Software Requirements Specification

for

Implementation of a Workshop Inventory Management System for King's Jewellery World

Version 1.0 approved

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Revision History

Name	Date	Reason For Changes	Version
All members (Group 7)	31-10-2024	Initial Document	1.0

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1.0 Introduction

1.1 Purpose

This Software Requirements Specification (SRS) document specifies the requirements for Version 1.0 of the Workshop Inventory Manager System for King's Jewellery World. The system encompasses a comprehensive workshop management solution designed to track inventory, monitor material usage, and manage employee productivity in the jewelry production process.

This SRS covers the complete system, including:

- Inventory management module
- Material usage tracking module
- Employee progress monitoring module
- Reporting and analytics module
- User management module

1.2 Document Conventions

This document follows these conventions:

1. Requirements Priority Levels:
   - **MUST**: Essential requirements
   - **SHOULD**: Important but not essential requirements
   - **MAY**: Optional requirements
2. Requirement Numbering:
   - REQ-XX-YY where:
     - XX represents the module (IN=Inventory, MT=Material Tracking, etc.)
     - YY represents the requirement number within that module

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1.3 Intended Audience and Reading Suggestions

This document is intended for the following audiences:

1. Development Team
   - Start with Sections 1 and 2 for context
   - Focus on Section 3 for detailed requirements
   - Reference Section 4 for technical constraints
2. Project Managers
   - Focus on Sections 1 and 2
   - Review Section 5 for timeline and deliverables
   - Reference Section 3 for scope details
3. KJW Stakeholders
   - Begin with Sections 1.1 and 1.4 for overview
   - Review Section 2 for business context
   - Reference Section 3.2 for functional capabilities
4. QA Team
   - Focus on Section 3 for testable requirements
   - Review Section 4 for quality attributes
   - Reference Section 6 for acceptance criteria

1.4 Product Scope

The Workshop Inventory Manager System aims to revolutionize King's Jewellery World's workshop operations by:

1. Business Objectives:
   - Minimize material loss during jewelry production
   - Improve workshop efficiency through automated tracking
   - Enhance employee accountability and productivity
   - Enable data-driven decision-making
2. Key Features:
   - Real-time inventory tracking
   - Material loss calculation at each production stage
   - Employee performance monitoring
   - Automated reporting and analytics
3. Business Benefits:
   - Projected 50% reduction in material loss
   - Expected 20% improvement in workshop efficiency
   - Enhanced operational visibility and control
   - Improved cost management and profitability

This system aligns with KJW's corporate goal of maintaining its position as Guyana's leading luxury retailer by optimizing operations and reducing costs.

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1.5 References

Project Documents:

- *Project Charter - Implementation of a Workshop Inventory Manager System for King's Jewellery World (04-Oct-2024)*
- *Project Plan - Implementation of a Workshop Inventory Manager System for King's Jewellery World (18-Oct-2024)*
- *King's Jewelry World - Concept Note (2024)*

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2.0 Overall Description

2.1 Product Perspective

The Workshop Inventory Manager System is a new, web-based solution to modernize King's Jewellery World's workshop operations. It will replace the manual Excel-based tracking system while integrating with existing business systems.
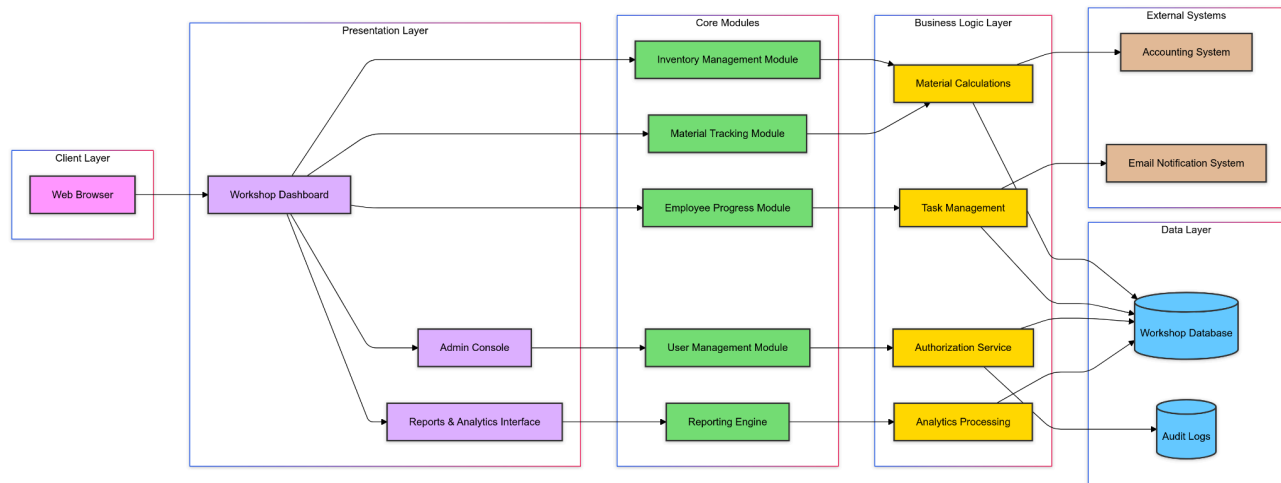
Figure 1.0: High-Level System Architecture Diagram

The diagram shows the layered architecture approach, from client interfaces through to data storage, including external system integrations and hardware interfaces.

Key components are organized into the following layers:
- Client Layer (User Access Points)
- Presentation Layer (User Interfaces)
- Core Modules (Main System Functions)
- Business Logic Layer (Processing Components)
- Data Layer (Storage)
- External Systems (Integrations)
- Hardware Devices (Physical Interfaces)

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2.2 Product Functions

The major functions of the system include:

1. **Inventory Management**

   i. Track real-time inventory levels

   - Monitor quantities of raw materials
   - Track work-in-progress inventory
   - Maintain finished goods inventory

   ii. Manage material receipts and issues

   - Record new material arrivals
   - Document material disbursement
   - Handle returns to inventory

2. **Material Usage Tracking**

   i. Record material consumption

   - Log material usage by task
   - Track material allocation by employee
   - Record batch/lot numbers

   ii. Calculate material loss

   - Measure pre and post-process weights
   - Calculate yield percentages
   - Track loss patterns

   iii. Track material wastage

   - Document reasons for wastage
   - Categorize types of waste

   iv. Manage scrap recovery

   - Record recoverable materials
   - Track scrap refinement

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3. Employee Progress Monitoring

i. Assign and track tasks

- Create detailed work orders
- Set task priorities
- Track completion status
- Manage task dependencies

ii. Monitor productivity

- Track completion times
- Compare against benchmarks
- Calculate efficiency metrics

iii. Record work hours

- Log start and end times
- Track breaks and downtimes
- Calculate total production hours

iv. Evaluate performance

- Compare against standards
- Generate performance metrics
- Track quality indicators
- Monitor material efficiency

4. Reporting and Analytics

i. Generate standard reports

- Daily production reports
- Material consumption reports
- Wastage analysis reports

iii. Visualize data

- Generate graphs and charts
- Create dashboards
- Show trend analysis

iv. Export reports

- Multiple format support (PDF, Excel, CSV)

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5. User Management

i. Manage user accounts

- Create and modify accounts
- Manage user profiles
- Handle password resets
- Maintain user hierarchies

ii. Control access rights

- Define role-based permissions
- Set access levels
- Control sensitive data access

iii. Track user activities

- Log system actions
- Record data modifications

iv. Maintain security

- Enforce password policies
- Manage session timeouts
- Control concurrent access

6. System Administration

ii. Data Management

- Perform backups
- Manage data retention

7. Integration Management

i. Accounting System Integration

- Sync financial data
- Transfer material costs
- Update inventory values

ii. Email Notifications

- Send alerts and notifications

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2.3 User Classes and Characteristics

Workshop Manager

- **Usage Characteristics**
  - Frequency: Daily use
  - Peak Usage Times: Business hours (8 AM - 5 PM)
  - Average Session Duration: 4-6 hours
- **Technical Characteristics**
  - Technical Expertise: Moderate
  - Computer Literacy: Proficient
  - Required Training: Comprehensive system training (8-16 hours)
- **System Access**
  - Level: Full access
  - Authentication: Multi-factor authentication required
  - Device Access: Desktop and mobile
- **Primary Functions**
  - Overall workshop management
  - System Administration
  - User management
  - Report generation and analysis
  - Performance monitoring
- **User Priority**: Critical user
- **Special Needs**
  - Dashboard customization
  - Real-time notifications
  - Advanced reporting capabilities

Inventory Clerk

- **Usage Characteristics**
  - Frequency: Daily use
  - Peak Usage Times: Morning inventory checks, end-of-day reconciliation
  - Average Session Duration: 6-8 hours
- **Technical Characteristics**
  - Technical Expertise: Basic to moderate
  - Computer Literacy: Intermediate
  - Required Training: Focused inventory module training (4-8 hours)
- **System Access**
  - Level: Limited to inventory functions
  - Authentication: Standard login
  - Device Access: Desktop, barcode scanners, digital scales
- **Primary Functions**
  - Stock management

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- ○ Material tracking
- ○ Inventory reconciliation
- ○ Purchase order processing
- **User Priority**: High-priority user
- **Special Needs**
    - ○ Mobile scanner integration
    - ○ Quick data entry interfaces
    - ○ Inventory alerts

Workshop Employees

- **Usage Characteristics**
    - ○ Frequency: Daily use
    - ○ Peak Usage Times: Throughout the work shift
    - ○ Average Session Duration: 2-3 hours (intermittent)
- **Technical Characteristics**
    - ○ Technical Expertise: Basic
    - ○ Computer Literacy: Basic
    - ○ Required Training: Basic system training (2-4 hours)
- **System Access**
    - ○ Level: Limited to assigned tasks
    - ○ Authentication: Standard login
    - ○ Device Access: Workshop terminals, mobile devices
- **Primary Functions**
    - ○ Task updates
    - ○ Material usage recording
    - ○ Time tracking
    - ○ Work order processing
- **User Priority**: High-priority user
- **Special Needs**
    - ○ Simplified user interface
    - ○ Step-by-step guides
    - ○ Local language support if needed

Supervisors

- **Usage Characteristics**
    - ○ Frequency: Daily use
    - ○ Peak Usage Times: Start/end of shifts, periodic checks
    - ○ Average Session Duration: 3-4 hours
- **Technical Characteristics**
    - ○ Technical Expertise: Moderate
    - ○ Computer Literacy: Intermediate
    - ○ Required Training: Advanced user training (6-8 hours)

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- **System Access**
  - Level: Department-level access
  - Authentication: Standard login with additional privileges
  - Device Access: Desktop
- **Primary Functions**
  - Task assignment
  - Progress monitoring
  - Performance evaluation
  - Resource allocation
- **User Priority**: High-priority user
- **Special Needs**
  - Team dashboard views
  - Performance metrics
  - Scheduling tools

Management

- **Usage Characteristics**
  - Frequency: Weekly use
  - Peak Usage Times: During review meetings
  - Average Session Duration: 1-2 hours
- **Technical Characteristics**
  - Technical Expertise: Basic
  - Computer Literacy: Basic to Intermediate
  - Required Training: Executive overview (2 hours)
- **System Access**
  - Level: Read-only access to reports
  - Authentication: Standard login
  - Device Access: Desktop and mobile
- **Primary Functions**
  - Viewing reports and analytics
  - Performance review
  - Resource planning
- **User Priority**: Medium priority user
- **Special Needs**
  - Executive dashboard
  - Automated report scheduling
  - High-level KPI views

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User Class Interaction Matrix

User Class	Interacts With	Primary Interaction Points
Workshop Manager	All classes	System-wide
Inventory Clerk	Workshop Manager, Employees	Inventory System
Workshop Employees	Supervisors, Inventory Clerk	Task Management
Supervisors	Workshop Manager, Employees	Progress Monitoring
Management	Workshop Manager	Reporting System

2.4 Operating Environment

The system will be designed to operate within the existing infrastructure of King's Jewellery World Workshop and must seamlessly integrate with said infrastructure with the use of key hardware and software components.

Hardware Platform

Server Infrastructure

- **Server Requirements (Minimum)**
  - Operating System: Microsoft Windows Server 2012 R2 Standard
  - Processor: Quad-core processor (Intel Xeon or equivalent)
  - Memory: Minimum 8 GB (expandable)
  - Storage: 1 TB HDD/SSD
  - Network: Gigabit Ethernet connection

- **Backup Server**
  - Mirror configuration of production server
  - Automated backup system
  - Disaster recovery capabilities

Client Environment

- **Client Devices (Minimum)**
  - Operating System
    - Windows 10 or higher
  - Hardware Specifications:
    - Processor: Dual-core or higher
    - Ram: 8GB or higher
    - Storage: 256GB SSD

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Software Environment

Database System

- Primary Database
    - PostgreSQL 14 or higher
    - Regular backup schedule
    - Data encryption at rest
- Development Stack
    - Backend: PHP 8.0 or higher
    - Frontend: HTML5, CSS3, JavaScript
    - Framework: Laravel/React

Development and Design Tools

- Design Tools
    - Lucidchart for wireframing
    - Figma for UI/UX design
- Development Tools
    - Visual Studio Code
    - Git for version control
    - Docker for containerization

Security Environment

- Network Security
    - Firewall protection
    - SSL/TLS encryption

- Data Security
    - Encrypted data storage
    - Secure backup system
    - Regular security audits

Compliance Requirements

- Audit Requirements
    - System activity logging
    - User action tracking
    - Regular audit reports

Performance Requirements

- System Response Time

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- ○ Page load: < 3 seconds
- ○ Database queries: < 1 second
- ○ Report generation: < 30 seconds
- Concurrent Users
  - ○ Support for 50+ simultaneous users
  - ○ Scalable architecture

2.5 Design and Implementation Constraints

Technical Constraints

Hardware Constraints

- **Computing Resources**
  - ○ Must operate on existing hardware infrastructure
  - ○ Minimum workstation specifications must be met (8GB RAM, dual-core processor)
  - ○ Storage capacity limited to existing server allocation (1TB)
- **Connectivity**
  - ○ Must function within current network bandwidth limitations
  - ○ System must handle intermittent network connectivity
  - ○ Local caching required for critical operations

Software Constraints

- **Development Stack**
  - ○ Backend: PHP 8.0
  - ○ Frontend: HTML5, CSS3, JavaScript
  - ○ Database: PostgreSQL
  - ○ Version control: Git
- **Browser Compatibility**
  - ○ Must support Chrome (latest 2 versions)
  - ○ Must support Firefox (latest 2 versions)
  - ○ Must support Edge (latest 2 versions)

Security Constraints

Access Control

- **Authentication Requirements**
  - ○ Must implement role-based access control
  - ○ Must support single sign-on integration
  - ○ Password policies must align with corporate standards

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- **Data Protection**
  - All sensitive data must be encrypted at rest
  - Must implement SSL/TLS for data in transit
  - Regular security audits required

Compliance Requirements

- **Industry Standards**
  - Must comply with jewelry industry regulations
  - Must maintain audit trails for all transactions
  - Must support data retention policies

Business Constraints

Budget Limitations

- **Development Costs**
  - Must utilize open-source frameworks where possible
  - Third-party integrations may be limited
  - Custom feature development subject to cost approval
- **Maintenance Costs**
  - Must be maintainable by internal IT staff
  - Support costs must be minimized

Timeline Constraints

- **Development Schedule**
  - Must be completed within the 16-week timeframe
  - Phased implementation required
  - Critical features must be prioritized

Integration Constraints

External Systems

- **Accounting System**
  - Must integrate with existing accounting software
  - Real-time data synchronization required
  - Must handle data format compatibility

Hardware Integration

- **Scale Integration**
  - Must support specific scale models used in the workshop
  - Real-time weight data capture required

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○ Error handling for device communication

Operational Constraints

Performance Requirements

- **Response Time**
  - ○ Page load times must not exceed 3 seconds
  - ○ Report generation limited to 30 seconds
  - ○ Search results must return within 2 seconds

Availability

- **System Uptime**
  - ○ Must maintain 99.9% uptime during business hours
  - ○ Maintenance windows limited to off-hours
  - ○ Must support failover capabilities

Development Process Constraints

Coding Standards

- **Documentation**
  - ○ Must follow PHPDoc standards
  - ○ Must maintain updated API documentation
  - ○ Code comments required for complex logic
- **Quality Control**
  - ○ Must implement unit testing
  - ○ Must pass security code review
  - ○ Must follow corporate coding guidelines

Version Control

- **Release Management**
  - ○ Must follow GitFlow workflow
  - ○ Feature branching required
  - ○ Code review mandatory before the merge

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2.6 User Documentation

System Manuals

- **System Administration Guide**
  - Installation and setup procedures
  - System configuration
  - Format: PDF
- **User Operation Manual**
  - Basic system navigation
  - Core functionality guides
  - Common procedures
  - Format: PDF with screenshots

Role-Based Guides

- **Workshop Manager Guide**
  - Management dashboard usage
  - Reporting features
  - User management
- **Inventory Staff Guide**
  - Inventory management
  - Material tracking
- **Employee Quick Guide**
  - Task management
  - Material usage recording
  - Time tracking

Training Materials

- **Training Guides**
  - Role-specific training modules
  - Format: PDF and PowerPoint

Quick Reference Materials

- **User Manuals**
  - Guide to KJW Workshop Inventory Manager System(To be created upon completion of development)

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2.7 Assumptions and Dependencies

Assumptions

Technical Assumptions

- System infrastructure will remain stable throughout development
    - Current server hardware will be sufficient
    - Network capacity can handle the expected load
    - Existing backup systems are adequate

Business Process Assumptions

- Workshop operations will remain consistent
    - Current workflow processes won't significantly change
    - Material tracking requirements will remain stable
    - Reporting needs will stay consistent

User-Related Assumptions

- Staff capabilities and availability
    - Users will complete the required training
    - Staff have basic computer literacy
    - Workshop managers will support the transition
    - Users can access the training environment

Project-Related Assumptions

- Stakeholder engagement
    - Stakeholders will be available for reviews
    - Decision-making will be timely
    - Requirements won't change significantly

Dependencies

Technical Dependencies

- Infrastructure Requirements
    - Reliable broadband internet connection (minimum 10 Mbps)
    - Server environment meeting specifications
    - Compatible browser versions
- Software Dependencies
    - Laravel framework availability
    - PostgreSQL database system
    - Required PHP extensions
    - Development tools and libraries

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External Dependencies

- Third-Party Systems
  - Accounting system integration availability
  - Email server functionality
  - Digital scale interfaces
- Human Resources
  - Development team availability
  - Training staff availability
  - Technical support capability

Business Dependencies

- Operational Requirements
  - Workshop operational hours
  - Staff availability for training
  - Data migration timeframes
  - System testing windows

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3.0 External Interface Requirements

3.1 User Interfaces

General Interface Standards

Layout Structure

- **Header Area**
  - Company logo (top left)
  - User profile menu (top right)
  - Quick navigation menu (top center)
  - Notifications icon
- **Navigation**
  - Left sidebar menu for main navigation
  - Breadcrumb trail below header
  - Quick action buttons where applicable
- **Main Content Area**
  - Clear headings and subheadings
  - Consistent spacing and padding
  - Responsive grid layout
  - Maximum width of 1200px

Error Handling Display

- **Error Messages**
  - Clear descriptive text
  - Action-oriented solutions
  - Consistent positioning

3.2 Hardware Interfaces

Workstation Requirements

- **Desktop Computers**
  - Minimum Display: 1920 x 1080 resolution
  - Input Devices: Standard keyboard and mouse
- **Error Handling**
  - Hardware disconnection detection
  - Error logging and notification
- **Communication Specifications**
  - Network Interface
    - Ethernet: 1000BASE-T
    - Wi-Fi: 802.11ac or better

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3.3 Software Interfaces

Database System

- **PostgreSQL Integration**
    - Version: 14 or higher
    - Connection pooling
    - Transaction management
    - Data Types:
        - Numeric for weights (precision: 4 decimal places)
        - Timestamp with timezone
        - UUID for unique identifiers

Authentication System

- **Integration Requirements**
    - Support for role-based access control
    - Session management
    - Password encryption

Development Framework

- **Laravel Framework**
    - Version: 8.x or higher
    - Required Extensions:
        - PHP 8.0+
        - OpenSSL PHP Extension
        - PDO PHP Extension
        - Mbstring PHP Extension

3.4 Communications Interfaces

Network Protocol Requirements

- **HTTP/HTTPS**
    - TLS 1.3 required for all communications
    - Certificate: 2048-bit SSL
    - REST API endpoints
    - Rate limiting implemented

Email Communications

- **SMTP Configuration**
    - Secure SMTP (Port 587)
    - TLS encryption required

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- ○ HTML and plain text support
- ○ Attachment size limit: 10MB

API Specifications

- **RESTful API**
  - ○ Authentication: Bearer tokens
  - ○ Response format: JSON
  - ○ Status codes: Standard HTTP
  - ○ Rate limits: 1000 requests/hour
  - ○ Endpoint documentation: OpenAPI 3.0

Data Transfer

- **Specifications**
  - ○ Maximum payload: 10MB
  - ○ Batch processing for large datasets
  - ○ Timeout: 30 seconds

Security Requirements

- **Encryption**
  - ○ In-transit: TLS 1.3
  - ○ At-rest: AES-256
  - ○ Key management system

Error Handling

- **Protocol**
  - ○ Retry mechanism for failed communications
  - ○ Error logging and monitoring
  - ○ Notification system for critical failures

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4.0 System Features

Requirement Type Summary:

- MUST Requirements: 15
- SHOULD Requirements: 8
- MAY Requirements: 0

Module Code Reference:

- IM: Inventory Management
- MT: Material Tracking
- EP: Employee Progress
- RA: Reporting and Analytics
- UM: User Management

Each requirement now follows the REQ-XX-YY format where:

- XX represents the module code (IM, MT, EP, RA, UM)
- YY represents the sequential requirement number within that module
- Priority level (MUST, SHOULD, MAY) is clearly indicated

4.1 Inventory Management Module

4.1.1 Description and Priority

The inventory management module enables real-time tracking of workshop materials and automated stock management. This feature is High priority as it directly impacts workshop operations and prevents costly material shortages.

Priority Components (scale 1-9):

- Benefit: 9 - Critical for preventing material shortages
- Penalty: 8 - Material shortages directly impact production
- Cost: 6 - Moderate implementation complexity
- Risk: 4 - Well-understood domain with proven solutions

4.1.2 Stimulus/Response Sequences

1. View Current Stock
   - Stimulus: User logs into system and selects inventory view
   - Response: The system displays current stock levels of all materials
   - Error Case: System shows cached data with timestamp if network unavailable
2. Set Stock Thresholds
   - Stimulus: User enters minimum stock level for an item
   - Response: The system saves the threshold and begins monitoring

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   ○ Error Case: System validates against maximum threshold before saving
3. Stock Alert
   ○ Stimulus: Stock falls below set threshold
   ○ Response: The system generates alert and notifications to relevant staff
   ○ Error Case: System retries notification if delivery fails
4. Receive Materials
   ○ Stimulus: User enters details of received materials
   ○ Response: System updates stock levels and generates receipt record
   ○ Error Case: System flags discrepancies between ordered and received quantities

4.1.3 Functional Requirements

REQ-IM-01 (MUST)

The system shall display real-time inventory levels of all workshop materials.

Acceptance Criteria:

- Update inventory display within 5 seconds of changes
- Show quantities with appropriate units (grams, pieces)
- Display the last update timestamp
- Indicate stock status (normal, low, critical)

Validation Rules:

- Quantities must be non-negative numbers
- Updates must include user ID and timestamp
- Unit conversions must maintain precision

REQ-IM-02 (MUST)

The system shall allow authorized users to set minimum and maximum stock thresholds for each material type.

Acceptance Criteria:

- Support different units for different materials
- Prevent minimum threshold above maximum
- Allow bulk updates for similar items
- Maintain threshold history

Validation Rules:

- Minimum threshold > 0
- Maximum threshold > minimum threshold
- Thresholds must match material-type units

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REQ-IM-03 (MUST)

The system shall automatically generate alerts when stock levels fall below defined thresholds.

Acceptance Criteria:

- Send alerts via system notification and email
- Include current stock level and threshold
- Provide reorder recommendation
- Allow alert acknowledgment

Validation Rules:

- Alert frequency not more than once per hour
- Alert must reach all designated recipients
- Include material details and location

REQ-IM-04 (MUST)

The system shall track and record all material receipts with timestamps and quantities.

Acceptance Criteria:

- Generate unique receipt numbers
- Record supplier information
- Support batch receiving
- Allow attachment of delivery documents

Validation Rules:

- The receipt date cannot be a future date
- Quantities must match order tolerances
- Required fields must be completed

REQ-IM-05 (SHOULD)

The system shall maintain a historical log of all inventory transactions.

Acceptance Criteria:

- Log all inventory changes
- Record user, timestamp, and action
- Support audit trail reporting
- Enable transaction search

Validation Rules:

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- All transactions must have user ID
- Timestamps in system standard format
- Transaction types from predefined list

REQ-IM-06 (SHOULD)

The system shall automatically calculate reorder quantities based on usage patterns and set thresholds.

Acceptance Criteria:

- Consider historical usage data
- Account for lead times
- Suggest economic order quantities
- Allow manual override

Validation Rules:

- Minimum 30 days of usage data required
- Orders within budget constraints
- Valid supplier assignments

REQ-IM-07 (MUST)

The system shall handle error conditions effectively.

Error Handling Specifications:

1. Invalid Quantity Entries
   - Validate against material-specific ranges
   - Show specific error message
   - Maintain last valid value
   - Log validation failure
2. Duplicate Entry Detection
   - Check against recent transactions
   - Alert user of potential duplicate
   - Require override authorization
   - Log duplicate attempts
3. Network Connectivity Issues
   - Cache critical data locally
   - Queue updates for sync
   - Show offline indicator
   - Auto-sync on reconnection

4.1.4 Performance Requirements

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- Page load time < 3 seconds
- Real-time updates < 5 seconds
- Report generation < 30 seconds
- Support 50+ concurrent users

4.1.5 Interface Requirements

- Intuitive navigation (max 3 clicks)
- Mobile-responsive design
- Support for barcode scanners
- Integration with weighing scales

4.2 Material Usage Tracking Module

4.2.1 Description and Priority

The material usage tracking module monitors material consumption during jewelry production, calculates losses, and tracks wastage. This feature is High priority as it directly impacts cost control and production efficiency.

Priority Components (scale 1-9):

- Benefit: 9 - Critical for cost control and efficiency
- Penalty: 8 - Material losses directly impact profitability
- Cost: 5 - Moderate implementation complexity
- Risk: 6 - Requires precise measurement integration

4.2.2 Stimulus/Response Sequences

1. Record Material Usage
   - Stimulus: User enters initial material weight for task
   - Response: The system records starting weight and associates with task
   - Error Case: System flags weights outside expected range
2. Process Completion
   - Stimulus: User enters final product weight
   - Response: The system calculates material loss and updates records
   - Error Case: System alerts if the loss exceeds an acceptable threshold
3. Waste Recording
   - Stimulus: User logs recoverable waste materials
   - Response: System updates waste tracking records
   - Error Case: System validates total weights against the initial amount
4. Usage Review
   - Stimulus: Supervisor requests material usage report
   - Response: The system generates detailed usage analysis

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　　　　○　Error Case: System indicates if data is incomplete

4.2.3 Functional Requirements

REQ-MT-01 (MUST)

The system shall record the initial and final weights for each production task.

Acceptance Criteria:

- Record weights with precision of 0.01g
- Link weights to specific work orders
- Support multiple measurement units
- Capture timestamp and user ID

Validation Rules:

- Initial weight must be > 0
- Final weight must be ≤ initial weight
- Weights must be within scale capacity
- Valid work order reference required

REQ-MT-02 (MUST)

The system shall automatically calculate material loss by comparing initial and final weights.

Acceptance Criteria:

- Calculate absolute loss in grams
- Calculate percentage loss
- Compare against standard loss rates
- Flag exceptional variations

Validation Rules:

- Loss cannot exceed the initial weight
- Percentage calculation to 2 decimals
- Standard loss rates by material type
- Maximum acceptable loss thresholds

REQ-MT-03 (MUST)

The system shall track recoverable waste materials separately from total loss.

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Acceptance Criteria:

- Categorize waste types
- Track waste by location
- Calculate recovery value
- Generate waste reports

Validation Rules:

- Valid waste category required
- Waste weight + final product ≤ initial weight
- Recovery value within market rates
- Proper waste storage location

REQ-MT-04 (MUST)

The system shall associate material usage with specific employees and tasks.

Acceptance Criteria:

- Link usage to employee ID
- Track by work order
- Record time stamps
- Support team assignments

Validation Rules:

- Valid employee ID required
- Active work order reference
- Within shift schedule
- Authorized material access

REQ-MT-05 (SHOULD)

The system shall generate alerts for unusual material loss patterns.

Acceptance Criteria:

- Define normal loss ranges
- Send real-time alerts
- Track pattern history
- Support investigation workflow

Validation Rules:

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- Loss patterns by material type
- Statistical deviation thresholds
- Minimum sample size for patterns
- Alert frequency limits

REQ-MT-06 (MUST)

The system shall maintain historical records of material usage and losses.

Acceptance Criteria:

- Store complete usage history
- Enable trend analysis
- Support audit requirements
- Maintain data integrity

Validation Rules:

- Minimum 2-year history
- Complete audit trail
- Data immutability
- Backup requirements

4.2.4 Error Handling

1. Measurement Errors
    - Scale calibration check
    - Re-weigh option
    - Manual override with approval
    - Error logging
2. Data Entry Errors
    - Field validation
    - Double-entry for critical weights
    - Correction workflow
    - Audit trail maintenance
3. Pattern Detection Errors
    - False positive handling
    - Pattern verification
    - Alert threshold adjustment
    - Learning system adaptation

4.2.5 Performance Requirements

- Weight recording response < 2 seconds

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- Loss calculation < 1 second
- Report generation < 30 seconds
- Pattern analysis < 5 seconds

4.2.6 Interface Requirements

- Digital scale integration
- Barcode/RFID support
- Mobile device compatibility
- Real-time display updates

4.2.7 Data Requirements

- Weight precision: 0.01g
- Storage capacity: 5 years
- Backup frequency: Daily
- Archive policy: 7 years

4.3 Employee Progress Monitoring Module

4.3.1 Description and Priority

The employee progress monitoring module tracks task assignments, completion rates, and productivity metrics. This feature is Medium priority as it supports operational efficiency and performance management.

Priority Components (scale 1-9):

- Benefit: 7 - Important for productivity tracking
- Penalty: 6 - Impacts workflow efficiency
- Cost: 4 - Relatively straightforward implementation
- Risk: 3 - Standard functionality with proven patterns

4.3.2 Stimulus/Response Sequences

1. Task Assignment
   - Stimulus: Supervisor assigns task to employee
   - Response: The system creates a task record and notifies the employee
   - Error Case: System checks for scheduling conflicts
2. Progress Update
   - Stimulus: Employee updates task status
   - Response: The system records progress and updates timeline
   - Error Case: System validates status transition logic
3. Task Completion

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○ Stimulus: Employee marks task as complete
○ Response: The system updates the task status and records completion time
○ Error Case: System verifies all requirements met

4.3.3 Functional Requirements

REQ-EP-01 (MUST)

The system shall allow task assignment to specific employees.

Acceptance Criteria:

● Assign single or multiple tasks
● Set priority levels
● Define deadlines
● Specify required skills

Validation Rules:

● Valid employee ID required
● No scheduling conflicts
● Within working hours
● Matches skill requirements

REQ-EP-02 (MUST)

The system shall track task progress and completion times.

Acceptance Criteria:

● Record start and end times
● Track status changes
● Monitor breaks/pauses
● Calculate actual duration

Validation Rules:

● Status changes sequentially
● Valid time entries
● Break duration limits
● Completion verification

REQ-EP-03 (MUST)

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The system shall calculate productivity metrics per employee.

Acceptance Criteria:

- Calculate completion rates
- Track efficiency metrics
- Compare to benchmarks
- Generate trend analysis

Validation Rules:

- Minimum task sample size
- Valid date ranges
- Consistent metrics
- Benchmark relevance

REQ-EP-04 (SHOULD)

The system shall provide real-time task status updates.

Acceptance Criteria:

- Live status dashboard
- Progress indicators
- Delay notifications
- Timeline updates

Validation Rules:

- Update frequency ≤ 5 minutes
- Valid status codes
- Notification rules
- Timeline accuracy

REQ-EP-05 (SHOULD)

The system shall support task management workflows.

Acceptance Criteria:

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- Define task dependencies
- Set milestones
- Enable task templates

Validation Rules:

- Valid dependency chains
- Milestone alignment
- Template consistency

4.3.4 Error Handling

1. Assignment Conflicts
   - Check scheduling conflicts
   - Alert overallocation
2. Progress Update Errors
   - Validate status transitions
   - Check time consistency
3. Completion Verification
   - Quality check requirements
   - Documentation complete
   - Materials reconciled
   - Supervisor approval

4.3.5 Performance Requirements

- Task assignment response < 2 seconds
- Status update delay < 1 second
- Dashboard refresh < 5 seconds
- Report generation < 30 seconds

4.3.6 Interface Requirements

- Task board view
- Calendar integration
- Email notifications

4.3.7 Reporting Requirements

- Daily progress reports
- Weekly productivity summaries
- Monthly performance analytics

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4.3.8 Integration Requirements

- Time tracking system
- Inventory management
- Quality control system
- HR management system

4.3.9 Data Requirements

1. Task Data
   - Unique task ID
   - Assignment details
   - Time stamps
   - Status history
2. Employee Data
   - Skills matrix
   - Availability calendar
   - Performance History
   - Training records
3. Metrics Data
   - Standard times
   - Efficiency rates
   - Quality scores
   - Productivity trends

4.4 Reporting and Analytics Module

4.4.1 Description and Priority

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The reporting and analytics module provides insights into workshop operations through customizable reports and data visualization. This feature is Medium priority as it supports decision-making and process improvement.

Priority Components (scale 1-9):

- Benefit: 7 - Valuable for operational insights
- Penalty: 5 - Affects decision-making efficiency
- Cost: 4 - Standard reporting functionality
- Risk: 3 - Well-established reporting patterns

4.4.2 Stimulus/Response Sequences

1. Report Generation
   - Stimulus: User requests specific report
   - Response: System generates report according to selected parameters
   - Error Case: System handles timeout or data unavailability
2. Data Export
   - Stimulus: User requests data export
   - Response: System creates file in requested format
   - Error Case: System manages large data sets and format compatibility
3. Dashboard View
   - Stimulus: User accesses analytics dashboard
   - Response: System displays real-time metrics and charts
   - Error Case: System shows cached data if real-time update fails

4.4.3 Functional Requirements

REQ-RA-01 (MUST)

The system shall generate standard reports for inventory, material usage, and productivity.

Acceptance Criteria:

- Predefined report templates
- Scheduled report generation
- Multiple output formats
- Email distribution options

Validation Rules:

- Valid date ranges
- Complete data sets
- Authorized access level
- Format compatibility

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REQ-RA-02 (MUST)

The system shall allow creation of custom reports with user-selected parameters.

Acceptance Criteria:

- Custom field selection
- Filter criteria definition
- Sort order options
- Save report templates

Validation Rules:

- Valid field combinations
- Logical filter conditions
- Performance thresholds
- Template naming conventions

REQ-RA-03 (MUST)

The system shall support data export in multiple formats.

Acceptance Criteria:

- Support PDF, Excel, CSV formats
- Maintain data formatting
- Include metadata
- Batch export capability

Validation Rules:

- File size limits
- Format compatibility
- Character encoding
- Security restrictions

REQ-RA-04 (MUST)

The system shall provide real-time dashboard visualizations.

Acceptance Criteria:

- Key performance indicators
- Interactive charts
- Drill-down capability

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● Custom dashboard layouts

Validation Rules:

● Data refresh rates
● Visual accuracy
● Interactive response time
● Device compatibility

REQ-RA-05 (SHOULD)

The system shall support advanced analytics features.

Acceptance Criteria:

● Trend analysis
● Statistical calculations
● Comparative analysis

Validation Rules:

● Statistical significance
● Data sample size
● Calculation accuracy

4.4.4 Error Handling

1. Report Generation Errors
    ○ Timeout management
    ○ Partial data handling
    ○ Error notification
2. Export Failures
    ○ Format conversion errors
3. Dashboard Updates
    ○ Connection loss handling
    ○ Cache management
    ○ Refresh failures
    ○ Data consistency

4.4.5 Performance Requirements

1. Report Generation
    ○ Standard reports < 30 seconds
2. Dashboard Performance

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- ○ Initial load < 5 seconds
- ○ Updates < 2 seconds
- ○ Chart rendering < 1 second
- ○ Interactive response < 500ms

4.4.6 Interface Requirements

1. Report Interface
    - ○ Intuitive report builder
    - ○ Parameter selection controls
    - ○ Preview capability
    - ○ Template management
2. Dashboard Interface
    - ○ Customizable layouts
    - ○ Drag-and-drop widgets
    - ○ Responsive design
    - ○ Touch-screen support

4.4.7 Data Requirements

1. Report Data
    - ○ Historical data access
    - ○ Real-time data access
    - ○ Aggregation rules
    - ○ Data retention policy
2. Export Data
    - ○ Format specifications
    - ○ Data mapping rules
    - ○ Security requirements
    - ○ Archive requirements

4.4.8 Integration Requirements

1. External Systems
    - ○ Accounting system
    - ○ ERP integration
    - ○ Email system
    - ○ File storage system
2. Internal Modules
    - ○ Inventory management
    - ○ Material tracking
    - ○ Employee progress
    - ○ User management

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4.4.9 Security Requirements

1. Access Control
    - ○ Report-level permissions
    - ○ Data-level security
    - ○ Export restrictions
    - ○ Audit logging
2. Data Protection
    - ○ Sensitive data handling
    - ○ Export encryption
    - ○ Secure transmission
    - ○ Retention compliance

4.5 User Management Module

4.5.1 Description and Priority

The user management feature controls system access, user permissions, and security settings. This feature is High priority as it ensures system security and proper access control.

Priority Components (scale 1-9):

- ● Benefit: 8
- ● Penalty: 9
- ● Cost: 5
- ● Risk: 7

4.5.2 Stimulus/Response Sequences

1. User Account Management
    - ○ Stimulus: Admin initiates user account creation
    - ○ Response: The system creates an account and sends credentials
2. Role Assignment
    - ○ Stimulus: Admin modifies user role
    - ○ Response: System updates permissions and logs change
3. Access Control
    - ○ Stimulus: User attempts to access restricted feature
    - ○ Response: The system verifies permissions and grants/denies access

4.5.3 Functional Requirements

REQ-UM-01 (MUST)

The system shall implement role-based access control for all system functions.

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Acceptance Criteria:

- Support minimum 5 predefined roles (Admin, Manager, Supervisor, Employee, Viewer)
- Allow custom role creation
- Enable granular permission settings
- Support role hierarchy

Validation Rules:

- Each user must have at least one role
- Role names must be unique
- Permissions must be explicitly defined
- No circular dependencies in role hierarchy

Error Handling:

1. Invalid Role Assignment
   - Prevent removal of last admin
   - Log failed assignment attempts
   - Notify system administrator
   - Maintain previous valid role

REQ-UM-02 (MUST)

The system shall maintain comprehensive audit logs of all user actions.

Acceptance Criteria:

- Log all user actions with timestamp
- Record user ID, action, and affected data
- Support audit log search and filtering
- Enable audit report generation

Validation Rules:

- All logs must include user ID
- Timestamp in ISO 8601 format
- Action type must be from predefined list
- Maximum log retention period defined

Error Handling:

1. Log Storage Failure
   - Local cache backup
   - Alert system administrator

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REQ-UM-03 (MUST)

The system shall enforce password policies and security requirements.

Acceptance Criteria:

- Minimum password length: 12 characters
- Require complexity (uppercase, lowercase, numbers, special characters)
- Maximum password age: 90 days

Validation Rules:

- No common passwords allowed
- No personal information in the password
- Password change required at first login
- Lock account after 5 failed attempts

Error Handling:

1. Failed Password Change
   - Show specific validation errors
   - Suggest password requirements
   - Log failed attempts
   - Offer password guidance

REQ-UM-04 (MUST)

The system shall provide comprehensive user account management capabilities.

Acceptance Criteria:

- Create, modify, and disable accounts
- Assign roles and permissions
- Set account expiration
- Manage department assignments

Validation Rules:

- Unique username required
- Valid email format
- Required fields completion
- Proper authorization level

Error Handling:

1. Duplicate Username
   - Show alternative suggestions
   - Check similar usernames
   - Prevent duplicate creation
   - Log attempt

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REQ-UM-05 (SHOULD)

The system shall provide secure account recovery mechanisms.

Acceptance Criteria:

- Self-service password reset
- Multi-factor authentication
- Time-limited reset tokens
- Account unlock procedure

Validation Rules:

- Verify user identity
- Require new password

Error Handling:

1. Failed Recovery Attempt
   - Lock recovery after 3 fails
   - Notify account owner
   - Log recovery attempts
   - Require admin intervention

4.5.4 Non-functional Requirements

1. Performance
   - User authentication: < 2 seconds
   - Role change application: < 5 seconds
   - Audit log retrieval: < 3 seconds
2. Security
   - All passwords hashed using bcrypt
   - Session timeout after 30 minutes
   - TLS 1.3 for all communications
   - Regular security audit requirements
3. Scalability
   - Support 1000+ user accounts
   - Handle 100+ concurrent sessions
   - Audit log retention: 2 years
   - Role limit: 50 custom roles

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5.0 Other Nonfunctional Requirements

5.1 Performance Requirements

5.1.1 Response Time

- System response times must meet the following criteria:
    - Page load time: < 3 seconds
    - Database queries: < 2 seconds
    - Report generation: < 30 seconds for standard reports
    - Real-time updates: < 5 seconds for inventory changes

5.1.2 Capacity

- The system must support:
    - Minimum 30 concurrent users
    - Storage of 2 years of historical data
    - 200 inventory transactions per day
    - 100 material tracking records per day

5.1.3 Performance Metrics

- System must achieve:
    - System uptime: 99.9% during business hours (8 AM - 5 PM)
    - Data accuracy: 99.99% for inventory records
    - Material loss reduction: 50% from current levels
    - Workshop efficiency improvement: 20% in completed tasks
    - User adoption rate: 95% within 2 weeks of implementation

5.1.4 Degradation Limits

- Under peak load (25-30 users):
    - Maximum response time increase: 20%
    - No data loss permitted
    - Graceful degradation of non-critical features

5.2 Safety Requirements

5.2.1 Data Safety

- Automated backup systems must:
    - Perform daily incremental backups
    - Perform weekly full backups
    - Maintain 30-day backup history
    - Store backups in separate physical location

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5.2.2 Material Handling Safety

- The system must enforce:
    - Maximum material allocation limits
    - Proper material storage location tracking
    - Hazardous material handling procedures
    - Material compatibility checks

5.3 Security Requirements

5.3.1 Authentication

- The system must implement:
    - Multi-factor authentication for privileged users
    - Password complexity requirements
    - Account lockout after 3 failed attempts
    - Password change every 90 days

5.3.2 Authorization

- Role-based access control with:
    - Minimum 5 distinct user roles
    - Granular permission settings
    - Activity logging for sensitive operations
    - Regular access review requirements

5.3.3 Data Protection

- The system must ensure:
    - Encryption of all sensitive data at rest
    - TLS 1.3 for data in transit
    - Secure audit logging
    - Compliance with local data protection laws

5.4 Software Quality Attributes

5.4.1 Reliability

- System must achieve:
    - 99.9% uptime during business hours
    - < 0.1% error rate in calculations
    - Mean time between failures: > 720 hours
    - Recovery time: < 1 hour

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5.4.2 Usability

- System must provide:
    - Intuitive navigation (max 3 clicks to any function)
    - Consistent UI patterns
    - Context-sensitive help
    - Error messages in plain language

5.4.3 Maintainability

- System design must ensure:
    - Modular architecture
    - Documented code (minimum 70% coverage)
    - Standard coding practices
    - Regular update capability

5.4.4 Portability

- System must support:
    - Cross-browser compatibility
    - Responsive design for different screen sizes
    - Platform independence
    - Data export in standard formats

5.5 Business Rules

5.5.1 Operational Rules

- Material allocation requires:
    - Manager approval for items above $50,000
    - Daily reconciliation of inventory
    - Monthly audit reports

5.5.2 Administrative Rules

- System administration requires:
    - Changes to user roles approved by management
    - Regular system audits (monthly)
    - Compliance with company IT policies
    - Documentation of all system changes

5.5.3 Reporting Rules

- Report generation must:

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      ○ Follow company standard formats
      ○ Include data source and timestamp
      ○ Maintain audit trail of access
      ○ Support electronic signatures for approval

6.0 Other Requirements

6.1 Database Requirements

- PostgreSQL 14 or higher required
- Minimum storage capacity: 500GB
- Daily backup requirements
- Data retention period: 5 years
- Data archival strategy implementation

6.2 Internationalization Requirements

- Support for multiple currencies (GYD)
- Date format: DD/MM/YYYY
- Weight units: Grams, Carats
- Language support: English
- Time zone handling: GMT-4 (Guyana Time)

6.3 Legal Requirements

- Compliance with local jewelry industry regulations
- Data protection compliance
- Electronic record-keeping requirements
- Audit trail maintenance
- Employee privacy protection

6.4 Installation Requirements

- Automated deployment scripts
- System restoration procedures
- Configuration management
- Version control implementation
- Testing environment setup

7. Project Success Measurements

7.1 Key Performance Indicators (KPIs)

7.1.1 System Performance

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- System Uptime: 99.9% availability
- Response Time: < 3 seconds for 95% of transactions
- Data Accuracy: 99.99% accuracy in inventory records

7.1.2 User Adoption and Satisfaction

- User Adoption Rate: 95% of target users actively using the system within 2 weeks
- User Satisfaction Score: Average of 4.5/5 on user surveys

7.1.3 Operational Efficiency

- Inventory Turnover Rate: 20% improvement from pre-implementation
- Material Loss Rate: 50% reduction from pre-implementation

7.1.4 Financial Impact

- Cost Savings: 15% reduction in inventory holding costs
- ROI: Positive Return on Investment (ROI) within 18 months of full implementation

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Appendix A: Glossary

Term	Definition
KJW	King's Jewellery World
Material Loss	Difference between initial and final weight of materials during production
Raw Materials	Unprocessed materials used in jewelry production
Stock Threshold	Minimum quantity of material that triggers reorder alert
SRS	Software Requirements Specification
API	Application Programming Interface
SSL	Secure Sockets Layer
TLS	Transport Layer Security

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Appendix B: Analysis Models

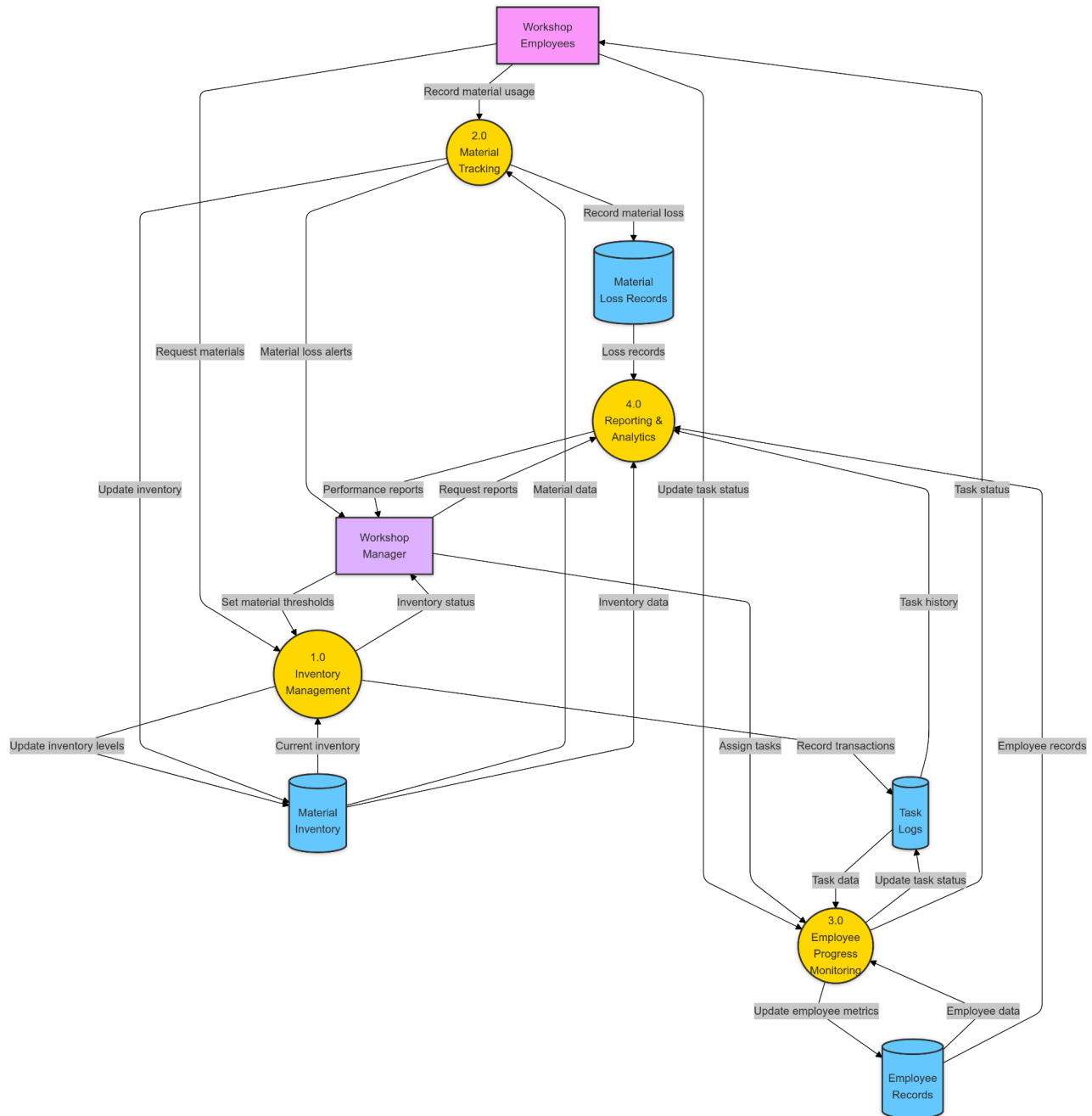*Figure 1.1: Data Flow Diagram(DFD)*

This diagram illustrates the complete data flow within the Workshop Management System.

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External Entities:

1. Workshop Employees - Primary users who interact with materials and tasks
2. Workshop Manager - Oversees operations and receives reports

Processes:

1. Inventory Management (1.0)
   - Handles stock levels and material requests
   - Manages material thresholds
   - Updates inventory records
2. Material Tracking (2.0)
   - Records material usage
   - Tracks material loss
   - Generates loss alerts
3. Employee Progress Monitoring (3.0)
   - Manages task assignments
   - Tracks task completion
   - Updates employee metrics
4. Reporting & Analytics (4.0)
   - Generates performance reports
   - Analyzes inventory and loss data
   - Provides management insights

Data Stores:

1. Material Inventory (D1)
   - Stores current stock levels
   - Tracks material thresholds
2. Employee Records (D2)
   - Stores employee information
   - Maintains performance metrics
3. Task Logs (D3)
   - Records task assignments
   - Tracks task status
4. Material Loss Records (D4)
   - Stores material loss data
   - Tracks usage patterns

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Key Data Flows:

From Workshop Employees:

- Record material usage → Material Tracking
- Update task status → Employee Progress Monitoring
- Request materials → Inventory Management

From Workshop Manager:

- Set material thresholds → Inventory Management
- Assign tasks → Employee Progress Monitoring
- Request reports → Reporting & Analytics

Between Processes and Data Stores:

- Inventory Management → Material Inventory: Updates levels
- Material Tracking → Material Loss Records: Records loss
- Employee Progress Monitoring → Task Logs: Updates status
- All Data Stores → Reporting & Analytics: Provides data for reports

To External Entities:

- Inventory Management → Manager: Inventory status
- Material Tracking → Manager: Loss alerts
- Employee Progress Monitoring → Employees: Task status
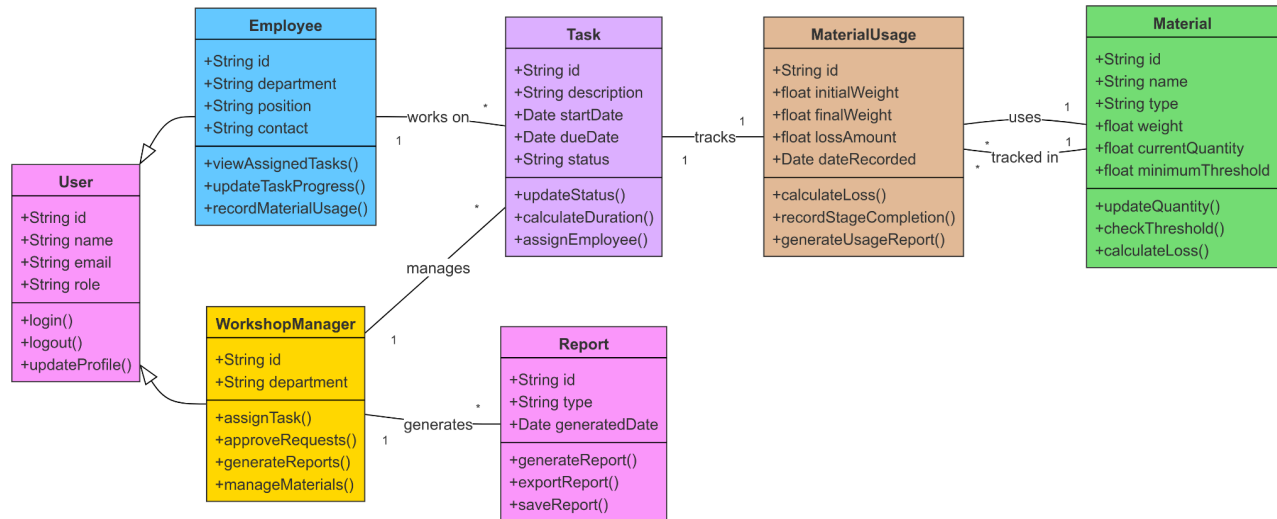- Reporting & Analytics → Manager: Performance reports

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Figure 1.2: Class Diagram

This diagram shows the object-oriented structure of the system.

Core Classes:

1. User Class (Abstract)
   - Attributes: user_id, name, email, role
   - Methods: login(), logout(), updateProfile()
2. Employee Class (Inherits from User)
   - Attributes: employee_id, department, position, contact
   - Methods: viewAssignedTasks(), updateTaskProgress(), recordMaterialUsage()
3. WorkshopManager Class (Inherits from User)
   - Attributes: manager_id, department
   - Methods: assignTask(), approveRequests(), generateReports(), manageMaterials()
4. Material Class
   - Attributes: material_id, name, type, weight, currentQuantity, minimumThreshold
   - Methods: updateQuantity(), checkThreshold(), calculateLoss()
5. MaterialUsage Class
   - Attributes: usage_id, initialWeight, finalWeight, lossAmount, dateRecorded
   - Methods: calculateLoss(), recordStageCompletion(), generateUsageReport()
6. Task Class
   - Attributes: task_id, description, startDate, dueDate, status
   - Methods: updateStatus(), calculateDuration(), assignEmployee()
7. Report Class
   - Attributes: report_id, type, generatedDate
   - Methods: generateReport(), exportReport(), saveReport()

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Relationships:

- User (Abstract) is inherited by Employee and WorkshopManager
- WorkshopManager (1) --- (*) Task: A manager can manage multiple tasks
- Employee (1) --- (*) Task: An employee can work on multiple tasks
- Task (1) --- (1) MaterialUsage: Each task tracks one material usage record
- MaterialUsage (*) --- (1) Material: Multiple usage records can be associated with one material
- Material (1) --- (*) MaterialUsage: One material can have multiple usage records
- WorkshopManager (1) --- (*) Report: A manager can generate multiple reports

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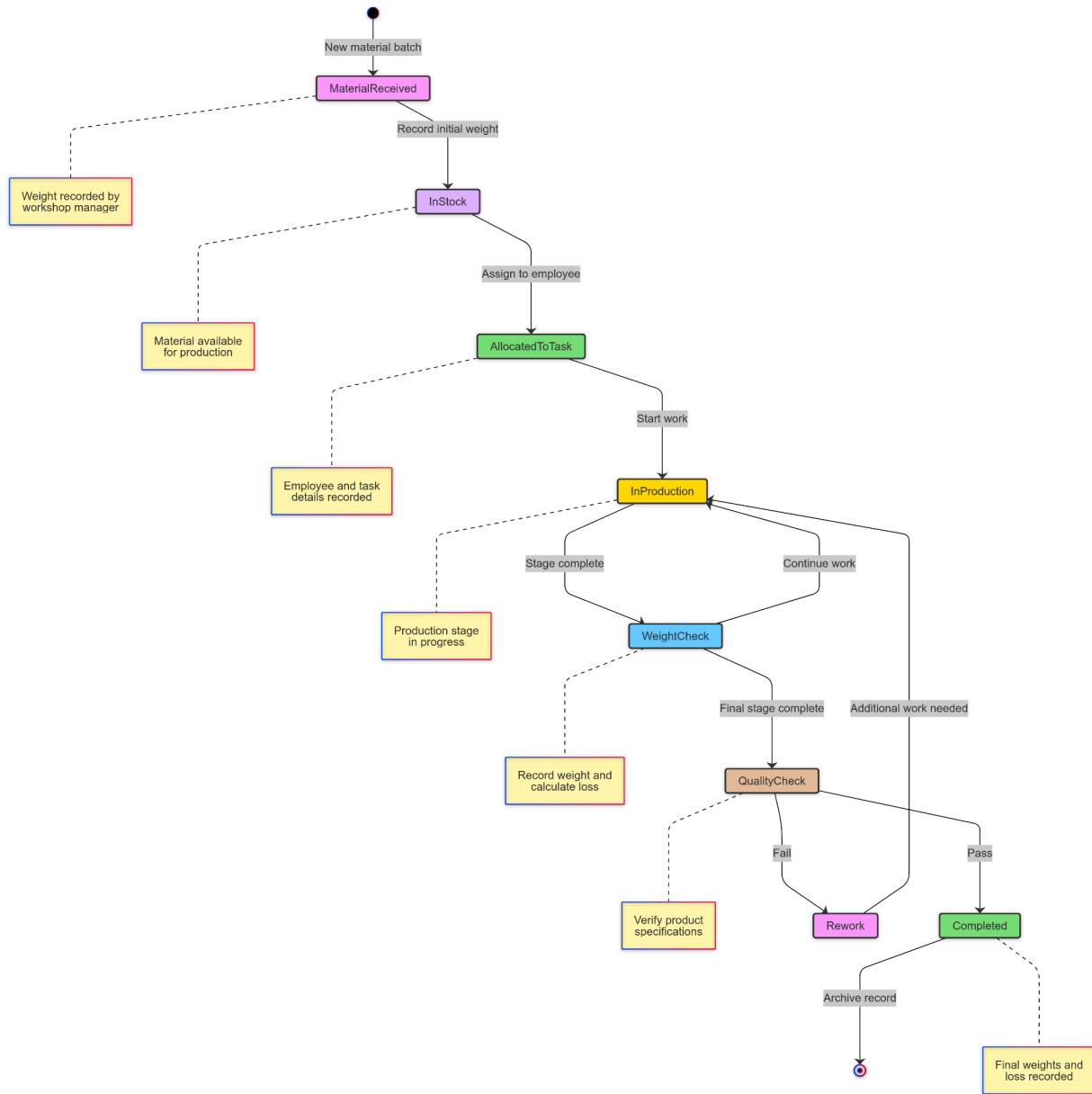
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Figure 1.3: Showing the state diagram for the workshop management system.

This State Diagram illustrates the lifecycle of material tracking in the Workshop Inventory Management System.

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States:

1. MaterialReceived
   - Initial state when new material enters system
   - Captures initial weight and details
   - Note: Weight recorded by workshop manager
2. InStock
   - Material available in inventory
   - Ready for assignment to tasks
   - Note: Material available for production
3. AllocatedToTask
   - Material assigned to specific employee/task
   - Tagged with employee and task details
   - Note: Employee and task details recorded
4. InProduction
   - Material actively being worked on
   - Progress being tracked
   - Note: Production stage in progress
5. WeightCheck
   - Intermediate verification state
   - Material weight measured after stage completion
   - Note: Record weight and calculate loss
6. QualityCheck
   - Final verification state
   - Product checked against specifications
   - Note: Verify product specifications
7. Completed
   - Final state for successful production
   - All measurements recorded
   - Note: Final weights and loss recorded
8. Rework
   - State for failed quality checks
   - Material needs additional processing
   - Note: Additional work needed

Transitions:

1. MaterialReceived → InStock: Record initial weight
2. InStock → AllocatedToTask: Assign to employee
3. AllocatedToTask → InProduction: Start work
4. InProduction → WeightCheck: Stage complete
5. WeightCheck → InProduction: Continue work
6. WeightCheck → QualityCheck: Final stage complete
7. QualityCheck → Completed: Pass
8. QualityCheck → Rework: Fail
9. Rework → InProduction: Additional work needed
10. Completed → [End]: Archive record

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Key Features:

- Captures complete material lifecycle
- Includes quality control checkpoints
- Shows potential rework cycles
- Tracks weight measurements at key points
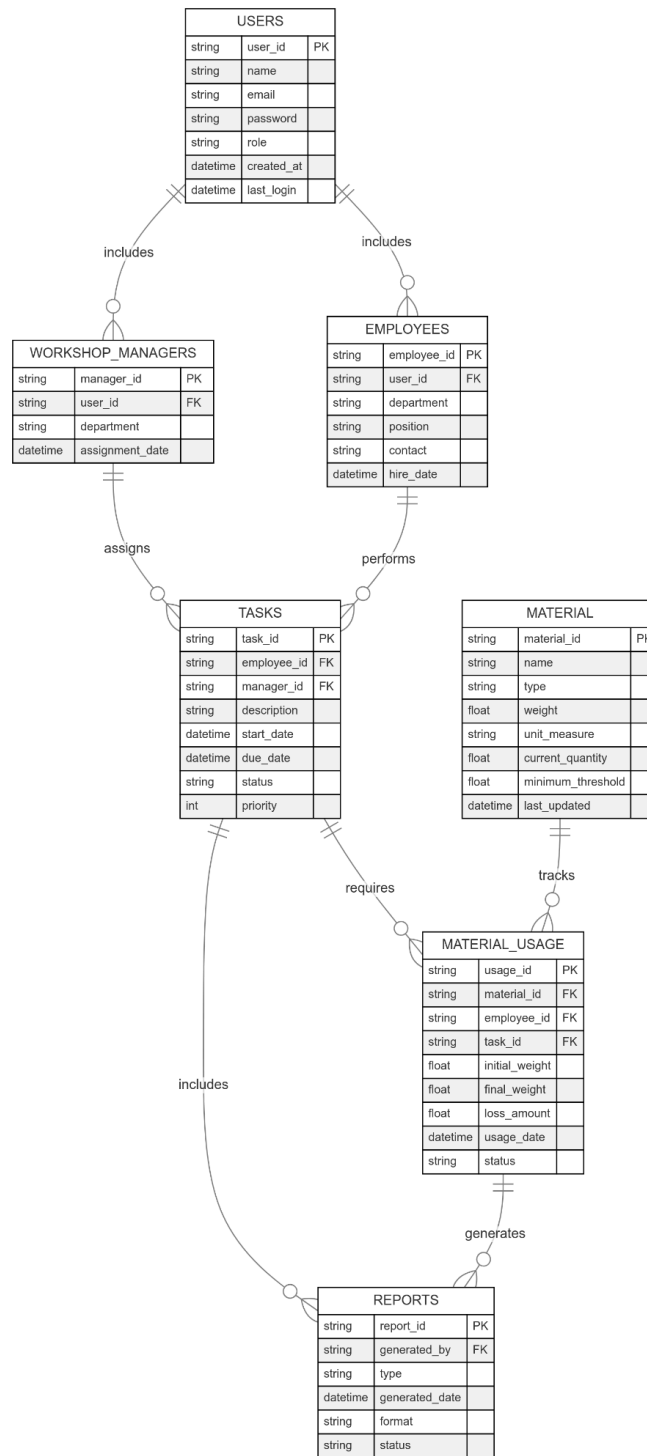- Maintains employee accountability

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Figure 1.4: Showing the entity-relationship diagram for the workshop management system.

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Entities and Attributes:

1. Report
   - id (PK, string)
   - type (string)
   - date (timestamp)
   - status (string)
2. Inventory
   - id (PK, string)
   - name (string)
   - quantity (float)
   - min_threshold (float)
   - reorder_level (float)
   - status (string)
3. MaterialUsage
   - id (PK, string)
   - init_weight (float)
   - final_weight (float)
   - waste (float)
   - date (timestamp)
   - status (string)
4. Employee
   - id (PK, string)
   - name (string)
   - role (string)
   - contact (string)
   - status (string)
5. Task
   - id (PK, string)
   - description (string)
   - start_date (timestamp)
   - due_date (timestamp)
   - status (string)
   - est_time (float)
6. WorkOrder
   - id (PK, string)
   - title (string)
   - date (timestamp)
   - status (string)
   - cost (float)

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Relationships:

1. Report relationships:
    - Report "analyzes" Inventory
    - Report "includes" MaterialUsage
2. Inventory relationships:
    - Inventory "tracks" MaterialUsage
3. MaterialUsage relationships:
    - MaterialUsage "assigned_to" Employee
    - MaterialUsage "summarizes" Task
4. Employee relationships:
    - Employee "performs" Task
5. Task relationships:
    - Task "part_of" WorkOrder
6. WorkOrder relationships:
    - WorkOrder "requires" MaterialUsage

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Appendix C: To Be Determined

1. Software Interface Specifications

Database System

Final decisions needed for:

- PostgreSQL version selection (currently specified as 14 or higher)
- Connection pooling implementation details
- Specific backup and replication configuration
- Performance tuning parameters

Framework and Dependencies

Version and compatibility verification needed for:

- Laravel framework version (currently specified as 8.x+)
- PHP version requirements (currently specified as 8.0+)
- Extension compatibility across different environments
- Development environment standardization

Considerations:

1. Version Selection Impact
   - Long-term support (LTS) availability
   - Security update timelines
   - Compatibility with hosting environment
   - Performance implications
2. Implementation Timeline
   - Database migration schedule
   - Framework upgrade path
   - Extension update coordination
   - Testing requirements

These specifications may need adjustment based on:

- Hosting environment constraints
- Performance requirements
- Security requirements
- Development team expertise
- Project timeline

Final versions and configurations are to be confirmed before the development phase begins.

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2. Digital Scale Integration

The integration of digital scales is currently listed as TBD (To Be Determined) due to time constraints. The following references to scale integration appear in the requirements document and should be considered optional/future features:

Current Document References:

1. In Material Tracking Module (Section 4.2):
    - Error handling for "Scale calibration check"
    - Reference to "backup scale if available"
    - Weight validation rules mentioning "scale capacity"
    - Interface requirement for "Digital scale integration"
2. In Inventory Management Module (Section 4.1):
    - Interface requirement for "Integration with weighing scales"
3. In Performance Requirements:
    - Any mentions of automated weight capture or scale response times

Implementation Decision:

For the initial release, the system will:

- Implement manual weight entry functionality
- Include validation rules for manually entered weights
- Support future integration of digital scales without requiring architectural changes

All mentions of scale integration in the requirements should be considered as planned future enhancements rather than core requirements for the initial system release.