



Bridging the Digital Gap: Encouraging Digital Solutions for Local Shops in Pakistan

PROJECT PROGRESS REPORT

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1 Accomplishments

1.1 Empathizing with the user - Insights from Interviews

Our primary user being the local shop owners, to understand their perspective, we set out to have conversation with them. We met with multiple shop owners in our local neighborhood, from a general store owner to a dry fruit shop owner. These interviews helped us identify some common elements among these shop owners:

- Currently maintain two physical registers – one for sales and one for purchases.
- No prior experience or understanding of how a POS (Point of Sale) system works.
- Comfortable with the current manual system and hesitant to change.
- Often forgets to record sales entries during busy periods.
- All calculations are done manually, which takes significant time.
- Prone to calculation errors, which can negatively affect customers.
- Open and eager to learn about how a POS system works.
- Would prefer a POS system that can be accessed via mobile.
- Willing to adopt a POS system if it is free and someone can provide proper guidance.
- Some individuals are resistant or uncomfortable with the idea of transitioning to a new system.
- Currently requires a dedicated person for bookkeeping and record maintenance.
- Interested in adopting a POS system if it helps save the cost of hiring a separate employee.
- Concerned about the reliability of internet connectivity in the area.
- Believes that such digital systems should be promoted and supported by the government through schemes or incentives.

Apart from these insights gathered through interviews, we also tried to gauge the needs based on our own understanding, and some points which didn't get highlighted in user interviews are:

- Only one person in the shop is familiar with all the product rates.
- Customers often have to wait or ask multiple times to get accurate pricing information.
- This leads to wasted time and energy for both the staff and the customers.
- Frequent customer queues and delays due to lack of quick access to price information.
- Physical records and inventory take up a lot of space, leading to bulky and inefficient storage.

1.2 Defining the Problem

1.2.1 Task Analysis

To design an effective POS system, we must analyze how shopkeepers currently perform tasks and how the POS can optimize their workflow.

Key Questions for Task Analysis:

Question	Findings from Interviews
Who uses the system?	Shop owners, employees, customers.
Current tasks?	Manual sales entries, inventory tracking, cash handling.
Desired tasks?	Auto-billing, digital payments, inventory alerts.
How are tasks learned?	App trial-and-error, peer guidance, WhatsApp tutorials.
Where performed?	Inside shops (often crowded, noisy, dusty).
People-data relationship?	Trust issues with digital records; prefer manual backup.
Other tools used?	Paper registers, calculators, mobile calculators.
Communication?	Verbal (customer \leftrightarrow shopkeeper), SMS for orders.
Task frequency?	50+ transactions/day (peak hours: 5-8 PM).
Time constraints?	Rush hours \rightarrow need <30 sec/transaction.
Error handling?	Manual corrections \rightarrow disputes with customers.

Table 1: Task Analysis

Primary Task: Process a Sale

- **Goal:** Complete a customer purchase quickly and accurately.
- **Sub-Tasks & Pain Points**
 - Current (Manual) Workflow:
 - * Customer Requests Items
 - Shopkeeper memorizes prices or checks a rate list.
 - Pain Point: Delays if prices aren't memorized.
 - * Manual Calculation
 - Uses calculator or mental math.
 - Pain Point: Errors lead to customer disputes.
 - * Cash Handling
 - Gives change from cash drawer.
 - Pain Point: Incomplete records \rightarrow tax/stock issues.
 - * Record in Register
 - Writes sale in a ledger (often forgotten during rush).
 - Pain Point: Shortage of small notes.
 - * Inventory Update
 - Manually reduces stock (if done at all).
 - Pain Point: Stockouts due to poor tracking.
 - Desired (POS-Supported) Workflow
 - * Scan Product
 - Barcode/QR scan \rightarrow auto-fetches price.
 - Pain Point Cured: No delays if prices aren't memorized.
 - * Auto-Calculation
 - System sums totals + applies discounts.
 - Pain Point Cured: No errors lead to customer disputes.
 - * Digital Payment
 - Customer pays via JazzCash/QR \rightarrow instant receipt.

- Pain Point Cured: No incomplete records → tax/stock issues.
- * Auto-Update Records
 - Sales logged + inventory adjusted in real-time.
 - Pain Point Cured: No missing logs/reports.
- * Tax Report Generation
 - Manually reduces stock (if done at all).
 - Pain Point: Stockouts due to poor tracking.

1.2.2 Task Prioritization (MoSCoW Method)

Priority	Tasks	Reason
Must-Have	Offline sales, Urdu UI, auto-calculations	Core needs for adoption.
Should-Have	Inventory alerts, multi-payment support, voice assistance	Reduces key pain points
Could-Have	Loyalty programs	Adds value but not critical
Won't-Have	AI demand forecasting	Overkill for small shops

Table 2: Task Prioritization

1.2.3 User Personas

Details

- Name: Aamir Saahab
- Role: Traditional Pakistani Shopkeeper (The Reluctant Adopter)
- Age: 45–60 years

Background:

- **Shop Type:** Small kiriyana store, medical store
- **Tech Literacy:** Low (uses basic phone, rarely smartphone)

Current Workflow:

- Maintains two handwritten registers (sales + purchases).
- Struggles with manual calculations → frequent errors.
- Forgets entries during peak hours.
- Hires a bookkeeper for record-keeping.

Pain Points:

- Fear of change ("This is how we've always done it").
- Concerned about internet/electricity issues.
- No awareness of POS benefits.
- Needs government-backed assurance to trust the system.

Motivations:

Will adopt if:

- Free/low-cost (no upfront investment).
- Saves salary of bookkeeper.
- Works offline (no internet dependency).

Figure 1: Traditional Pakistani Shopkeeper (The Reluctant Adopter)

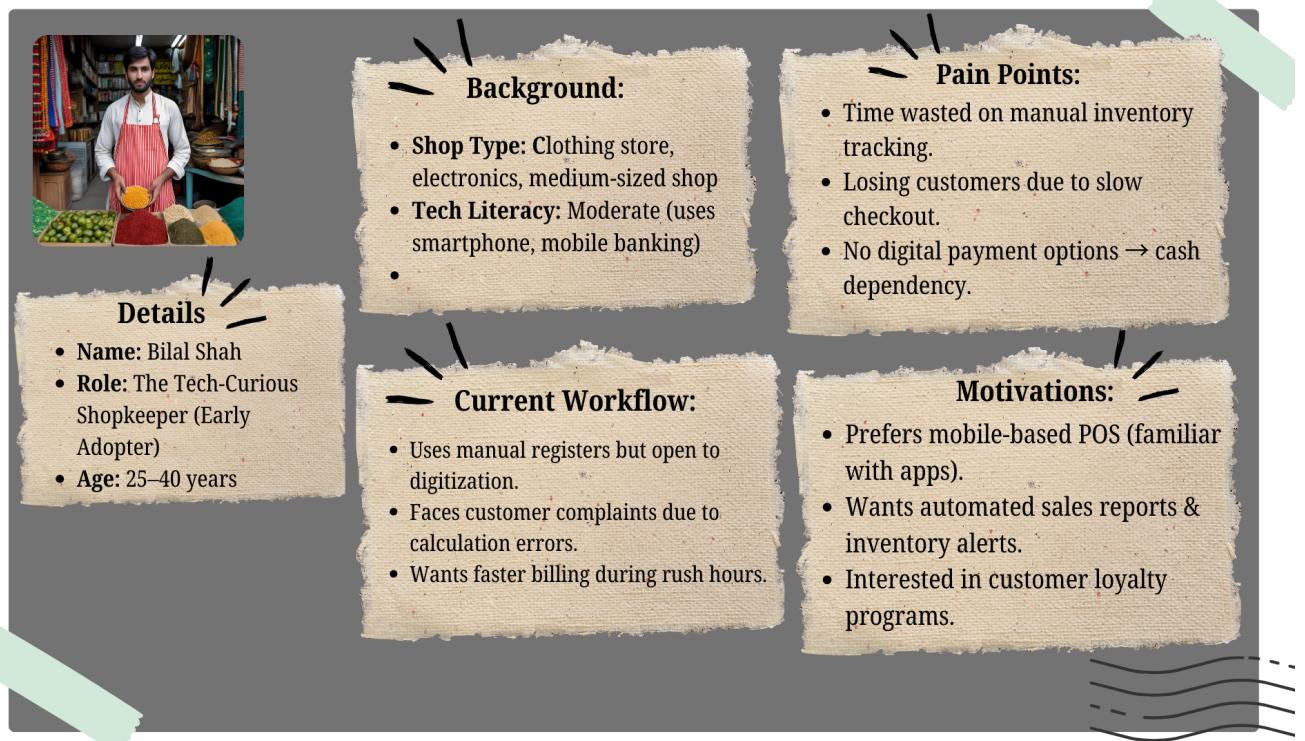


Figure 2: The Tech-Curious Shopkeeper (The Early Adopter)

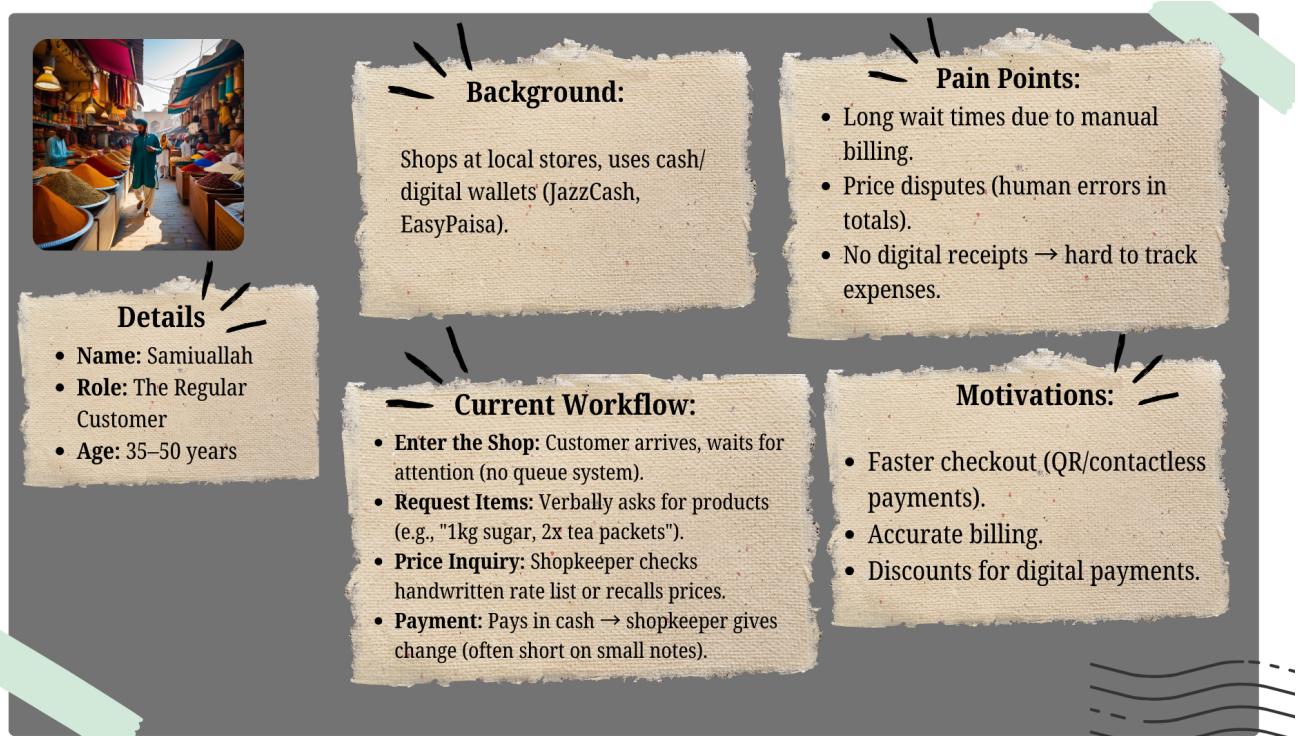


Figure 3: The Regular Customer

1.2.4 System Requirements

To design a robust POS system for Pakistani shops, we must categorize requirements into functional (what the system does), non-functional (how well it does it), and environmental (constraints from the real-world context).

Category	Requirements
Functional	1.1 Sales & Billing: Scan products → auto-calculate totals, generate receipts (Urdu/English), apply discounts
	1.2 Offline Mode: Record sales without internet → sync when reconnected
	1.3 Inventory Management: Auto-update stock, low-stock alerts (SMS)
	1.4 Multi-Payment: Cash, JazzCash, EasyPaisa, cards, QR payments
	1.5 Tax Compliance: Auto-generate FBR-compliant reports
	1.6 User Management: Role-based access (owner/employee)
Non-Functional	2.1 Usability: Urdu voice guidance, <5 min training
	2.2 Reliability: 99% uptime, data backup
	2.3 Performance: <2 sec/transaction, works on 1GB RAM phones
	2.4 Security: PIN-based access, encrypted data
	2.5 Cost: Free trial → 500 PKR/month
Environmental	3.1 Physical: Dust-resistant, solar-charging support
	3.2 Social: Role-based permissions, fast checkout (<30 sec)
	3.3 Organizational: WhatsApp training, local "POS champions"
	3.4 Technical: 2G network support, Android 8+ compatibility

Table 3: Functional, Non-Functional and Environmental Requirements

1.2.5 Use Cases

Shopkeeper Use Cases

- **Sales & Billing**

- **UC-1:** Process a Sale (Online Mode)
 1. Customer brings items to counter.
 2. Shopkeeper scans barcode → POS auto-fetches price.
 3. POS sums total + applies discounts (if any).
 4. Customer pays via cash/QR → POS prints/digital receipt.
 5. Inventory auto-updates.
- **UC-2:** Process a Sale (Offline Mode)
 1. Internet is down → POS switches to offline mode.
 2. Shopkeeper scans items; totals are saved locally.
 3. Once online, data syncs to cloud.
- **UC-3:** Apply Discounts
 1. Shopkeeper selects "Discount" → enters fixed amount
 2. POS adjusts total → receipt shows discounted price.

- **Inventory Management**

- **UC-4:** Low-Stock Alert
 1. POS detects stock < threshold (e.g., 5 units).
 2. Sends SMS/notification: "Restore: Coca-Cola (3 left)".
- **UC-5:** Add New Product
 1. Shopkeeper selects "Add Item" → enters name/price/barcode.
 2. POS adds to database → now scannable.

- **Bookkeeping & Reports**

- **UC-6:** Generate Daily Sales Report
 1. Shopkeeper taps "Reports" → selects date range.
 2. POS exports PDF/Excel for FBR taxes.

- **UC-7:** Add New Product
 1. Customer buys on credit → POS logs debt + due date.
 2. Sends reminder SMS: *"Rahim: Pay Rs. 500 by 15 Oct"*.

Customer Use Cases

- **UC-8:** Pay via Digital Wallet
 1. Customer selects "JazzCash" at checkout.
 2. Scans QR → payment confirmed → earns loyalty points.
- **UC-9:** Request Receipt
 1. Customer asks for receipt → POS prints/sends WhatsApp receipt.
- **UC-10:** Redeem Loyalty Reward
 1. POS shows points balance → customer claims free item (e.g., "100 pts = free tea packet").

Employee Use Cases

- **UC-11:** Role-Based Access
 1. Employee logs in with PIN → only allowed to process sales (no inventory edits).
- **UC-12:** Shift Handover
 1. POS generates end-of-shift report → cash tally + sales summary.

Edge Cases

- **UC-13:** Handle Barcode Errors
 1. Unscannable item → Shopkeeper manually enters price.
- **UC-14:** Refund Process
 1. Customer returns item → POS logs refund → updates inventory.
- **UC-15:** Power Outage Recovery
 1. POS crashes → reboots → recovers unsaved transactions from cache.

1.2.6 Requirements to Use Case Mapping

Use Case (Priority)	P	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4
UC-1: Online Sale (High)	H	X		X	X					X					
UC-2: Offline Sale (High)	H		X												X
UC-3: Apply Discounts (Med)	M	X						X							
UC-4: Low-Stock Alert (High)	H			X					X						
UC-5: Add New Product (Med)	M	X		X											
UC-6: Tax Report (Med)	M				X		X								
UC-7: Track Debts (Low)	L	X						X							
UC-8: Digital Payment (High)	H				X					X					
UC-9: Generate Receipt (High)	H	X						X							
UC-10: Loyalty Rewards (Med)	M	X			X										
UC-11: Employee Access (High)	H					X					X				
UC-12: Shift Handover (Low)	L	X							X						
UC-13: Barcode Error (Med)	M	X						X							
UC-14: Refund Process (High)	H	X		X											
UC-15: Power Recovery (High)	H								X			X			

Table 4: Key:

- **Priority:** H (High), M (Medium), L (Low)
- **Color Coding:** Dark Green = High Priority, Medium Green = Medium Priority, Light Green = Low Priority
- Requirements abbreviated (1.1 = Functional Req. 1.1, 2.1 = Non-Functional Req. 2.1, etc.)

1.3 Ideation - Storyboards

1.3.1 Scenario 1 - First Time Using the POS App

Features Used:

- Urdu-only interface with audio
- Step-by-step tutorial
- Practice Mode

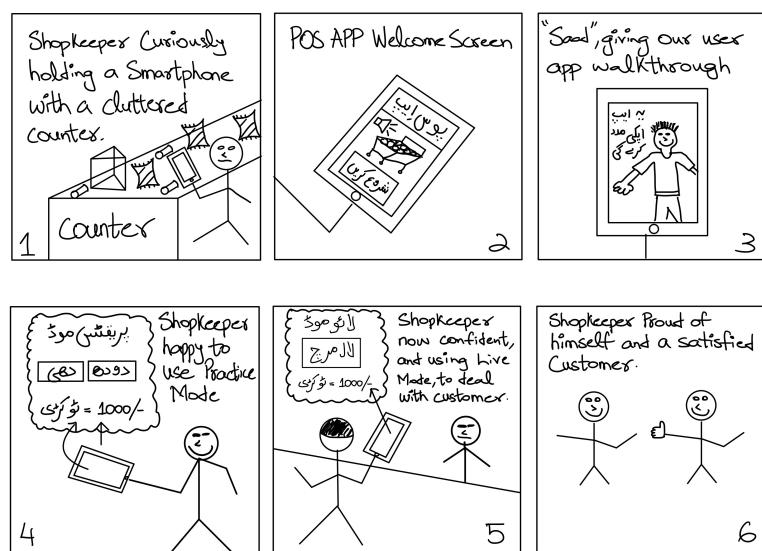


Figure 4: Scenario 1 - Story Board

1.3.2 Scenario 2 - Busy Evening at the Shop

Features Used:

- Voice-assisted interaction
- Urdu interface
- WhatsApp support

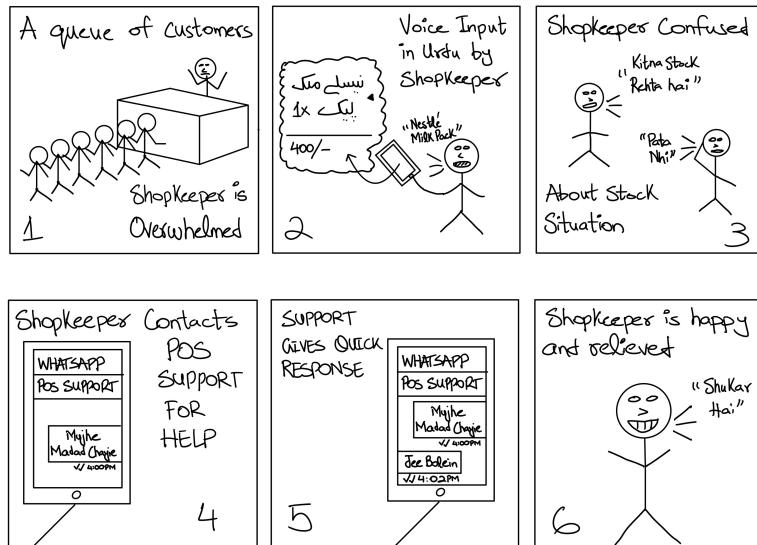


Figure 5: Caption

1.3.3 Scenario 3- Calculation errors in billing

Features Used:

- Item search and selection via POS app
- Cart management with plus-minus quantity adjustment
- Automatic total and discount calculation
- Error-free billing and receipt generation

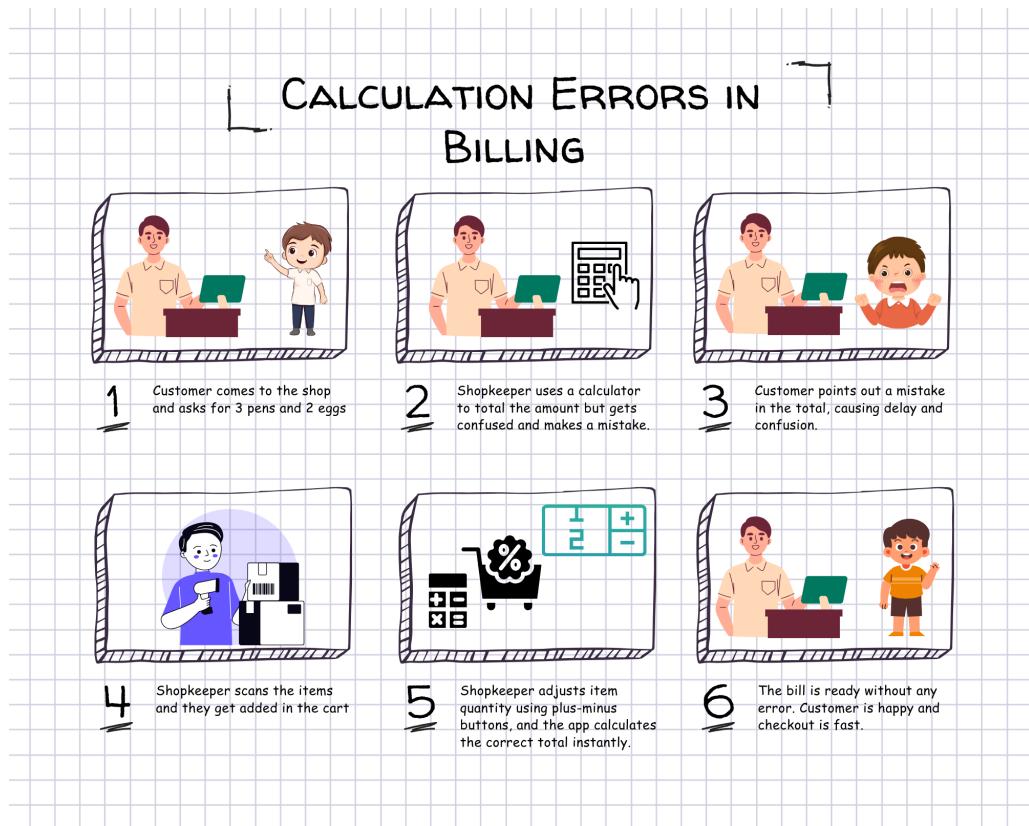


Figure 6: Calculation Errors in Billing

1.3.4 Scenario 4- Low stock alert

Features Used:

- Low-stock alert notification
- Manual stock check and POS inventory visibility
- Inventory update through POS app
- System confirmation of updated stock

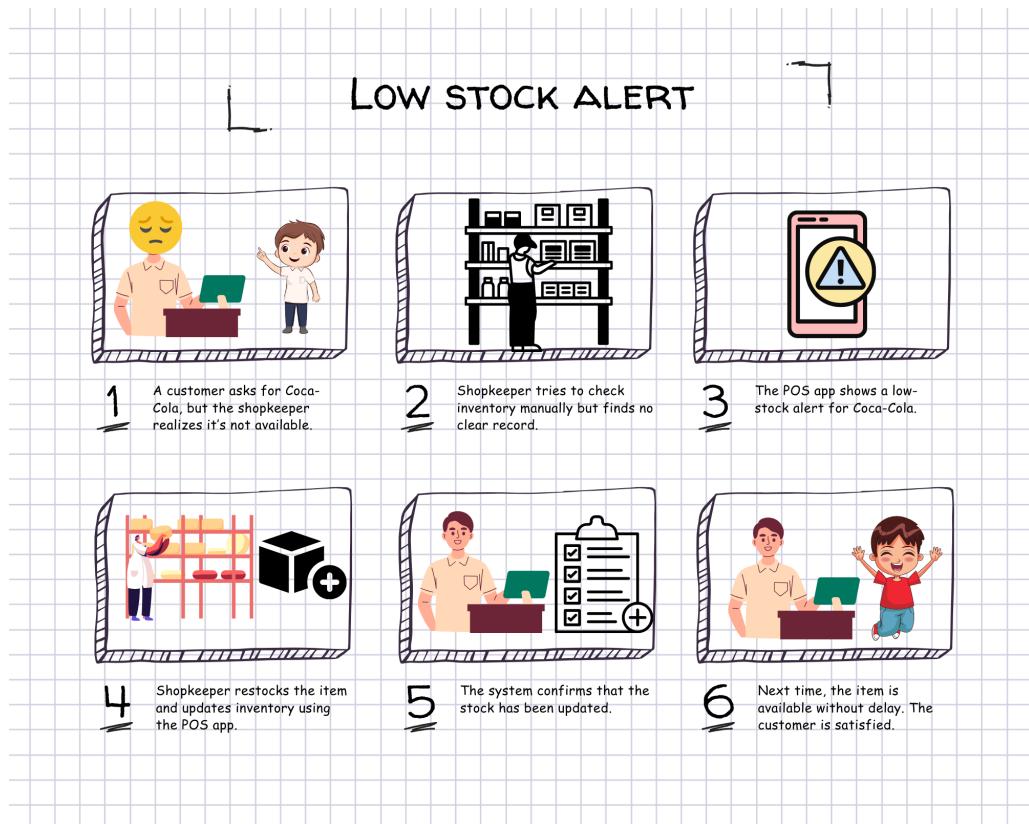


Figure 7: low stock alert

1.3.5 Scenario 5- Making a Sale Without Internet

Features Used:

- Automatic offline mode activation when internet is unavailable
- Seamless continuation of billing without connectivity
- Local saving of transaction data during offline mode
- Automatic sync of offline transactions once internet is restored
- Product scanning and cart management remains functional offline



Figure 8: Making a sale without Internet

1.3.6 Scenario 6- Creating FBR Tax Reports

Features Used:

- Billing summary and reporting module
- Timeframe selection for report generation
- One-click export of FBR-compliant tax reports
- Automated data aggregation from past transactions

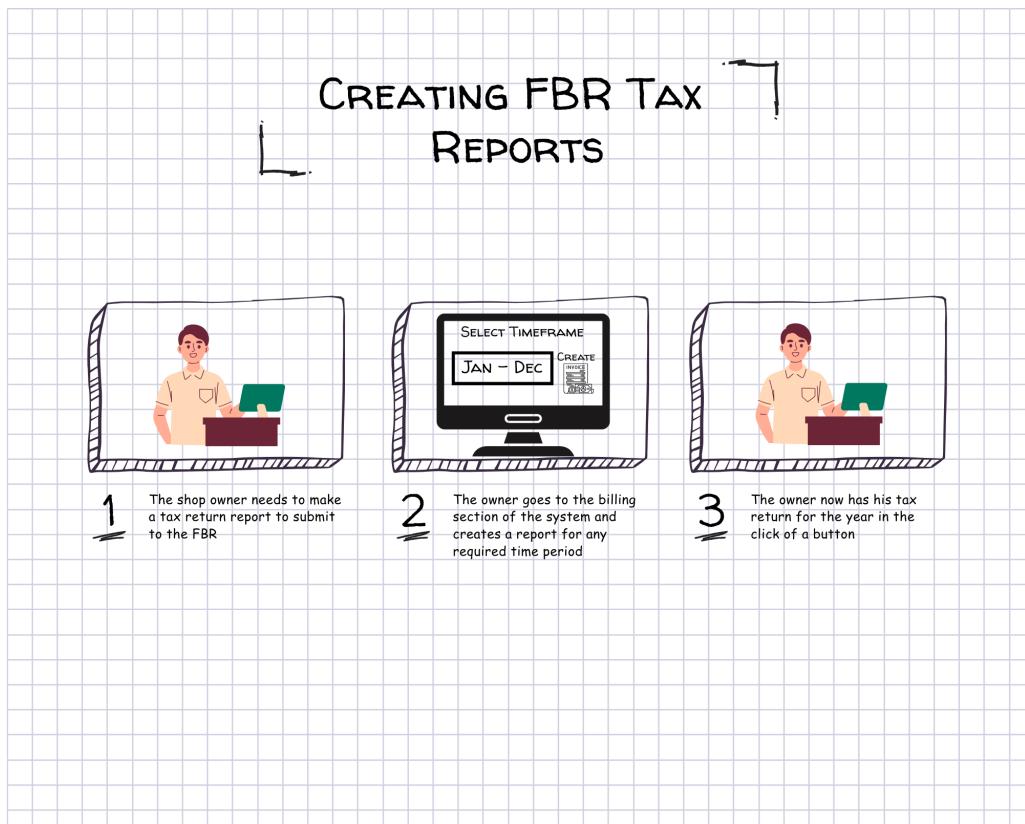


Figure 9: Creating FBR Tax Reports

1.4 Prototyping - Wire-frames

We developed a low-fidelity prototype of our solution using Figma to get a starting point in understanding how our solution could be shaped. The prototype can be viewed https://www.figma.com/proto/wrGDHTIQgjCx1CLE3ZzR4f/HCI-Project-POS-App-Wireframe?page_id=0%3A1&node_id=1-51&p=f&viewport=119%2C135%2C0.45&t=Kznep5sqYwzKP7Wa-1&scaling=scale-down&content-scaling=fixed&starting-point-node-id=1%3A51.



Figure 10: Screen 1 - Login Screen



Figure 11: Screen 2 - Welcome



Figure 12: Screen 3 - Dashboard



Figure 13: Screen 4 - New Cart Screen

2 Challenges

1. Finding Time for Shopkeeper Interviews

It was hard to find the right time to talk to shopkeepers because they were busy during rush hours. To fix this, we visited during quiet times in the afternoon and kept our questions short and to the point.

2. Too Many Responses During Interviews

Shopkeepers gave a lot of different answers, and many times their replies were long and not related to what we asked. At first, we felt awkward to stop them or guide the conversation. Later, we improved our questions and made them more clear and to the point, so that the shopkeepers would stay focused. We also wrote everything in a shared document and later met as a team to highlight the most common and useful ideas.

3. Privacy Concerns from Shopkeepers

Some shopkeepers were worried that their way of working might be copied or shared. We talked to them clearly, explained that our project is only for learning, and promised that we would not share any names or private details. This helped build trust.

4. Keeping Wireframes Simple

While designing the screens quite often in order to do something new, we were about to add too many features. But we made sure to include only things that were part of the real tasks and were possible to build. For doing so we planned that we should keep seeing our use-case table to stay on track.

5. Aligning Storyboards with Real Use Cases

During making the storyboards we realized that some ideas we initially visualized were not fully supported by the actual use cases or requirements we had defined earlier. To solve this we went back to our use case table and made sure that each storyboard was based on real pain points and features already discussed in our system requirements. This helped us to keep our designs practical and aligned with the project scope.

3 Next Steps

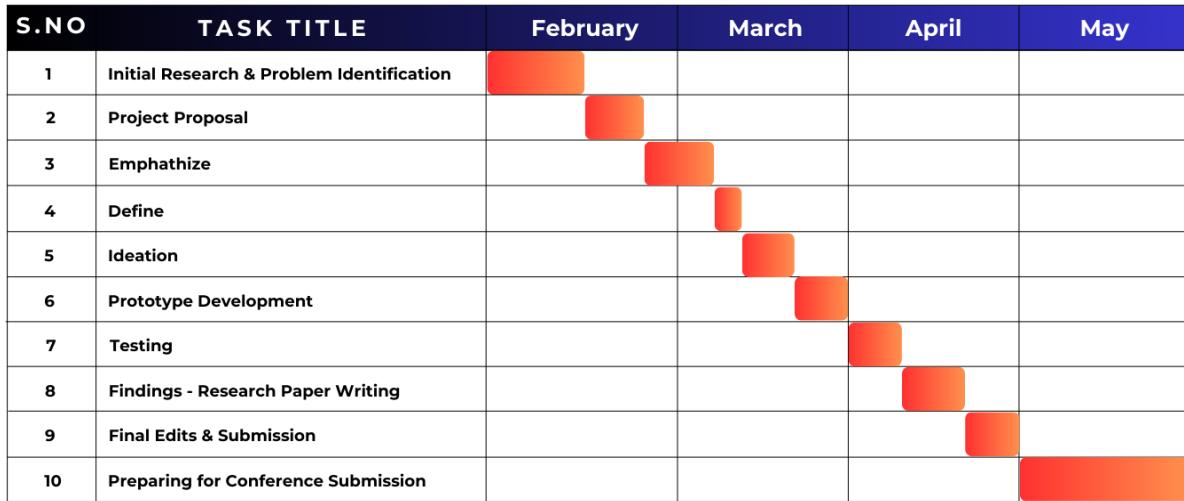


Figure 14: Project Timeline: Gantt Chart

We are currently working on building our prototype based on the insights and requirements gathered during our research and design phases. In the coming weeks we plan to test the prototype with actual users to get feedback on usability and functionality. This will help us evaluate how well the system meets user needs and guide us in making improvements before we make our final submission.

4 Team Task Breakdown

- **Huzaifah Tariq Ahmed**

Worked on task analysis, system requirements, and use case definitions. Contributed to the MoSCoW prioritization and collaborated on creating the wireframes and app's overall structure.

- **Basil Khwaja**

Conducted user interviews with shop keepers, gathered key information, and contributed in the creation of storyboards. Also wrote the Challenges section and made sure it showed real project experiences and how we as a team planned to cop up with those challenges.

- **Javeria Azfar**

Collaborated on designing the wireframes and helped refine user personas based on interview data. Also played a key role in organizing and writing the report content in a clear and structured manner.