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NGORONGORO CONSERVATION AREA AUTHORITY

Software Requirements Specification

NCAA Digital Transformation - Comprehensive Mobile Application

Version: 1.0

Date: 2025-11-12

Status: Draft

www.ncaa.go.tz

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1 Document Information

Field	Value
Project Name	NCAA Digital Transformation - Comprehensive Mobile Application
Version	1.0
Date	2025-11-12
Project Manager	TBD
Tech Lead	TBD
Qa Lead	TBD
Platforms	['iOS', 'Android', 'Web']
Document Status	Draft
Budget	$185,000
Module Code	MOBILE_APP
Parent Project	NCAA Digital Transformation - Ngorongoro Gateway System

2 Project Overview

2.1 What Are We Building

2.1.1 System Function

Unified digital platform connecting tourists, tour operators, and NCAA staff through a single intelligent interface for bookings, payments, permit verification, and real-time communication. Features mobile-first, offline-capable architecture with seamless integration to Ngorongoro Gateway, Nasera AI, and Business Intelligence systems.

2.1.2 Users

- Tourists: International and domestic visitors for trip planning and permits
- Tour Operators: Safari companies managing manifests and bookings
- NCAA Staff: Field officers for operational reporting and coordination
- Management: Operations managers and administrators

2.1.3 Problem Solved

Manual paper-based booking causing delays, fragmented credit note and reconciliation issues, no self-service gateway entry, limited field reporting capabilities, lack of digital wallet for prepaid services, no multilingual AI assistance, no offline functionality for remote areas

2.1.4 Key Success Metric

Booking and payment processing 90% faster and error-free, 100% credit note resolution automation, 80% visitor satisfaction improvement, 70% field reporting efficiency gain, continuous operations despite power/connectivity challenges

2.2 Scope

2.2.1 In Scope

- Visitor and tour operator services (browsing, booking, payments)
- Digital wallet and payment gateway integration
- Self-service entry integration with Ngorongoro Gateway

- QR code-based permit verification
- Internal reporting and communication tools for staff
- AI-driven assistance via Nasera AI integration
- Offline functionality with auto-sync
- Multilingual support (English, Swahili)
- Low-power optimization for solar charging
- Real-time integration with BI System

2.2.2 Out Of Scope

- Third-party tour operator platform integration
- International flight booking
- Hotel/lodge reservation management outside NCAA facilities
- Wildlife tracking features

3 User Requirements

3.1 Visitor Tour Operator Services

Feature Code	I Want To	So That I Can	Priority	Notes
FT-MOBILE-BOOKING	Browse and book park entry, campsite, and activity permits	Plan my visit independently without manual processes	Must	Support sleeping/ passing tourist categories. Group booking capability.
FT-MOBILE-PERMIT-DISPLAY	Access digital permits with QR codes on my mobile device	Present permits at gates without physical paperwork	Must	Offline access to stored permits. Integration with Gateway QR verification.
FT-MOBILE-ITINERARY	Plan and manage my visit itinerary within the app	Organize activities, routes, and schedules efficiently	Should	Integration with offline maps. Activity scheduling and reminders.
FT-MOBILE-REALTIME-CAPACITY	View real-time capacity information for crater and gates	Plan visit timing to avoid overcrowding	Must	Live sync with Gateway capacity data. Color-coded availability indicators.

3.2 Digital Wallet Payments

Feature Code	I Want To	So That I Can	Priority	Notes
FT-MOBILE-WALLET	Maintain a digital wallet with preloaded	Make quick payments without	Must	Support mobile money, card payments, bank

Feature Code	I Want To	So That I Can	Priority	Notes
	funds for NCAA services	repeated card/ mobile money transactions		transfers. Real-time balance tracking.
FT-MOBILE-PAYMENT-GATEWAY	Pay for permits and services using multiple payment methods	Complete transactions conveniently and securely	Must	Mobile money (M-Pesa, Tigo Pesa, Airtel Money), Visa/ Mastercard, institutional billing.
FT-MOBILE-CREDIT-RESOLUTION	Redeem or modify unused services seamlessly through my wallet	Resolve credit notes and unutilized payments automatically	Must	Automated reconciliation. QR-based redemption at gates. Eliminates manual credit note processing.
FT-MOBILE-TRANSACTION-HISTORY	View complete transaction history and receipts	Track spending and maintain records for accounting	Must	Export to PDF/ email. Integration with BI system for analytics.

3.3 Self Service Gate Entry

Feature Code	I Want To	So That I Can	Priority	Notes
FT-MOBILE-QR-ENTRY	Use QR code scanning at gates for self-service entry	Access prepaid services without manual verification delays	Must	Real-time sync with Ngorongoro Gateway. Offline QR validation capability.
FT-MOBILE-GATE-STATUS	View live gate status and wait times	Choose optimal entry point and timing	Should	Integration with Gateway real-time data. Map-based gate visualization.

3.4 Internal Reporting Tools

Feature Code	I Want To	So That I Can	Priority	Notes
FT-MOBILE-STAFF-REPORTS	Submit operational updates and incident reports from the field	Maintain real-time accountability and coordination	Must	Photo attachments. GPS tagging. Offline submission with auto-sync.
FT-MOBILE-TASK-UPDATES	Receive and update task assignments in real-time	Coordinate field operations efficiently	Must	Push notifications. Status tracking. Integration with Fleet Management for vehicle assignments.
FT-MOBILE-ANALYTICS-ACCESS	Access performance analytics while in the field	Make informed decisions without returning to headquarters	Should	Role-based dashboard access. Real-time BI data visualization.

3.5 Offline Functionality

Feature Code	I Want To	So That I Can	Priority	Notes
FT-MOBILE-OFFLINE-MODE	Use core app functionality without internet connectivity	Continue operations in remote areas with poor connectivity	Must	Local caching of permits, maps, and recent data. Auto-sync when connection restored.
FT-MOBILE-LOW-POWER	Use the app efficiently on devices with limited battery/ solar charging	Support field operations in regions with limited electricity	Must	Optimized for low-power consumption. Background sync scheduling.

3.6 Ai Assistance

Feature Code	I Want To	So That I Can	Priority	Notes
FT-MOBILE-NASERA-CHAT	Ask questions and get guided assistance through AI chat	Get instant help with procedures, permit status, and general inquiries	Must	Powered by Nasera AI. Multilingual (English/ Swahili). Natural language processing.
FT-MOBILE-AI-RECOMMENDATIONS	Receive personalized recommendations for activities and routes	Enhance my visit experience with AI-powered suggestions	Should	Based on visitor preferences, weather, capacity data. Integration with conservation guidelines.

3.7 Multilingual Accessibility

Feature Code	I Want To	So That I Can	Priority	Notes
FT-MOBILE-MULTILANG	Use the app in my preferred language (English or Swahili)	Navigate and understand information comfortably	Must	Complete UI translation. AI chat in both languages. Adaptive layouts for different user categories.

4 Technical Requirements

4.1 Performance Standards

Requirement	Target	How To Test
App load time	< 3 seconds on 4G connection	Performance testing on target devices (Android 8+, iOS 12+)
Booking transaction time	< 30 seconds from selection to confirmation	End-to-end booking flow testing with 100 sample transactions
Offline data sync	Auto-sync within 2 minutes of connectivity restoration	Offline mode testing with controlled network interruptions
Payment processing	< 15 seconds for payment authorization	Payment gateway integration testing with multiple providers
QR code generation/scanning	< 2 seconds	QR functionality testing across device cameras

4.2 Platform Requirements

Platform	Minimum Version	Target Version	Notes
iOS	iOS 12	iOS 16+	Native performance via Flutter
Android	Android 8.0 (Oreo)	Android 13+	Native performance via Flutter
Web	Chrome 90, Firefox 88, Safari 14	Latest stable versions	Responsive web access for operators and admins

4.3 Security Privacy

Requirement	Must Have	Implementation
Data encryption	True	AES-256 at rest; TLS 1.3 for API communication
User authentication	True	OAuth 2.0 with JWT tokens. Role-based access control (RBAC). Session timeout after 30 min inactivity.
Payment data security	True	PCI DSS compliance. Tokenized payment processing. No local storage of card details.
Personal data protection	True	Compliance with Tanzania Data Protection Act. User consent management. Right to data deletion.

5 External Dependencies

5.1 Third Party Services

Service	What It Does	Criticality	Backup Plan
Payment Gateway (M-Pesa, Cards)	Process mobile money and card payments	Must have	Multiple gateway providers for redundancy
SMS Gateway	Send booking confirmations and alerts	Should have	Email and in-app notifications
Mapping Service	Provide offline maps and navigation	Should have	Pre-downloaded map tiles
Push Notification Service (FCM/APNS)	Deliver real-time alerts and updates	Must have	In-app notification polling

5.2 Device Requirements

Feature	Required	Optional	Notes
Camera for QR scanning	True	False	Standard device camera for permit verification
GPS for location services	False	True	Enhanced features like nearby attractions and gate navigation
Internet connectivity	False	True	Offline mode supports core functionality without connectivity

6 Release Planning

6.1 Development Phases

Phase	Features Included	Timeline	Success Criteria
Phase 1 (MVP - Tourist App)	['Permit booking', 'Digital wallet', 'Payment gateway', 'QR permits', 'Basic AI chat', 'Offline mode']	16 weeks	Tourist app operational with 90% faster booking and error-free payments
Phase 2 (Tour Operator App)	['Operator manifest management', 'Bulk booking', 'Credit redemption', 'QR gate entry', 'Advanced wallet features']	12 weeks	100% credit note resolution automation. Self-service gate entry functional.
Phase 3 (Staff & Admin Features)	['Field reporting tools', 'Analytics access', 'Task management', 'Admin panel', 'Advanced AI features']	12 weeks	70% field reporting efficiency gain. Real-time coordination operational.

6.2 Release Checklist

- All Must-Have features complete and tested
- Payment gateway integration tested with all providers
- Offline functionality verified across device types
- QR integration with Gateway system validated
- Security audit completed (penetration testing passed)
- User training materials prepared
- App store submission approved (iOS/Android)

- Performance baselines met (load time < 3s, booking < 30s)
- BI integration operational for analytics tracking

7 Risks Assumptions

7.1 Risks

Risk	Probability	Impact	Mitigation
Payment gateway downtime or integration failures	Medium	High	Multiple payment provider integration. Wallet system allows offline transaction queuing. Fallback to manual payment processing.
Low adoption due to limited smartphone penetration among local visitors	Medium	Medium	Web-based access alternative. Staff-assisted booking at gates. SMS-based confirmations.
Poor connectivity in remote areas affecting user experience	High	High	Offline-first architecture. Local data caching. Auto-sync when connectivity restored.
Security vulnerabilities in payment processing	Low	Very High	PCI DSS compliance. Regular security audits. Tokenized payments. Bug bounty program.
Integration issues with existing Gateway/Safari Portal systems	Medium	High	API-first design. Comprehensive integration testing. Phased rollout with pilot gates.

7.2 Assumptions

- Target users have basic smartphone literacy or can be trained
- Internet connectivity available intermittently for data sync
- Power supply stable enough or solar charging available for field devices
- Payment gateways (M-Pesa, cards) remain operational and accessible
- NCAA management committed to digital transformation and user adoption
- Budget of $185,000 secured for full implementation

8 Market Specific Considerations

8.1 Primary Market

- Tanzania - Ngorongoro Conservation Area

8.2 Target Demographics

- International tourists (high smartphone adoption)
- Domestic tourists (mixed device types)
- Tour operators (professional users)
- NCAA field staff (varying technical skills)

8.3 Local Considerations

- Swahili language support for local staff and Maasai communities
- Low-bandwidth optimization for areas with poor 3G/4G coverage
- Solar charging compatibility for field devices in remote areas
- Cultural sensitivity in UI/UX design and conservation messaging
- Mobile money (M-Pesa, Tigo Pesa, Airtel Money) as primary payment method
- Integration with national tourism initiatives and TANAPA cooperation

8.4 Payment Preferences

Preference	Value
Mobile Money	45%
Cards	30%
Bank Transfer	15%
Cash Wallet Reload	10%

8.5 Competition

- Safari Portal (existing system being modernized)
- Third-party tour operator platforms
- Tanzania National Parks booking systems

9 Sign Off

9.1 Approval

Role	Name	Signature	Date

9.2 Document History

Version	Date	Changes Made	Changed By
1.0	2025-11-12	Initial draft based on NCAA Digital Transformation roadmap (Section 2.1)	SRS Development Team

10 Detailed Feature Requirements

10.1 Ft Mobile Booking

10.1.1 Priority

Must Have

10.1.2 User Story

As a tourist, I want to browse and book park entry, campsite, and activity permits so that I can plan my visit independently without manual processes

10.1.3 Preconditions

User authenticated; Permit inventory available; Payment methods configured

10.1.4 Postconditions

Booking confirmed; Payment processed; Digital permit generated; Confirmation sent via email/SMS

10.1.5 Test Cases

Id	Description	Weight
MOBILE-BOOK-TC-001	Book sleeping tourist permit for 2 days	High
MOBILE-BOOK-TC-002	Book passing tourist permit	High
MOBILE-BOOK-TC-003	Book crater campsite at Lemala	High
MOBILE-BOOK-TC-004	Book group permit for safari tour (10 tourists)	High
MOBILE-BOOK-TC-005	Book activity at Olduvai Gorge	Medium
MOBILE-BOOK-TC-006		High

Id	Description	Weight
	Handle booking with insufficient wallet balance	
MOBILE-BOOK-TC-007	Complete booking in offline mode	High

10.2 Ft Mobile Permit Display

10.2.1 Priority

Must Have

10.2.2 User Story

As a visitor, I want to access digital permits with QR codes on my mobile device so that I can present permits at gates without physical paperwork

10.2.3 Preconditions

Booking completed; Permit generated and synced

10.2.4 Postconditions

QR code displayed; Offline access enabled; Gateway verification ready

10.2.5 Test Cases

Id	Description	Weight
MOBILE-PERMIT-TC-001	Display permit QR code offline	High
MOBILE-PERMIT-TC-002	Scan QR at gate for entry verification	High
MOBILE-PERMIT-TC-003	View permit details (validity, visitor category, expiry)	High
MOBILE-PERMIT-TC-004	Share permit copy via email/ SMS	Medium

Id	Description	Weight
MOBILE-PERMIT-TC-005	Handle expired permit display with warning	High

10.3 Ft Mobile Wallet

10.3.1 Priority

Must Have

10.3.2 User Story

As a tour operator, I want to maintain a digital wallet with preloaded funds for NCAA services so that I can make quick payments without repeated transactions

10.3.3 Preconditions

User account created; Payment methods linked

10.3.4 Postconditions

Wallet balance updated; Transaction history recorded; BI system notified

10.3.5 Test Cases

Id	Description	Weight
MOBILE-WALLET-TC-001	Load wallet via M-Pesa	High
MOBILE-WALLET-TC-002	Load wallet via credit/debit card	High
MOBILE-WALLET-TC-003	Load wallet via bank transfer	Medium
MOBILE-WALLET-TC-004	Pay for permit using wallet balance	High
MOBILE-WALLET-TC-005	View transaction history with receipts	High
MOBILE-WALLET-TC-006	Export transaction history to PDF	Medium
MOBILE-WALLET-TC-007	Handle insufficient balance gracefully	High

10.4 Ft Mobile Credit Resolution

10.4.1 Priority

Must Have

10.4.2 User Story

As a tour operator, I want to redeem or modify unused services seamlessly through my wallet so that I can resolve credit notes and unutilized payments automatically

10.4.3 Preconditions

Unused service exists in system; Wallet active

10.4.4 Postconditions

Credit automatically applied to wallet; Transaction reconciled; Audit trail created

10.4.5 Test Cases

Id	Description	Weight
MOBILE-CREDIT-TC-001	Redeem unused permit via QR scan at gate	High
MOBILE-CREDIT-TC-002	Modify booking and apply credit difference to wallet	High
MOBILE-CREDIT-TC-003	View all pending credits in wallet dashboard	Medium
MOBILE-CREDIT-TC-004	Automatic reconciliation of credit notes > 30 days old	High
MOBILE-CREDIT-TC-005	Validate credit redemption syncs with Gateway	High

10.5 Ft Mobile Qr Entry

10.5.1 Priority

Must Have

10.5.2 User Story

As a tour operator, I want to use QR code scanning at gates for self-service entry so that I can access prepaid services without manual verification delays

10.5.3 Preconditions

Permit booked and paid; QR code generated; Gateway system synchronized

10.5.4 Postconditions

Entry logged at gate; Capacity updated; Real-time sync to BI system

10.5.5 Test Cases

Id	Description	Weight
MOBILE-QR-TC-001	Scan QR at gate for automated entry (online mode)	High
MOBILE-QR-TC-002	Scan QR at gate for automated entry (offline mode)	High
MOBILE-QR-TC-003	Handle invalid/expired QR code gracefully	High
MOBILE-QR-TC-004	Process group entry with single QR code	High
MOBILE-QR-TC-005	Verify entry logged in Gateway within 30 seconds	High

10.6 Ft Mobile Staff Reports

10.6.1 Priority

Must Have

10.6.2 User Story

As NCAA field staff, I want to submit operational updates and incident reports from the field so that I can maintain real-time accountability and coordination

10.6.3 Preconditions

Staff authenticated; GPS enabled; Camera access granted

10.6.4 Postconditions

Report submitted; Photos attached; GPS location tagged; Data synced to BI system

10.6.5 Test Cases

Id	Description	Weight
MOBILE-REPORT-TC-001	Submit incident report with photo attachment	High
MOBILE-REPORT-TC-002	Submit operational update with GPS location	High
MOBILE-REPORT-TC-003	Submit report in offline mode and auto-sync	High
MOBILE-REPORT-TC-004	View submitted report status and confirmations	Medium
MOBILE-REPORT-TC-005	Receive push notification on report acknowledgment	Medium

10.7 Ft Mobile Offline Mode

10.7.1 Priority

Must Have

10.7.2 User Story

As a field officer, I want to use core app functionality without internet connectivity so that I can continue operations in remote areas with poor connectivity

10.7.3 Preconditions

App previously synced while online; Essential data cached locally

10.7.4 Postconditions

Offline transactions queued; Auto-sync triggered on connectivity restoration; No data loss

10.7.5 Test Cases

Id	Description	Weight
MOBILE-OFFLINE-TC-001	View cached permits offline	High
MOBILE-OFFLINE-TC-002	Submit field report offline and queue for sync	High
MOBILE-OFFLINE-TC-003	Display offline maps and navigation	Medium
MOBILE-OFFLINE-TC-004	Auto-sync queued transactions within 2 minutes of connectivity	High
MOBILE-OFFLINE-TC-005	Handle sync conflicts gracefully (e.g., duplicate bookings)	High

10.8 Ft Mobile Nasera Chat

10.8.1 Priority

Must Have

10.8.2 User Story

As a visitor, I want to ask questions and get guided assistance through AI chat so that I can get instant help with procedures, permit status, and general inquiries

10.8.3 Preconditions

Nasera AI service operational; User connected (online mode)

10.8.4 Postconditions

Query answered; Conversation logged for learning; User satisfaction tracked

10.8.5 Test Cases

Id	Description	Weight
MOBILE-AI-TC-001	Ask about permit requirements in English	High
MOBILE-AI-TC-002	Ask about gate status in Swahili	High
MOBILE-AI-TC-003	Request permit status via natural language query	High
MOBILE-AI-TC-004	Receive personalized route recommendations	Medium
MOBILE-AI-TC-005	Handle ambiguous query with clarifying questions	Medium

10.9 Ft Mobile Multilang

10.9.1 Priority

Must Have

10.9.2 User Story

As a local visitor, I want to use the app in my preferred language (English or Swahili) so that I can navigate and understand information comfortably

10.9.3 Preconditions

Language preference set; Translation files loaded

10.9.4 Postconditions

UI displayed in selected language; AI chat responds in same language

10.9.5 Test Cases

Id	Description	Weight
MOBILE-LANG-TC-001	Switch UI language from English to Swahili	High
MOBILE-LANG-TC-002	Complete booking flow entirely in Swahili	High
MOBILE-LANG-TC-003	Receive AI chat responses in selected language	High
MOBILE-LANG-TC-004	View permit documents in selected language	Medium

11 Additional Context

11.1 Success Metrics

11.1.1 Booking Processing Time

< 30 seconds from selection to confirmation (currently 5-10 minutes manual)

11.1.2 Payment Transaction Time

< 15 seconds (currently 2-3 minutes)

11.1.3 Credit Note Resolution

100% automated reconciliation (currently manual and error-prone)

11.1.4 Visitor Satisfaction

80% improvement in user experience ratings

11.1.5 Field Reporting Efficiency

70% reduction in reporting time

11.1.6 System Availability

99% uptime with offline capability ensuring continuous operations

11.1.7 Adoption Rate

70% of tourists and 90% of tour operators using mobile app within 6 months