FreshTech Systems

TechPoint Tower, 88 Innovation Drive,
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Project Specification Analysis Report

ValuPrice SmartReplenish Android Mobile Application

Date: 11/02/2026
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Prepared by: Group 1376T

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Declarations

AI Declaration

We acknowledge the use of Gemini, ChatGPT, and Grammarly solely for grammar correction and enhancement. We have reviewed, edited, and verified all AI-generated suggestions. Every technical requirement, system constraint, and functional specifications are the original work of this group.

Plagiarism Declaration

Employees are not allowed to copy assessment solutions from another person or from other sources. It is the employees' responsibility to guarantee that their solutions are their own work. Meanwhile, the employees must also ensure that their work is not accessible to others.

We hereby declare that:

- We fully understand and agree to the above-mentioned policy.
- We did not copy any materials from others or from other places.
- We did not share our materials with others or upload them to any other places for public access.
- We agree that we will not disclose any information or material from the team project to others or upload it to any other places for public access.
- We agree that our project will receive zero marks if any misalignment with the above mentioned policies is detected.

Declared By: Group 1376T

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Date: 13/02/2026

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1. Executive Summary

FreshTech Systems Analysis Team has completed the Breakdown and Clarify stages of BCIC analysis for the ValuPrice SmartReplenish Inventory Management System, and aims to move to the Interpretation stage. The project aims to deliver an Android-native application with an Azure cloud backend, enabling loyalty members to track home inventory, receive low-stock alerts, and generate automated shopping lists.

Out of 21 requirements analyzed, 10 business and 11 technical requirements, 52% are cogent and ready for specification, while the remaining 48% contain incongruities requiring resolution. 3 critical priority items block development initiation (IR-01 categorization redundancy, IR-05 authentication deadlock, IR-08 camera precedence mismatch). 2 High priority items threatening budget and architecture (IR-09 GS1 feasibility, IR-10 offline sync conflict). 3 medium priority items affecting business rules and user experience (IR-02 expiry thresholds, IR-03 price sync, IR-04 risk algorithm, IR-11 dashboard ownership). Lastly, 4 editorial resolutions are implementable without stakeholder involvement (IR-06 hyperscale removal, IR-07 Kotlin update, IR-12 continuous documentation).

Based on the issues identified during Breakdown & Clarify, the team expects meaningful cost avoidance by preventing rework across authentication, offline sync, and GS1 integration. Using a conservative assumption that resolving defects during implementation costs 3–5× more than resolving them during analysis (due to redevelopment, retesting, and re-documentation), addressing the 3 critical and 2 high priority incongruities before development starts is projected to avoid approximately 15–40% of potential rework effort for the affected modules. This reduces schedule risk and protects budget by preventing redesign of core architecture decisions (authentication, data sync strategy, barcode standardization).

Immediate Account Manager-facilitated clarification is required for critical and high-priority items, with recommended strategic actions including elevation of precedence for standardization to token-based authentication, GS1 cost ceiling confirmation, offline conflict resolution, and editorial stack modernization, enabling progression to Interpret and Categorize stages upon resolution within the two-week clarification window.

2. BCIC Analysis

The following analysis is based on the ValuPrice Project Specification reproduced in Annex A. Requirement IDs (BR-XX, TR-XX) correspond to the entries in Annex A. Incongruities identified are tagged [ICG-XX] and prioritized for stakeholder clarification in Section 2.2.

2.1 Breakdown

2.1.1 Team Incongruous Checklist

ID	Reqr ID	Classification	Rationale
IR-01	BR-03	Inconsistent with another requirement/Substantively invalid	Manual categorization (BR-08) is required for items without barcodes, but proposes Auto-population via GS1 database (TR-08)
IR-02	BR-06	Not feasible or unrealistic	Impractical 72-hour alert window. May be too late for many perishables (milk, bread) and too early for others (canned goods)
IR-03	BR-08	Inconsistent with another requirement	Price synchronization frequency vs. performance. May create stale pricing during promotions. Frequent sync conflicts with offline caching strategy (TR-09).
IR-04	BR-09	Ambiguous & Inconsistent with another requirement	Undefined "High Risk" stockout. Unverifiable and potentially inconsistent with auto-list generation logic (BR-07).
IR-05	BR-10	Ambiguous, Inconsistent, and/or Compound requirements	OTP via registered contacts (BR-10) and time-limited tokens (TR-13) are different implementations for same feature. Ambiguous registered contacts (email/phone).
IR-06	TR-04	Unseemly prioritized	Desirable precedence contradicts Essential TR-03, hyperscale significantly increases cost and complexity for a home inventory app.
IR-07	TR-06	Not feasible or unrealistic	Mandating Java/XML conflicts with modern Android practices. Kotlin is Google-preferred.
IR-08	TR-07	Unseemly prioritized	Desirable camera integration for Essential item scanning (BR-02). If TR-07 fails, BR-02 cannot be implemented.
IR-09	TR-08	Not feasible or unrealistic	Expensive and restrictive for GS1 API access. Conflicts with budget-friendly (TR-05) and may violate the offline-first requirement (TR-09).

IR-10	TR-09	Inconsistent with another requirement	Local caching (TR-09) creates sync conflicts with stock updates (BR-04) from the server. Missing a conflict resolution.
IR-11	TR-11	Suspected incompleteness	No clear business owner or maintenance plan for a parallel web development track.
IR-12	TR-12	Suspected incompleteness	Final documentation handover lacks interim documentation requirements for agile development throughout the project lifecycle.

The indicated incongruent requirements are in the requirements tree provided in Appendix A for reference.

2.1.2 Cogent Requirements

The validated functional scope is represented in the Use Case Diagram (Appendix B), which maps the actors to the core use cases.

Reqrs ID	Rationale
BR-01	Standard loyalty integration. Is atomic with no undue complexity or listed items.
BR-02	Core scanning functionality. Used the appropriate Imperative “must” for essential.
BR-04	The "one-hand use" constraint provides a clear metric for UI/UX testing.
BR-05	The requirement is testable. Passing/failing a push trigger is verifiable
BR-07	Not Compound. Logical extension of BR-05, ensuring atomicity.
TR-01	Specifically addresses data residency and latency needs
TR-02	RESTful architecture is atomic and without undue complexity or excessive continuance.
TR-03	Used the appropriate imperative shall as Azure SQL with backups is a critical backend infrastructure requirement.
TR-05	Feasible as Android 6.0 is a realistic baseline for the target budget device.
TR-10	AES-256/TLS 1.2+ is substantively valid. Aligns with Singapore PDPA policy.
TR-13	Secure password reset aligns with industry standards for security, making it verifiable and feasible.

2.2 Clarify

2.2.1 Clarifying Questions by Priority

2.2.1.1 Critical Priority Questions

These incongruous requirements deter implementation and must be resolved before Interpretation can begin. Appendix C consolidates the Critical Priority Questions that require stakeholder confirmation and are prerequisites to initiating software design.. Three critical questions block development: whether categorization is mandatory or GS1-dependent (IR-01), whether authentication uses OTP or tokens (IR-05), and whether camera integration must be Essential for scanning to function (IR-08). The Account Manager will facilitate stakeholder decisions on these items before design commences

2.2.1.2 High Priority Questions

These incongruous requirements create technical/budget risks (Appendix C, High Priority Questions). The high-priority questions center on GS1 feasibility licensing, cost ceiling, and geographic scope (IR-09), offline architecture, editing permissions, conflict resolution, and sync thresholds (IR-10). These architectural decisions prevent budget overrun and data corruption risks.

2.2.1.3 Medium Priority Questions

These incongruous requirements affect business rules/user experience (Appendix C, Medium Priority Questions). Medium priority questions refine UX and business rules: variable expiry thresholds and price sync behavior (IR-02, IR-03), "High Risk" algorithm definition (IR-04), and dashboard ownership assignment (IR-11). These enhance product fit without blocking the technical baseline.

2.2.1.4 No Clarification Needed

These incongruous requirements can be resolved editorially without stakeholder involvement because of their low priority.

ID	Resolution
IR-06	Remove hyperscale to prevent over-engineering.
IR-07	Update to Kotlin to align with modern Android standards.
IR-12	Change to continuous documentation instead of final documentation.

2.2.2 Account Manager

To mitigate the risks inherent in the transition from the Tender process to the Analysing method, FreshTech Systems has assigned a dedicated Account Manager to oversee the ValuPrice engagement. The role is focused on cultivating a sustainable, long-term partnership rather than a purely transactional vendor-customer interaction

Facilitating Cooperative Interactions:
Responsible for arranging high-priority, face-to-face sessions between our Business Analysts and ValuPrice stakeholders during the **Clarify** activity. This ensures that priority incongruities are resolved efficiently through direct communication.

Risk Mitigation & Trust Building:
Addresses the customer's "Junior Analyst" fear by guaranteeing that only senior BAs conduct the **BCIC** activities and by providing frequent, transparent progress updates on the analysis team's status.

Strategic Opportunity Identification:
By maintaining a deep understanding of ValuPrice's retail operations, the Account Manager identifies business opportunities that align with existing contracts, such as ensuring the **SmartReplenish** system maintains inventory data quality and sustainability.

Neutralizing Communication Failure:
Acting as a buffer, the Account Manager intervenes when technical complexities threaten to overwhelm non-technical stakeholders, ensuring the project avoids the "blind faith" pitfalls common in standard software delivery.

2.3 Interpret

This section will formalize requirement semantics after Critical and High-priority incongruities (IR-01, IR-05, IR-08, IR-09, IR-10) are resolved.

2.4 Categorize

This section will finalize the requirement allocation after Medium-priority incongruities (IR-02, IR-03, IR-04, IR-11) are resolved.

3. Repository & Site Organization

3.2 Repository Link

https://github.com/Knight-RT/SmartReplenish

3.2 Site Organization

The repository is organised by project workflow so that deliverables can be located quickly and traced end-to-end (Requirements → Analysis → Models → Traceability → Implementation → Testing). The top-level folders are:

- **README/** : Navigation guide and links to latest deliverables
- **01_Requirements/** : Project Specification (SRS), baselined requirement IDs (FR/NFR), revisions
- **02_Analysis/** : Analysing (BCIC) Debriefing Report, stakeholder notes, findings and status
- **03_Models/** : UML/PlantUML diagrams (use case, class, sequence), domain/data models
- **04_Traceability**/ : iRTM / traceability tables mapping PS ↔ SRS ↔ (later) tests
- **05_Implementation/** : Source code
- **06_Testing_Evidence/** : test cases, screenshots, and results linked back to requirement IDs

4. Risk Analysis

This section identifies risks that threaten the successful delivery of the SmartReplenish project. Risks are assessed using Likelihood Rank (L, 1 = highest probability among identified risks) and Severity Rank (S, 1 = worst impact among identified risks).

4.1 FreshTech Systems Risks

ID	Risk Description	L	S	Mitigation Strategy
VR-01	Potentially increasing development hours beyond the project budget. TR-06 mandates Java, while Kotlin is preferred for modern Android development.	3	3	Interpret the requirement to Kotlin with the customer's consent to maintain the budget line.
VR-02	Additional development cost due to an undefined “High Risk” definition (BR-09). The lack of a simple formula to define a high-risk stockout may turn into a costly predictive analysis.	2	1	Use the Clarify phase to fix the calculation as a simple threshold check to avoid AI scope creep.
VR-03	The lack of a conflict resolution strategy for offline editing (TR-09) will corrupt the inventory logs, affecting UX.	1	2	Propose a "Last Write Wins" logic during the Clarify phase.

4.2 ValuPrice Risks

ID	Risk Description	L	S	Mitigation Strategy
CR-01	Labeling expiry date logging as "Desirable" risks SFA regulatory action, as missing tracking on perishables (dairy, seafood), creates food safety liability.	3	3	Change priority to “Essential”.
CR-02	Integration with global GS1 databases (TR-08) may inadvertently move personal data outside of Azure Singapore (TR-01), risking a PDPA/Data Residency breach.	2	1	Perform a V&V audit for implementation neutrality and data residency compliance.
CR-03	The vendor's implementation of OTPs via "registered contacts" (BR-10) may create data intercept vulnerabilities. This risk a PDPA breach.	1	2	Mandate MFA standards in the SRS to ensure secure, encrypted identity verification

5. Sign-off

This Analysing Debriefing Report records the Requirements Engineering (RE) work completed during the Analysing stage for the SmartReplenish project, covering the activities of Breakdown, Clarify, Interpret, and Categorize (BCIC). It summarises each activity's objectives, what was done, what went well, what went wrong, key findings, and the current status of the RE operation at this point.

By signing below, the approvers confirm that they have reviewed this report and agree that:

- The report accurately represents the BCIC activities performed over the past two weeks and the resulting outputs
- The findings and risks documented are valid and acknowledged.
- The identified next steps and recommended actions for proceeding to Specifying / SRS baseline are accepted as the current plan.

This sign-off does not freeze or baseline the final requirements, it confirms agreement on the current analysis outcomes and RE status. Any material disagreements or additions after sign-off must be recorded as Open Issues or Change Requests and managed through the team's change control process.

5.1. Review & Acknowledgement (Technical & Operational)

Role / Organisation	Name	Signature	Date
Project Lead, ValuPrice	David Chen		
Senior Project Manager, FreshTech Systems	Sarah Lim		

5.2. Financial & Compliance Approval

Role / Organisation	Name	Signature	Date
Head of Finance, ValuPrice	Derek Chua		
Head of Legal and Compliance, Value Price	Anthony Tan		

5.3. Project Sponsor

I hereby authorize this project specification for official release to the market for tendering.
Name:
Date:
Signature:

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Appendix A - Requirements Tree

L0: SmartReplenish
- L1: Business Requirements
  - User Management:
    - BR-01 User Account (Essential)
    - BR-10 Forgot Password (Essential) [IR-05]
  - Inventory Management:
    - BR-02 Item Scanning (Essential) [IR-08]
    - BR-04 Stock Tracking (Essential)
    - BR-05 Low-Stock Alerts (Essential)
  - Shopping List Generation:
    - BR-07 Auto-List (Essential) [IR-10]
  - Manual Entry:
    - BR-03 Manual Entry (Desirable) [IR-01]
  - Expiry Management:
    - BR-06 Expiry Tracking (Desirable) [IR-02]
  - Price & Risk Features:
    - BR-08 Price Sync (Desirable) [IR-03]
    - BR-09 Risk Suggestion (Acceptable) [IR-04]
- L1: Technical Requirements
  - Infrastructure:
    - TR-01 Azure Singapore (Essential)
    - TR-02 Cloud-Native REST (Essential)
    - TR-03 Azure SQL + backups (Essential)
    - TR-04 Hyperscale/Serverless (Desirable) [IR-06]
  - Mobile Platform:
    - TR-05 Android 6.0+ (Essential)
    - TR-06 Java/XML (Desirable) [IR-07]
    - TR-07 Camera 1D/2D (Desirable) [IR-08]
  - Data & Integration:
    - TR-08 GS1 Database (Acceptable) [IR-09]
    - TR-09 Local Caching (Desirable) [IR-10]
  - Security & Compliance:
    - TR-10 PDPA Compliance (Essential)
    - TR-13 Secure Password Reset (Essential)
  - Admin & Documentation:
    - TR-11 Admin Dashboard (Acceptable) [IR-11]
    - TR-12 API Documentation (Acceptable) [IR-12]

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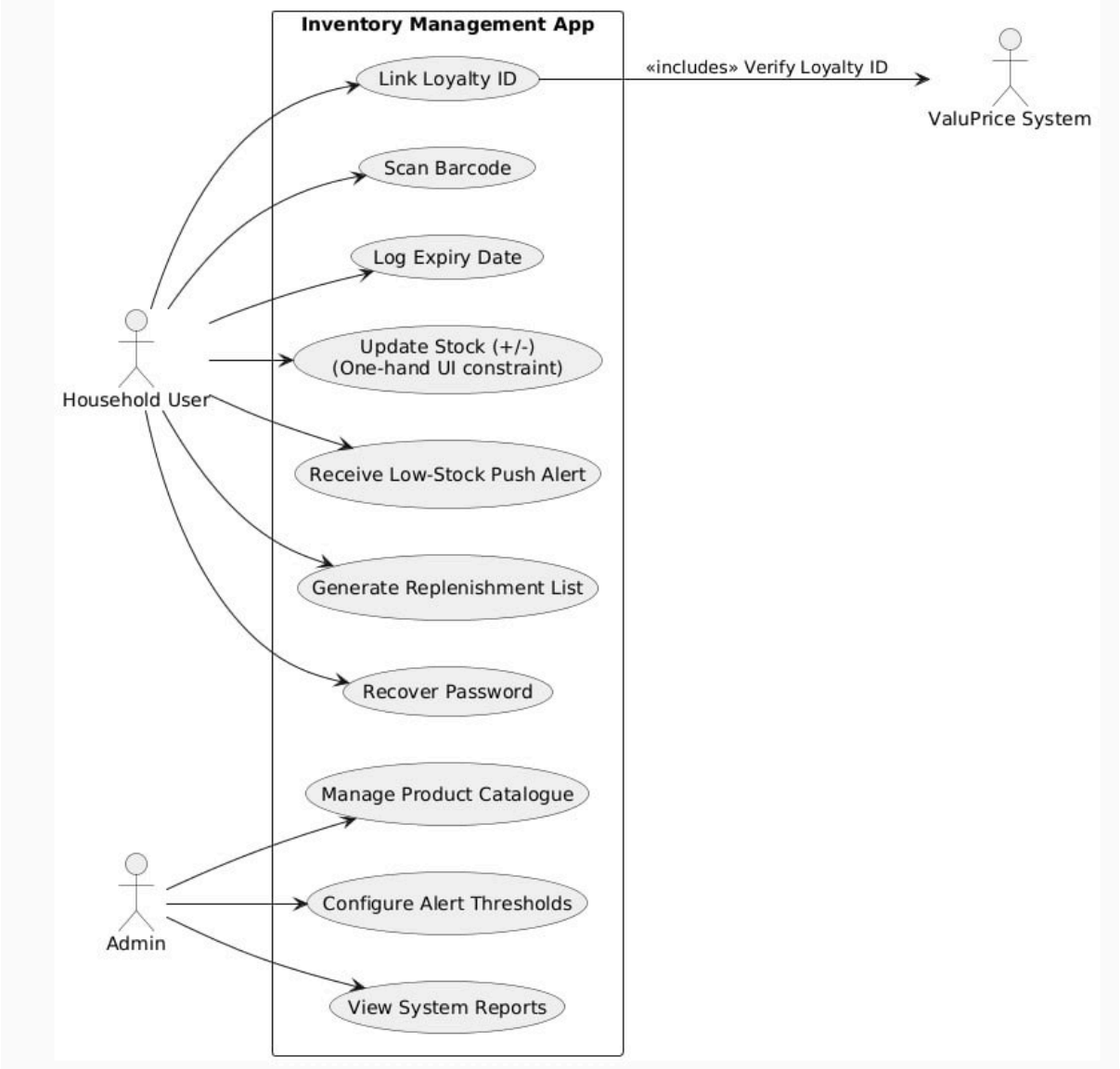
Appendix B - Use Case Diagram



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Appendix C - Clarifying Questions

Critical Priority Questions

ID	Questions
IR-01	• Is categorization mandatory for all manual entries, or can users skip it? • If GS1 integration succeeds, does categorization become automatic or remain manual? • Can the app function with "uncategorized" items in the interim? • What is the business value of categorization: analytics, store mapping, or user organization?
IR-05	• Does "registered contacts" mean SMS, email, or both? • Is "time-limited" referring to OTP expiration (minutes) or token validity (hours)? • What is the actual user flow for password reset? Active screen OTP or an email reset link?
IR-08	• Is manual entry (BR-03) an acceptable fallback if camera integration fails? • If scanning is truly Essential, should TR-07 be elevated to Essential? • What is the minimum viable barcode format: 1D only, or must include 2D/QR? • Are there budget/licensing constraints preventing camera integration from being Essential?

High Priority Questions

ID	Questions
IR-09	• Is there existing GS1 licensing or partnership? • Does "Acceptable" precedence mean "nice to have if free" or "required if technically possible"? • What product coverage is expected: Singapore-only Stock Keeping Units (SKUs) or global products?
IR-10	• Is offline mode read-only viewing, or must edits be possible? • If edits are allowed, how should conflicts be resolved: last-write-wins, manual merge, or server authority? • What is the maximum offline duration before sync is mandatory: hours, days, or unlimited?

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Medium Priority Questions

ID	Questions
IR-02	• Is 72 hours a minimum, maximum, or fixed window? • Should different categories have different thresholds (e.g., dairy = 48 hours, canned = 2 weeks)? • Can users customize alert timing per item or category? • What constitutes "expiry": best-before, use-by, or sell-by dates?
IR-03	• If offline, show last-known price, hide prices, or show estimated prices? • Is the price total in the shopping list a strict budget tool or an approximate guide? • Should price sync be user-triggered (pull-to-refresh) or strictly background? • What happens if price sync fails for 48+ hours: stale data warning, or block list generation?
IR-04	• Is BR-09 required for MVP or future release? • If required, what algorithm defines "High Risk"?
IR-11	• Who is the primary business stakeholder responsible for managing the "master product catalogue" mentioned in TR-11? • Who will be responsible for the long-term hosting and security patching of this web portal after the initial handover?

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Annex 1 - Project Specification

A.1 Business Requirements (Extract)

ID	Title	Description	Constraints & Business Rules	Precedence
BR-01	User Account	Users shall create a profile linked to their ValuPrice Loyalty ID.	One profile per valid ID.	Essential
BR-02	Item Scanning	The system must allow users to add items via a barcode scanner.	Must sync with the master database.	Essential
BR-03	Manual Entry	The app shall allow manual searches for items without barcodes.	Categorization is mandatory.	Desirable
BR-04	Stock Tracking	The system shall provide a simple +/- interface to update home stock.	UI must be for one-hand use.	Essential
BR-05	Low-Stock Alerts	Users shall set thresholds that trigger replenishment notifications.	Notifications must be push-based.	Essential
BR-06	Expiry Tracking	The app shall log expiry dates and send "consume soon" alerts.	Alert sent 72 hours before expiry.	Desirable
BR-07	Auto-List	The system must compile a shopping list from items below thresholds.	Group items by store category.	Essential
BR-08	Price Sync	The list shall display current store prices and calculate a total.	Sync must occur every 24 hours.	Desirable
BR-09	Risk Suggestion	The app shall suggest alternatives if a listed item is "High Risk" of stockout.	Limit to currently in-stock items.	Acceptable
BR-10	Forgot Password	The app must ensure	OTP generated on	Essential

		user retention by providing self-service account recovery	password reset via registered contacts	

A.2 Technical Requirements (Extract)

ID	Technical Requirement	Precedence
TR-01	The backend shall be hosted on Microsoft Azure within the Singapore region to ensure data residency compliance and low-latency access for local users.	Essential
TR-02	The system shall use a Cloud-Native RESTful architecture to manage the synchronization between the mobile front-end and the centralized inventory database.	Essential
TR-03	The system shall utilize Azure SQL (MSSQL) for all structured data, automated daily backups and point-in-time recovery.	Essential
TR-04	The database shall utilize hyperscale or serverless configurations to handle peak traffic without manual intervention.	Desirable
TR-05	The system shall be a native application compatible with Android 6.0 (API Level 23) and above to ensure compatibility with a wide range of budget-friendly mobile devices.	Essential
TR-06	The system shall be programmed using Java/XML to ensure the code is maintainable by standard Android development teams.	Desirable
TR-07	The system shall integrate with the device's camera hardware to support 1D (EAN/UP) and 2D (QR) barcode scanning.	Desirable
TR-08	The system shall integrate with the GS1 Global Product Database API (or equivalent) to automatically populate product names and images based on scanned barcodes.	Acceptable
TR-09	The system shall implement a local caching mechanism to allow users to view and edit their inventory in areas of poor cellular reception.	Desirable
TR-10	The system shall comply with Singapore PDPA regulations, including AES-256 encryption for data at rest and TLS 1.2+ for data in transit.	Essential
TR-11	A secure web-based admin dashboard shall be provided for the Customer Project Team to manage the master product catalogue and user accounts.	Acceptable
TR-12	The vendor shall deliver complete API Documentation using OpenAPI or Swagger and a system architecture diagram as part of the final handover.	Acceptable
TR-13	The system must implement a secure password reset protocol, using a unique, time-limited tokens and industry standard encryption for data transmission and storage	Essential