# Product Requirements - TCG eBay Batch Uploader

## 1. Introduction

This document outlines requirements for an advanced application that automates listing Trading Card Game (TCG) inventory on eBay using intelligent caching and comprehensive data enrichment. The application leverages AI for card identification, advanced caching for cost optimization, and generates professional eBay-ready files with complete SEO data. Primary focus: Pokémon TCG and Magic: The Gathering cards.

## 2. Goals

* **Minimize API costs** through intelligent caching strategies (60-80% cost reduction).
* **Maximize listing quality** through comprehensive data enrichment (all 40 eBay fields).
* **Optimize processing speed** through async processing (85% speed improvement).
* **Ensure professional listings** that rank higher in eBay search results.
* **Enable efficient batch processing** of hundreds of cards with cost optimization.

## 3. Requirements

### 3.1. Data Ingestion & Processing

* **Input Format**: Process all .jpg, .jpeg, .png, .webp, .bmp, and .tiff image files in /Scans/ directory.
* **Batch Processing**: Support concurrent processing of hundreds of cards with controlled rate limiting.
* **Processing Sequence**: Alphanumeric filename order for internal tracking and consistency.
* **Memory Management**: Efficient handling of large image batches without memory overflow.

### 3.2. Intelligent Caching System

* **Image-Level Caching**:
  + Cache Ximilar identification results by image hash
  + Avoid re-processing identical image files on subsequent runs
  + Persistent cache survives application restarts
* **Card-Type Caching**:
  + Cache Pokemon TCG/Scryfall data by card name + set combination
  + Multiple copies of same card type reuse cached pricing/metadata
  + 80-95% reduction in redundant API calls for duplicate card types
* **eBay EPS Caching**:
  + Cache eBay-hosted image URLs by image hash
  + Avoid re-uploading identical images
* **Cache Management**:
  + Configurable cache size limits (default: 10GB total)
  + Automatic cleanup of old cache entries
  + Cache performance metrics and hit rate reporting

### 3.3. AI-Powered Data Transformation

* **Card Recognition**:
  + Use Ximilar API for visual card identification
  + Extract card name, number, set, rarity, and game type
  + Confidence scoring with flagging for manual review
  + Cache results to minimize expensive API calls
* **Comprehensive Market Pricing**:
  + **Pokémon cards**: Pokemon TCG API with authenticated access
  + **Magic cards**: Scryfall API for comprehensive MTG data
  + **Pricing Strategy**: Apply 30% markup to market prices automatically
  + **Default Pricing**: $5.00 for cards without market data, flagged for review
* **eBay Category**: Default to "CCG Individual Cards" (ID: 183454) with option for customization.

### 3.4. Comprehensive Data Enrichment

* **Complete eBay Field Population**: All 40 required eBay columns populated for maximum SEO benefit:
  + **Core Fields**: Action, Category, Title, Description, Condition, Price
  + **Item Specifics**: Game, Card Name, Set, Rarity, Card Number, HP, Card Type
  + **Enhanced SEO**: Manufacturer, Language, Finish, Graded status
  + **Pokemon-Specific**: HP, Energy Types, Card Types, Artist information
  + **MTG-Specific**: Mana cost, Colors, Power/Toughness, Card types
* **Title Generation**:
  + Format: "Card Name | Card Number | Set Name | Finish | NM/LP"
  + Intelligent truncation to 80 characters with priority preservation
  + SEO optimization for eBay search algorithms
* **Enhanced Descriptions**:
  + Professional HTML templates with card-specific details
  + Conditional content based on available data (HP, types, artist)
  + Consistent branding and quality assurance messaging

### 3.5. Advanced Image Management

* **eBay EPS Integration**:
  + Direct upload to eBay's Picture Services (EPS)
  + Proper multipart form handling with retry logic
  + 30-day image retention with automatic renewal
  + Cache EPS URLs to avoid duplicate uploads
* **Image Processing**:
  + Support for multiple image formats and sizes
  + Automatic quality validation and format conversion
  + Batch upload optimization with concurrent processing
* **URL Management**:
  + Primary image URL in PicURL field
  + Support for multiple images per card (future enhancement)
  + Cache-busting parameters for eBay compatibility

### 3.6. Listing and Policy Configuration

* **Listing Type**: Fixed Price (Buy It Now) with Good 'Til Canceled duration
* **Payment Policy**: Immediate Payment Required for Buy It Now listings
* **Shipping Configuration**:
  + Price-based shipping policy selection from config.json
  + Support for multiple shipping services and costs
  + Free shipping options for higher-value items
* **Return Policy**: "Returns Accepted" with 30-day return window
* **Condition Standards**: Near Mint to Lightly Played (NM/LP) default

### 3.7. Output Requirements

* **Format**: Excel .xlsx file with advanced formatting capabilities
* **File Naming**: Timestamped output (e.g., tcg\_listings\_20250623\_143022.xlsx)
* **Location**: /output/ folder with automatic directory creation
* **Sheet Structure**:
  + **Sheet 1**: "eBay\_Upload" - Complete eBay-compatible format (40 columns)
  + **Sheet 2**: "Review\_Items" - Items flagged for manual attention
* **Enhanced Review System**:
  + **CONFIDENCE\_SCORE**: Ximilar confidence percentage
  + **REVIEW\_FLAG**: Classification (OK, LOW\_CONFIDENCE, PRICE\_MISSING, API\_ERROR)
  + **API\_DATA\_SOURCE**: Track which APIs provided data
  + **PROCESSING\_NOTES**: Detailed information about any issues
* **Conditional Formatting**:
  + Red highlighting for items requiring manual review
  + Color-coded confidence scores
  + Visual indicators for different issue types

### 3.8. Performance and Reliability Requirements

* **Processing Speed**:
  + Target: 25-50 cards per second for large batches
  + Async processing with configurable concurrency limits
  + Progress tracking with ETA calculations
* **Error Handling**:
  + Exponential backoff retry for API failures
  + Graceful degradation when services are unavailable
  + Comprehensive logging with different severity levels
  + Resume capability for interrupted processing
* **Rate Limiting**:
  + Configurable rate limits for each API service
  + Automatic throttling to prevent API bans
  + Queue management for high-volume processing
* **Cost Optimization**:
  + Target 60-80% reduction in Ximilar API costs through caching
  + Batch processing optimization for all API calls
  + Real-time cost tracking and reporting

### 3.9. Configuration and Extensibility

* **Configuration Management**:
  + Centralized config.json with environment-specific settings
  + API key management with validation
  + Caching parameters and thresholds
  + Processing limits and performance tuning
* **Extensibility**:
  + Modular architecture for adding new card games
  + Plugin system for additional data sources
  + Configurable field mapping for different eBay categories
* **Monitoring**:
  + Performance metrics collection
  + Cache efficiency reporting
  + API usage tracking and cost analysis
  + Processing success/failure statistics