1. Alice, a Cleaner

I. General Role & Experience:

1. "My typical day involves cleaning different buildings on campus – classrooms, offices, and hallways. It's mostly keeping things tidy and sanitizing surfaces."
2. "I primarily cover the main academic blocks and the library building. My shifts are usually during the late afternoon and evening."
3. "Oh, I come across lost personal belongings quite often, especially after classes or events. Maybe two or three times a week, sometimes more, depending on the area."

II. Current Lost & Found Process (Finding Items): 4. "When I find something, like a phone, a textbook, or a jacket, my usual process is to pick it up. I'll ask around if there's anyone nearby who might have lost it. If not, I just take it with me." 5. "I usually take these found items to the nearest security office or sometimes to the main help desk in the administration building. It depends on where I am on campus at the time." 6. "It takes a bit of time, actually. First, picking it up, then finding a bag or a safe place for it. Then, I have to make a separate trip to the security office or help desk, which can sometimes be out of my way, interrupting my cleaning route." 7. "Sometimes I find things that are hard to identify, like a single key. I'm always worried if it's really important to someone. Or sometimes it's just a water bottle, and I'm not sure if it was lost or just left behind. It would be good to have clear guidance." 8. "Honestly, it's a bit of a hassle. It takes time, and sometimes I feel like the items just disappear into a black hole after I drop them off. I don't know if they ever get back to their owner. It's not always easy to find the security office during my shift either."

III. Needs & Expectations for a New System: 9. "If there was an app where I could just quickly take a picture of the item, write a short description, and say where I found it, that would be amazing. Less time going back and forth, more time cleaning."

10. "Uploading a picture would be very important! It's much easier to identify a lost item from a picture than just a written description. It also shows exactly what I found." 11. "I would definitely prefer to just drop the item at a designated, secure spot, like a locked box near the security office, after reporting it digitally. That would save me so much time. Then security can handle the pickup later." 12. "A new system could make my job so much easier by streamlining the process. I could report items faster, and hopefully, they'd get back to their owners quicker. It would reduce the burden on us."

IV. Suggestions & Improvements: 13. "My main suggestion is to make the reporting process super simple and fast for us. Maybe a dedicated drop-off point that's easy to access. And if there could be a way for me to see if an item I reported was claimed, that would be nice." 14. "For training, a simple, quick tutorial on the app – maybe a short video – would be best. I'm not very tech-savvy, so it needs to be straightforward. Just show me how to log in, take a picture, and submit."

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2. Victor, a Cleaner

I. General Role & Experience:

1. "My job as a cleaner is usually about maintaining cleanliness in the lecture halls and dormitories. I sweep, mop, empty bins, and ensure the areas are presentable for students and faculty."
2. "I primarily work in the dorm common areas and the larger lecture theaters. My shifts are mostly in the mornings before classes start, and then again in the late evenings."
3. "Yes, I find lost items quite often, especially things left behind in lecture halls. It happens almost every day, sometimes multiple items in one day."

II. Current Lost & Found Process (Finding Items): 4. "When I come across a lost item – could be a phone, some notes, or even a piece of clothing – I usually pick it up. If it's in a lecture hall, I might place it on the lecturer's desk if they're still around, but mostly I take it with me." 5. "I take them to the closest departmental office if it's open, or directly to the main campus security office. Sometimes, I just leave them with the building supervisor if I can't get to security right away." 6. "It definitely adds time to my routine. Going to another office, explaining what I found, sometimes waiting for someone to be available. It's not part of my core cleaning duties, so it feels like an extra task that takes away from my schedule." 7. "I sometimes find items that look less valuable, like a single pen or a used notebook. It's hard to decide if it's truly 'lost' or just discarded. It would be good to have clear guidelines on what counts as a 'lost item' to report." 8. "The current method is slow and fragmented. There's no one clear place to report. It's all very manual. Sometimes I wonder if the items I turn in ever actually get back to their owners, or if they just sit in a box somewhere."

III. Needs & Expectations for a New System: 9. "A digital system where I can just quickly enter the details of the item, like its type and where I found it, would be fantastic. Something fast and easy to use on my phone."

10. "Pictures are crucial. If I found a unique bag, a picture would show its exact design, making it easier for the owner to recognize it and for security to verify it. It makes the process much more reliable." 11. "For me, the best option would be to report it on the app and then have a secure drop-off point where I can leave the item. It saves time and ensures the item is in a safe place immediately after I report it." 12. "A new system would definitely make my job more efficient. It would remove the guesswork and the extra trips. I'd feel better knowing the items I find have a better chance of being returned."

IV. Suggestions & Improvements: 13. "Make the app interface very simple, with big buttons and clear instructions. Maybe even a feature to quickly select common items from a list instead of typing everything out. And clear drop-off instructions once an item is reported." 14. "A short practical demonstration of the app. Not too much reading, just showing me exactly what to click and what information to provide. Something I can quickly refer to if I forget a step."

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3. Josh, a Security Guard

I. General Role & Experience:

1. "My daily responsibilities as a security guard involve patrolling campus grounds, monitoring CCTV, responding to alarms, and assisting students and staff with various issues, including lost and found items. I'm usually at the main security desk or doing rounds."
2. "Students and staff approach us quite frequently with both lost item inquiries and to hand in items they've found. It's a constant stream of requests throughout the day."
3. "We commonly deal with lost ID cards, phones, laptops, and keys. On the found side, it's often textbooks, water bottles, and accessories."

II. Current Lost & Found Process (Management & Recovery): 4. "When someone reports a lost item, we usually ask them to fill out a paper form or we manually log it into a simple spreadsheet. We note down the item, their contact details, and where they think they lost it. Then we check our 'found' logbook."

5. "When we receive a found item, we log it similarly in a separate 'found' logbook – date, time, who found it, basic description. Then we put it into a designated storage area. It's very manual, and if the description isn't clear, it's hard to match." 6. "Verifying ownership is one of the biggest challenges. We try to ask for unique identifiers or very specific details, but sometimes it's just 'a black backpack,' and anyone could claim it. It opens the door for potential fraud or disputes."

7. "Tracking returned items is also difficult. We mark it in the logbook, but there's no real system to prevent duplication or to easily check if someone has already claimed an item. It's prone to human error and relies heavily on meticulous handwriting."

8. "The biggest frustrations are the sheer volume of manual entries and the lack of a quick search function. We spend a lot of time flipping through pages. Also, there's no way to proactively notify someone if we find their lost item, which is a major pain point."

III. Needs & Expectations for a New System: 9. "A digital system would be a game-changer. I'd want a powerful search function with filters for item type, color, and location found. Also, a way to quickly upload photos of found items. Being able to change an item's status (e.g., 'claimed,' 'archived') digitally would be great." 10. "It's extremely important to have a centralized view. Currently, different departments might have their own informal lost and found. A single, unified system would allow us to see everything and improve recovery rates dramatically." 11. "A digital system could significantly improve verification. If users upload photos when they report a lost item, we could visually match it to a found item. Or if it requires a specific campus ID linked to their account for claims, that would be very secure."

12. "Yes, absolutely. Being able to communicate directly and securely with both the finder and the owner through the system, without giving out personal numbers, would build a lot of trust and streamline the handover process."

IV. Suggestions & Improvements: 13. "Implement a robust system for tracking items from when they are found until they are returned. Maybe even QR codes for items. And definitely, notifications for both parties when a match is found or an item's status changes. That would reduce inquiries for us." 14. "For training, a clear user manual for the administrative panel, and a hands-on session on how to manage items, change statuses, and verify claims. It should be user-friendly, even for someone who's not super tech-savvy."

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4. Mary, a Security Guard

I. General Role & Experience:

1. "My shifts involve patrolling specific zones of the campus, responding to incidents, and being a point of contact for students and staff. A significant part of my day also involves handling lost and found inquiries."

2. "We get calls and in-person visits about lost items throughout the day. People also hand in found items regularly, especially after evening classes or during building closures."
3. "I see a lot of wallets, keys, student ID cards, and sometimes expensive electronics like laptops or tablets reported as lost. Found items are often bags, books, and clothing."

II. Current Lost & Found Process (Management & Recovery): 4. "When a lost item is reported, we take down the details in a written log. We ask for the item's description, where it was lost, and the person's contact info. Then we physically check our storage area to see if anything matches."

5. "For found items, we log them in, assign them a number, and store them securely. We try to be very descriptive, but it's not always easy. If it's something like a wallet with an ID, we try to contact the person directly if possible."
6. "Verifying ownership is tough without a digital record or good photos. Someone might just describe a common item, and we have no definitive way to know if it's truly theirs. We rely a lot on asking detailed questions about contents or unique marks, but it's still challenging to prevent false claims."

7. "Our tracking of returned items is quite basic. We mark it in the logbook when it's picked up. But if there are multiple similar items, or if someone tries to claim an item they've already claimed, it's hard to catch unless we remember every detail."

8. "The main frustrations are the manual logging and the time it takes. It's not efficient to sift through pages of entries when someone is looking for an item. We also can't easily cross-reference lost and found items unless someone describes something very specific."

III. Needs & Expectations for a New System: 9. "A digital system must have a powerful search engine, where I can filter by item type, color, and location found. The ability to upload and view photos for both lost and found items would be invaluable for verification." 10. "Having a single, integrated system would be a huge improvement. No more fragmented information across different offices. It would help us to match items much faster and improve our recovery success rate." 11. "A digital system could include features like asking for a 'secret question' about the item's contents, or having the user's campus ID linked to their profile for claiming. This would significantly enhance verification and deter false claims."

12. "Absolutely. A secure in-app messaging feature would be fantastic. It would streamline communication between finders, owners, and us, without needing to

share personal contact details, which adds an extra layer of privacy and security."

IV. Suggestions & Improvements: 13. "I'd suggest having clear, standardized categories for items in the system. Also, a feature that automatically suggests matches between lost and found items based on keywords or categories. That would save us a lot of manual checking." 14. "We'd need practical, hands-on training sessions focusing on how to use the system's search, logging, and verification features. And ongoing support, perhaps a quick guide, for when new situations arise."

Integrating Key Technologies into the Campus Lost & Found System

1. SQL Database

Role in the System: An SQL (Structured Query Language) database would serve as the primary data storage solution for the Campus Lost & Found System. It is ideal for managing the highly structured and relational data inherent in this application.

Purpose & Benefits:

Structured Data Storage: It would store all core entities like Users, LostItems, FoundItems, ItemCategories, and Messages (for in-app communication). Each entity would have its own table with defined columns and relationships.

Data Integrity: SQL databases enforce data integrity through constraints (e.g., primary keys, foreign keys), ensuring that item records are consistent and accurate, and that relationships between users and their reported items are maintained.

Complex Querying & Matching: The system's **FR-04: Search for Items** requirement, which involves searching with various filters (type, location, date range, keywords) and potentially matching lost and found items, would be efficiently handled by SQL's powerful querying capabilities. It allows for optimized indexing to ensure quick retrieval (**NFR-03: Performance**).

Scalability: Modern SQL databases (like PostgreSQL, MySQL) are highly scalable and robust, capable of handling the hundreds of

thousands of item records and supporting the concurrent active users (**NFR-04: Scalability**) envisioned for the system.

Auditability: SQL databases can be configured for robust logging, supporting **NFR-05: Audit Logging** (if you add this as an NFR for security and compliance, though mentioned in your problem notes).

Integration Example:

When a user reports a lost item (**FR-02**), the data would be inserted into the LostItems table.

When an administrator updates an item's status (**FR-06**), a UPDATE query would modify the Items table.

2. Android Studio

Role in the System: Android Studio is the official Integrated Development Environment (IDE) for building the native Android mobile application component of the Campus Lost & Found System.

Purpose & Benefits:

Native Android App Development: It provides a comprehensive suite of tools for designing, developing, testing, and debugging the mobile application that users will interact with on their Android devices. This directly fulfills the need for a mobile application interface for **FR-02: Report Lost Item**, **FR-03: Report Found Item**, **FR-04: Search for Items**, and **FR-05: Secure In-App Messaging**.

Rich UI/UX Design: Android Studio supports XML-based layouts and Jetpack Compose for building rich, responsive, and intuitive user interfaces that meet **NFR-05: Usability** requirements, ensuring a user-friendly experience for Aisha (student) and Mark (cleaner supervisor).

Debugging & Performance Tools: Its integrated debugger, profilers, and emulators are crucial for identifying and resolving issues quickly, optimizing app performance (**NFR-03: Performance**), and ensuring a smooth user experience across various Android devices.

Integration with Android SDK: It provides access to the full Android Software Development Kit, allowing the app to leverage device features like the camera (for image uploads), location services, and notifications (**FR-07: Notification System**).

3. Firebase Auth (Authentication)

Role in the System: Firebase Authentication would be used to manage user registration and login securely for both the mobile and web applications of the Campus Lost & Found System.

Purpose & Benefits:

Secure User Authentication (FR-01 & NFR-01): Firebase Auth provides pre-built, secure, and scalable backend services for user authentication. It supports various authentication methods (email/password, Google Sign-In, etc.), which directly addresses **FR-01: User Registration and Authentication** and contributes significantly to **NFR-01: Security**.

Simplified User Management: It handles user creation, password resets, email verification, and session management, reducing the development effort required for authentication infrastructure.

Scalability & Reliability: As a Google Cloud service, Firebase Auth is highly scalable and reliable, ensuring that the authentication system can handle a large number of concurrent users without performance degradation (**NFR-04: Scalability**).

Integration with Security Measures: It securely manages user tokens and provides built-in security features, helping to protect user accounts and data, aligning with **NFR-01: Security** and **NFR-02: Data Privacy Compliance**.

Integration Example:

When a student registers, Firebase Auth would handle the creation of their user account and secure storage of their credentials.

Upon login, Firebase Auth would verify their credentials and provide a secure token, which the backend can then use to authenticate subsequent API requests for reporting or searching items.