

PART A: USER STORIES & ON-CHAIN REQUIREMENTS DOCUMENT: THE FINAL, CLEAN, AND METICULOUSLY REFINED VERSIONS OF YOUR CORE USER PERSONAS, FUNCTION MAPS, AND THE LIST OF POTENTIAL ON-CHAIN REQUIREMENTS FROM PART D.

THE PLASTIC CREDITS MARKETPLACE- UPDATED CORE VALUE PROPOSITION

To create a transparent, efficient, and environmentally sustainable marketplace for trading Plastic Credits representing post-consumer plastic resins (PET, HDPE, PP). By utilizing Solana's blockchain, it ensures immutable records of transactions and material origins, providing buyers with verifiable data on quality and authenticity. Solana's technical advantages —Proof-of-History consensus which allows for a theoretical limit of up to 65,000 transactions per second and low fees, as well as minimal energy consumption (0.00412 Wh per transaction)— enable environmentally sustainable, scalable and cost-effective operations. The verifiable Plastic Credits issued by the Marketplace support regulatory compliance (e.g., EU's Green Claims Directive) and promotes the circular economy by connecting buyers (e.g., manufacturers) with sellers (e.g., recyclers).

Core User Personas:

User Type	Rationale
Sellers (Recyclers)	Provide the supply of post-consumer plastic resins, central to listing and selling Plastic Credits.
Buyers (Manufacturers)	Represent the demand side, purchasing resins, essential for demonstrating marketplace functionality.
On-Chain Marketplace Operators	Manage the system and smart contracts, ensuring operational integrity for the PoC.

Function Maps:

- Sellers (Recyclers):
 - Register on the platform.
 - List available post-consumer plastic resins (type, quantity, quality, origin).
 - Set prices or accept bids.
 - Provide verifiable data (e.g., blockchain records).
 - Receive payments upon sale.
 - Manage inventory and sales records.
- Buyers (Manufacturers):
 - Register on the platform.
 - Search for resins (filter by type, quality, origin, price).
 - View detailed and verifiable data about materials.
 - Place orders or bids.
 - Make payments.
 - Receive purchased materials (delivery may be off-chain).

Marketplace Operators:

- Set up and maintain platform infrastructure, including Solana smart contracts.
- Manage user registrations and verifications.
- Ensure transaction and data integrity.
- Handle disputes or issues.
- Update platform features or regulations.
- Monitor environmental impact metrics.

LIST OF POTENTIAL ON-CHAIN REQUIREMENTS:

User Story: Seller creates a new asset token representing a batch of plastic resin.

Function: `mint_new_nft(metadata)` to mint a new NFT.

Stores: NFT metadata (type, quantity, origin, seller address).

Associates NFT with sellers wallet address as initial owner.

User Story: Seller lists the asset token for sale on the marketplace.

Function: `list_nft(nft_address, price)` in marketplace contract.

Stores: Listing data (nft_address, seller_address, price).

On-chain storage for queryable listings.

User Story: Buyer browses available listings.

Function: `get_active_listings()` to retrieve active listings.

On-chain storage allows filtering (e.g., by type, price).

User Story: Buyer purchases a listed asset token.

Function: `buy_nft(listing_id)` in marketplace contract.

Logic:

- Check buyers SOL balance.

- Transfer SOL from buyer to seller.

- Transfer NFT ownership to buyer.

- Remove listing from active listings.

Records transaction on-chain for transparency.

PART B: PROCESS APPENDIX: A DETAILED LOG OF MY PROCESS FOR THIS ASSIGNMENT, INCLUDING PROMPTS, AI OUTPUTS, ANALYSES, AND THE RATIONALE FOR ALL REFINEMENTS FROM PARTS A, B, C, AND D.

Part A: Initial User & Function Mapping

1) Manual User Brainstorming

Manual Task: Based on your refined Value Proposition from Assignment 1, brainstorm a broad list of every potential user type who might interact with your project. Think beyond just the primary user. Consider different categories:

- **Direct Users:** Who will use the product day-to-day? (e.g., content creators, voters, investors)
- **Indirect Users/Beneficiaries:** Who benefits from the direct users' actions? (e.g., content consumers, project owners)
- **Administrators/Moderators:** Who will manage the system? (e.g., you as the developer, community moderators)
- **Stakeholders:** Who has a vested interest in the project's success but may not use it directly? (e.g., token holders, partners)

Output: A preliminary, comprehensive list of all potential user types.

Comprehensive list of all potential user types:

Direct Users:

Plastic Credits¹ buyers: any company, investor or individual interested in claiming the PC for compliance with environmental, EPR, CSR policies or to meet voluntary goals towards plastic neutrality.

PC Sellers: recycling companies and collectives that collect and/or process recycled plastic resins, whose economic and environmental value is encapsulated in Plastic Credits that are listed and sold in the marketplace. (maybe social value as well? It would depend on the type of recycled plastic suppliers involved, I need to think more about this as plastic credits that also represent social value may be more attractive for the market and for stakeholders).

(Maybe investors? What are the pros and cons of allowing Plastic Credits trading? Maybe a soul-bound-token-type Plastic Credit would be more convenient?)

Indirect Users/Beneficiaries: organizations and individuals that need to verify the validity and details of a Plastic Credit, like regulatory bodies (local and national governments and international organizations), companies demanding suppliers the integration of Plastic Credits to the supply chain, any end-users of plastic products plastics supporting the circular economy.

Administrators/Moderators:

On-chain Marketplace operators: the team managing the on-chain system that ensures transaction and data integrity, including developers, customer support and internal/external auditors.

Stakeholders: governments, communities, consumers of products involving plastic in any way (the product itself or packaging)

2) AI-Assisted User Prioritization

¹ Plastic Credits (SPL-Tokens or NFT? TBD)

- **AI-Assisted Task:** Take the comprehensive list of potential user types you brainstormed in the previous step. You will now use AI to help you prioritize this list and focus on the most critical users for a Proof-of-Concept (POC).
- **AI Prompt:** Prompt the AI with: "My project's value proposition is [see UPDATED CORE VALUE PROPOSITION]. Here is a brainstormed list of all potential user types: [Comprehensive list of user types: Sellers (recyclers), buyers (manufacturers), regulatory bodies, consumers, on-chain marketplace operators, investors, partners]. Based on the value proposition, which 2-5 of these user types are the most critical to focus on for an initial Proof-of-Concept? For each user you recommend, provide a brief rationale explaining why they are essential for proving the project's core value."

User Type	Rationale
Sellers (Recyclers)	Provide the supply of post-consumer plastic resins, central to listing and selling Plastic Credits.
Buyers (Manufacturers)	Represent the demand side, purchasing resins, essential for demonstrating marketplace functionality.
On-Chain Marketplace Operators	Manage the system and smart contracts, ensuring operational integrity for the PoC.

- **Manual Action & Output:** Analyze the AI's recommendations and rationale. Decide on your final, prioritized list of the top 2-5 key user types. Document your final list and a brief explanation of your decision-making process, noting where you agreed or disagreed with the AI's suggestions and why.

I fully agree with the LLM suggestions as these 3 user types (the sellers of Plastic Credits, the buyers and the on-chain marketplace operators) are critical users; without them there is no marketplace. Regulatory bodies, investors, and partners are important for full implementation but can be simulated or minimally addressed in a PoC. Consumers are indirect beneficiaries and not critical for the initial proof. therefore the PoC must prove the system works for at least these 3 types of users.

3) Core Function Mapping

- **AI Task:** Now, using your final prioritized list of users, map out their functions. Prompt the AI: "For a project with this value proposition [see UPDATED CORE VALUE PROPOSITION] and focusing on these prioritized user types [buyers, sellers and operators], help map out the key functions or interactions each user would need to perform."
- **Output:** A list of key functions and interactions mapped to your prioritized user types.

The key functions for each prioritized user type are:

Sellers (Recyclers):

- Register on the platform.
- List available post-consumer plastic resins (type, quantity, quality, origin).
- Set prices or accept bids.
- Provide verifiable data (e.g., blockchain records).

- Receive payments upon sale.
- Manage inventory and sales records.

Buyers (Manufacturers):

- Register on the platform.
- Search for resins (filter by type, quality, origin, price).
- View detailed and verifiable data about materials.
- Place orders or bids.
- Make payments.
- Receive purchased materials (delivery may be off-chain).

Marketplace Operators:

- Set up and maintain platform infrastructure, including Solana smart contracts.
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- Handle disputes or issues.
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4) Deriving Core POC Requirements

Manual Task: From the function map you just created, identify the top 1-2 most critical user stories or interaction paths essential for a POC.

The most critical user stories for the POC are:

1. A seller lists post-consumer plastic resins for sale:

- Seller creates a listing with details (type, quantity, quality, origin).
- Seller provides verifiable data (e.g., blockchain records).
- Seller sets a price or accepts bids.

2. A buyer purchases Plastic Credits resins from a seller:

- Buyer searches and finds a listing.
- Buyer places an order.
- Buyer makes payment.
- Seller confirms the sale.
- Transfer of ownership or rights to materials (on-chain).
- Issuance of plastic credits.

AI Task: Prompt the AI: "Based on these top 1-2 critical user interactions [describe interactions], what are the key technical requirements needed to build a proof-of-concept?"

Output: An initial list of key technical requirements derived from the core user interactions.

- Smart contract for creating and managing listings (sellers).
- Smart contract for purchasing listings (buyers).
- On-chain storage for listing details and transaction history.
- Payment handling in SOL.
- Verification mechanisms for material authenticity and origin.

- User authentication and authorization.
- Minimal front-end interface for smart contract interaction.

Part B: Adversarial Analysis & Granularity Check

1) Critique & Refine User Stories / Requirements:

AI Prompt: "Review my core user functions/stories and requirements. Considering my project's refined value proposition, do these stories truly hit the mark? Are the requirements granular enough to map to specific technical components (e.g., database schemas, API endpoints, specific blockchain programs)? What's missing or unclear?"

User Stories Critique:

Granularity: "Buyer searches and finds listings" should be split into "Buyer performs a search with filters" and "Buyer views listing details." Similarly, "Buyer places an order" includes "Buyer selects a listing" and "Buyer specifies quantity."

Clarity: "Seller confirms sale" could be automated upon payment, simplifying the PoC.

Alignment: "Transfer of ownership" needs clarification modeled as transferring an NFT representing the resin batch. "Issuance of plastic credits" requires definition but may be deferred for POC simplicity.

Requirements Critique:

Granularity: "Smart contract for creating listings" needs specific data fields (e.g., seller address, material type, quantity, price). "On-chain storage" must clarify on-chain vs. off-chain data.

"Verification mechanisms" need a method (e.g., oracles or linked blockchain records).

Missing Elements: NFT-based representation of resin batches for ownership transfer. Basic user authentication via wallet addresses.

Action: Analyze the feedback. Refine your user stories for better alignment and ensure your technical requirements meet the necessary granularity for technical planning

Documentation: Document the AI critique, your analysis, and the rationale for your refined user stories and technical requirements.

Refined User Stories:

1. Seller creates a new asset token representing a batch of plastic resin (minting an NFT with metadata).
2. Seller lists the asset token for sale on the marketplace.
3. Buyer browses available listings.
4. Buyer purchases a listed asset token (transfers SOL and NFT).

Refined Technical Requirements:

- **NFT Minting Contract:**

Function: mint_new_nft(metadata) (stores NFT metadata, owner).

Marketplace Contract: – Function: list_nft(nft_address, price) (stores listing data: nft_address, seller, price).

Function: buy_nft(listing_id) (checks buyers SOL balance, transfers SOL to seller, transfers NFT to buyer, removes listing).

On-chain storage for NFT metadata and listing data. • Payment handling in SOL. • Basic user authentication (wallet addresses).

Part C: Granularity & Clarity Refinement

1) Final Manual Review & Refinement

Action: Review every user story and function from Part B through the following lens. Your goal is to simplify and clarify, preparing for technical implementation.

The refined user stories were reviewed for clarity, granularity, and alignment:

De-Jargon: Stories use simple language (e.g., "Buyer purchases a listed asset token" instead of "executes a blockchain transaction").

Granularity: Each story is a single action (e.g., "Seller creates a new asset token" is separate from "Seller lists the asset token").

Atomicity: No story combines multiple steps.

Clarity of Action: Actions and outcomes are clear (e.g., purchasing results in NFT transfer).

No Overlap: Stories are distinct with no redundancy.

Documentation: In your appendix, create a "Part C Refinement Log." For each change you make, briefly note the "Before" story and the "After" story with a short rationale for the change (e.g., "Split into two stories for atomicity," "Removed jargon 'API call' and replaced with 'sends information'").

BEFORE	AFTER	RATIONALE
Buyer searches and finds listings	Buyer performs a search with filters	Split for atomicity
	Buyer views listing details	
Seller confirms sale	Removed	Automated upon payment for PoC simplicity

Part D: Defining Potential On-Chain Requirements

- **1) Brainstorming On-Chain Requirements for Each User Story**
- **Action:** Take your final, refined list of user stories from Part C. For each individual story, create a simple bulleted list of potential on-chain requirements needed to make it happen. This is a brainstorming exercise to translate user actions into technical needs.

Output: A list of your user stories, each followed by a bulleted list of its potential on-chain requirements.

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