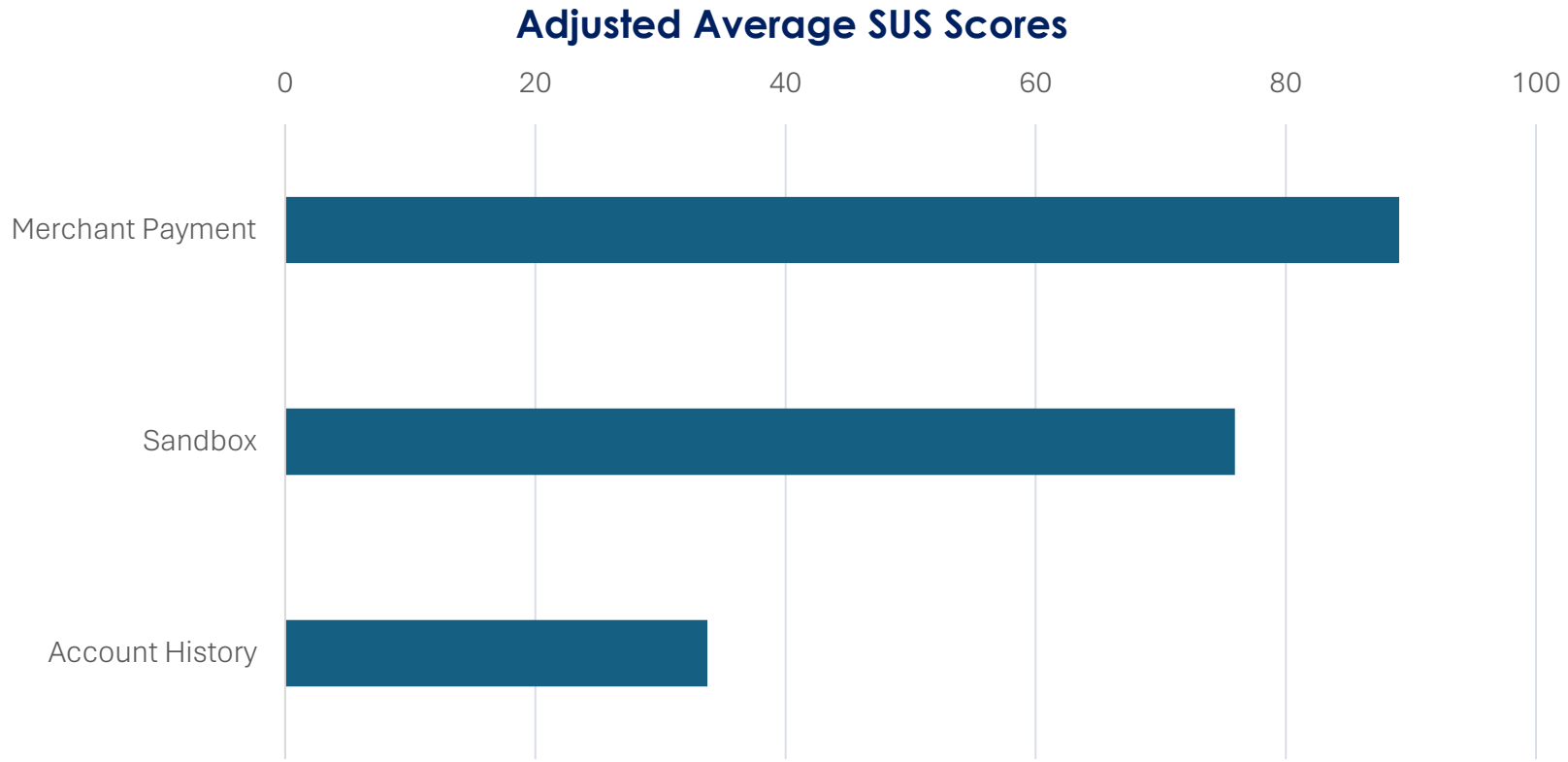
Prompts for the Roadsigns Features

- I think I would like to use this system frequently.
- I found the system unnecessarily complex.
- I thought the system was easy to use.
- I think that I would need the support of a technical person to be able to use this system.
- I found the various functions in this system were well integrated.
- I thought there was too much inconsistency in this system.
- I would imagine that most people would learn to use this system very quickly.
- I found the system very cumbersome to use.
- I felt very confident using the system.
- I needed to learn a lot of things before I could get going with this system.

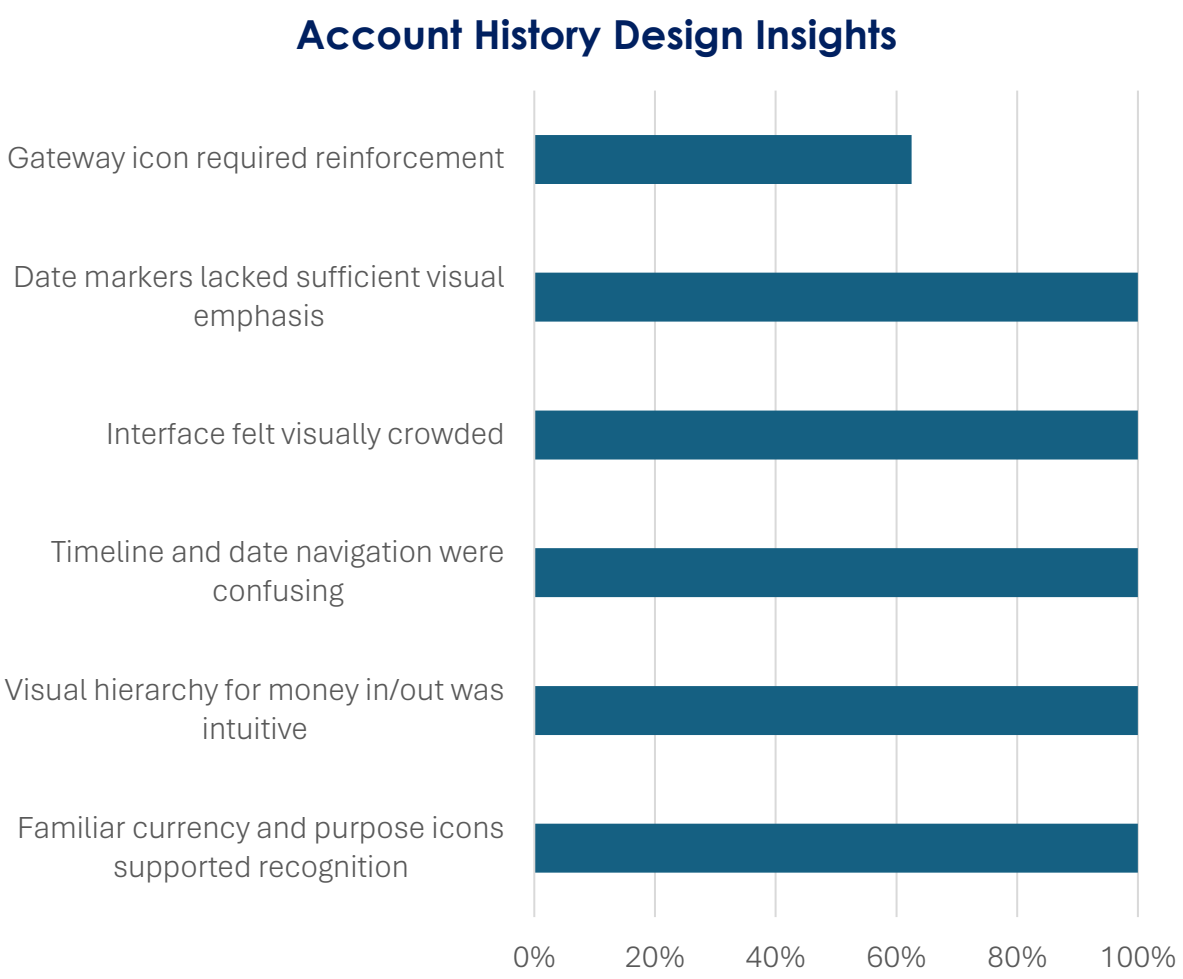
Source: John Brooke, 1995.

| System Usability Scale

Based on the SUS, the Merchant Payment is the most developed feature, followed by the Sandbox. The Account History requires the most further work.



| Observations



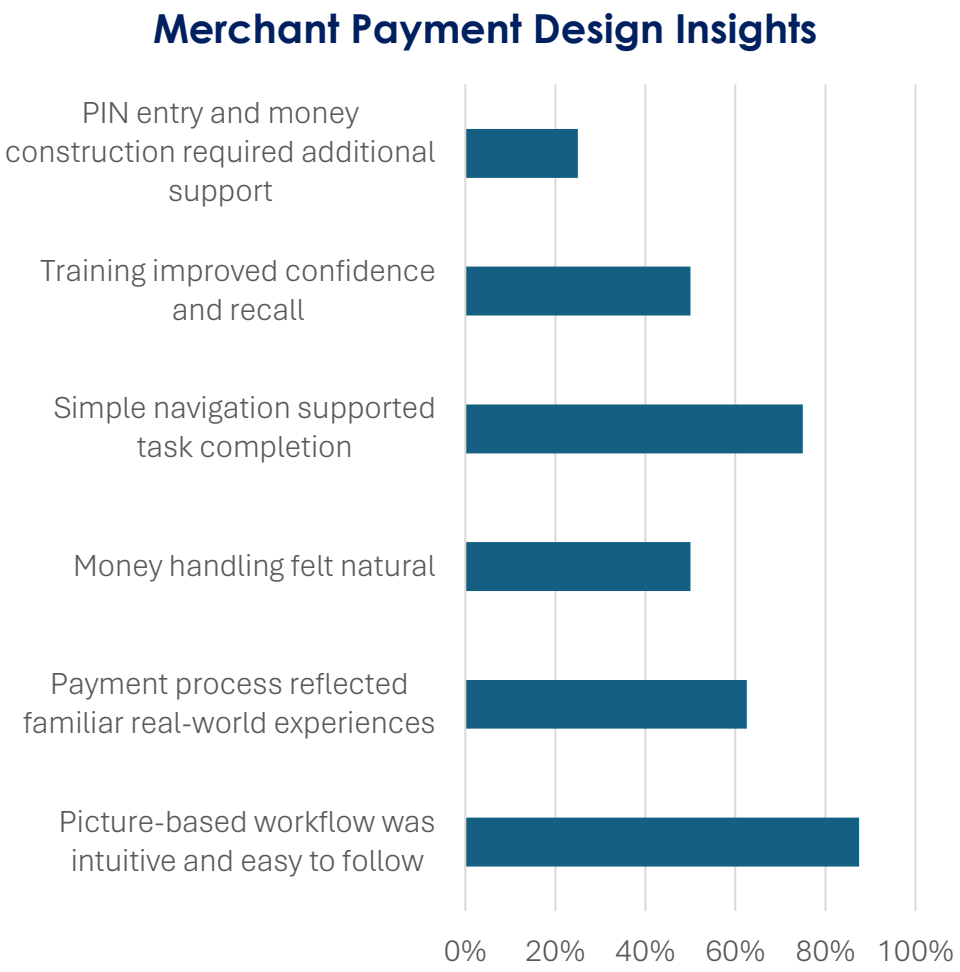
What Worked Well

- All participants found the familiar Sierra Leone currency-note images and transaction purpose icons easy to recognize.
- All participants correctly understood the visual distinction between money received and money spent, indicating that the overall transaction representation was intuitive.

Opportunities for Improvement

- All 8 users had trouble locating transactions by date, highlighting the need to redesign the timeline.
- All 8 felt the interface contained too much visual information, reducing their ability to quickly identify specific transactions.
- 5 participants required additional support to recognize the Account History gateway, suggesting the entry point should be made more prominent.

| Observations



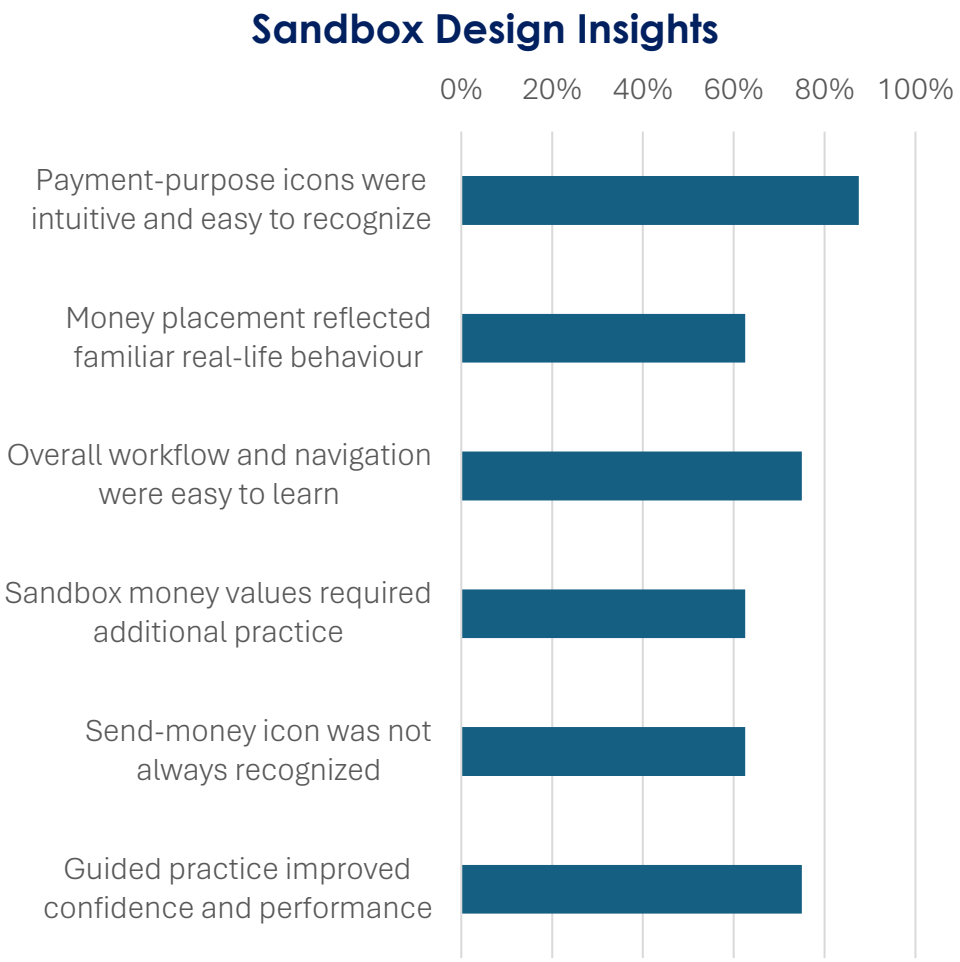
What Worked Well

- 7 of 8 participants highlighted the picture-based interface as making the payment process easy to understand.
- 6 participants described the navigation and screen flow as intuitive and easy to follow.
- 5 related the payment journey to familiar shopping experiences, suggesting that grounding the interface in everyday activities improved usability.
- 4 found money handling intuitive because it reflected activities they already perform in their daily businesses.

Opportunities for Improvement

- Only 2 participants experienced notable difficulties, primarily related to PIN entry and confidence with money calculations, both of which were linked to limited prior experience rather than problems with the interface itself.
- Several participants requested additional training and practice opportunities, indicating that continued exposure could further strengthen confidence and independent use.

| Observations



What Worked Well

- 7 out of 8 of participants found the payment-purpose icons easy to recognize and use.
- 6 successfully navigated the Sandbox workflow, demonstrating that the interface was generally easy to learn.
- 5 described placing money on the payment tray as intuitive because it reflected familiar, everyday cash-handling behaviours.

Opportunities for Improvement

- 5 had trouble remembering the values of the sandbox notes and coins, suggesting additional reinforcement is needed before users can confidently manipulate amounts.
- 5 had difficulty recognizing or locating the send-money action, indicating that the icon and its associated workflow could be made more visually distinct.
- Most participants requested additional practice rather than interface redesign, suggesting that repeated exposure may address many of the observed challenges.

| Observer Data – Key Themes

1: Visual language can communicate financial concepts to users with limited literacy and numeracy.

- Icons were quickly understood, and once found, participants generally interpreted the meaning correctly.
- Participants consistently recognised icons representing currency, financial transactions, payment purposes and money entering or leaving the account.

2: Navigation, especially as it relies on mapping time onto space, was a key challenge.

- Across all three features, participants searched multiple areas before locating information. They easily missed interface elements, or needed prompts to continue.
- When key elements are unfamiliar, users are more sensitive to clutter and other unfamiliar items.

3. Safe practice can build confidence and reduce perceived risk.

- Sandbox participants liked this feature, especially reporting that it helped them to build confidence.

4: The interface demonstrated strong learnability even with limited practice or orientation.

- Participants became faster after their initial exposure, required fewer prompts over time.
- The Sandbox feature appeared particularly valuable in reinforcing confidence through trial-and-error learning.

5: Confidence was closely linked to familiarity of processes.

- In interacting with money and other familiar tasks, participants were confident and independent.
- If the participant was not exposed to a task (e.g., entering a PIN or viewing past account information), they hesitated more, and required more support.

6: Mobile money experience was a great advantage.

- Experienced users showed higher first-attempt success across most usability dimensions, including money handling tasks.

SECTION 6:

Design Recommendations

| Design Recommendations

Account History

Design Element	What Participants Said	Design Implication / Recommendation
Currency and purpose icons	Easy to identify transaction amounts and purposes because the Sierra Leone currency-note images and familiar purpose icons were recognizable.	Continue using familiar local currency imagery and culturally relevant icons to represent financial information.
Visual hierarchy for money in/out	Easily understood that money coming in appeared at the top, money going out at the bottom, and were able to interpret transaction values.	Retain the existing visual layout for transaction direction, as it was consistently understood.
Timeline and date navigation	With no learned exposure to calendars or other schooled time/space maps, users found it very hard to associate date markers with individual transactions.	By default, account history screen to appear after user completes any transaction, including in the Sandbox, during first month of use. Early screens are uncluttered, so learning can keep pace with growing complexity.
Interface feel	Screen felt 'visually crowded' and had "a lot going on," making it difficult to search for specific transactions.	Capitalize on the uncluttered experience of early transactions. On first use automatically open a guidance video, easily accessible later.
Date markers	Month, year, and date indicators were difficult to distinguish from transaction information.	Divide weeks, months and years more clearly. Eliminate darkness for night when more than 1 week is showing.
Gateway icon	Some not immediately recognize the Account History gateway and required repeated prompting before identifying it.	Strengthen gateway recognition through more distinctive iconography, clearer visual cues, or additional onboarding.

| Design Recommendations

Merchant Payment

Design Element	What Participants Said	Design Implication / Recommendation
Picture-based workflow	Participants consistently described the interface as easy to understand because the pictures guided them through each step of the payment process.	Continue using picture-led workflows and minimize reliance on text, as visual guidance effectively supports users with limited literacy.
Payment process	Participants related the payment journey to buying goods in a local shop, making the process easy to understand and remember.	Preserve the familiar "shop-to-payment" flow, as aligning the interface with everyday experiences improves usability and confidence.
Money handling	Found counting money and placing it on the payment tray straightforward, reflecting familiarity from daily business activities.	Retain the current money handling interaction, which closely matches users' existing financial behaviours.
Task navigation	Gateway icons, navigation, and overall screen layout easy to follow throughout the payment process.	Maintain the consistent navigation structure and iconography across future features.
Impact of training	Increased confidence after only one training session and expressed a desire for additional opportunities to practise.	Continue pairing the interface with practical training and consider providing offline practice materials to reinforce learning.
PIN entry and money sum construction	Small participants found PIN entry unfamiliar or lacked confidence constructing payment amounts. These challenges reflected limited prior experience rather than interface design.	Consider additional onboarding or guided practice for PIN entry and money construction, particularly for first-time digital financial service users.

| Design Recommendations

Sandbox

Design Element	What Participants Said	Design Implication / Recommendation
Payment-purpose icons	Consistently identified and changed payment-purpose icons (e.g., water to electricity) with little difficulty, demonstrating that the icons were clear and meaningful.	Retain the current payment-purpose icons, as they were consistently recognized and supported successful task completion.
Sandbox currency	Users liked the sandbox notes and coins and did not believe they would be confused with real money. Some forgot denomination values, particularly when constructing or adjusting payment amounts.	Keep using Sandbox notes and coins with 'cowrie' symbol. In video, encourage new users to practice putting money on table and reading the digital counter.
Money placement	Placing money on the payment tray was intuitive because it mirrored how they normally handle cash in everyday transactions.	Continue using familiar money-handling interactions that reflect users' real-world experiences.
Overall workflow and navigation	Good navigation between screens and completion of payment sequence, with some completing all tasks independently on the first attempt.	Maintain the existing screen flow and navigation, which demonstrated strong learnability after minimal orientation.
Send-money icon	Some participants had trouble finding the send-money icon without help. A similar icon was used in Merchant Payment successfully in another location.	Use the Merchant Payment design in the upper right, with the Indo-Arabic Counter immediately left of it.
User Recommendations	Participants who experienced difficulties generally suggested additional practice rather than major interface changes, indicating that familiarity improved usability.	Continue incorporating guided practice through the Sandbox to reinforce learning before real transactions.