

Hand Me Down Clothing Documentation

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1 Informative Part

1.1 Team

The team is organized into key functional areas with dedicated leads overseeing documentation and requirement completion, authentication, listings, and search and map integration, under the guidance of three project managers.

Managers

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- Alma Piñeiro
- Jahsyel Rojas

Team 1 - Documentation & Requirements

- Joshua Dávila (Lead)
- Ojani Figueroa
- Giovanny García
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Team 2 - Authentication & User Accounts

- Lorenzo Pérez (Lead)
- Jessy Andújar
- Gabriel Marrero
- Luis Marrero
- Ángel Villegas

Team 3 - Listings

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- Leanelys González
- Karina López
- Nicolás Rivera
- Jachikasielu Uwakweh

Team 4 - Search & Map Integration

- Jorge De León (Lead)
- Devlin Hahn

- Alejandro Marrero
- Kian Ramos
- Januel Torres

Team 5 - UI/UX & Branding

- Fabiola Torres (Lead)
- Yamilette Alemañy
- Daniella Melero
- Andrea Segarra
- Kenneth Sepúlveda

1.2.1 Current Situation

Landfills and textile waste in Puerto Rico

- High waste volume: Approximately 250 million pounds of clothing and textiles are sent to Puerto Rico's landfills annually.
- High landfill rate: Similar to the global and U.S. trends, a very high percentage of discarded textiles, around 85%, end up in landfills, despite being largely recyclable.
- Low recycling rates: Puerto Rico's overall recycling rate is notably low, with some reports estimating it to be less than 10%. This is significantly lower than the U.S. national average.
- Overwhelmed landfills: Puerto Rico's landfills are facing a serious crisis, with many already at or over capacity. The high volume of textile waste contributes to this problem.

Sources:

- investpr.org
- theenvironmentalblog.org

Poverty

- Overall Poverty: The poverty rate in Puerto Rico is alarmingly high, at around 41.7% as of 2022. This is over three times the U.S. national average.
- Child Poverty: A staggering 54.3% to 57.6% of children under 18 in Puerto Rico live in poverty. This is more than any U.S. state and indicates that a vast number of families cannot afford to consistently provide their children with properly fitting, weather-appropriate clothing and shoes.
- Persistent Poverty: All 78 municipalities in Puerto Rico are classified as "persistent poverty counties," meaning they have maintained a poverty rate of 20% or more for at least 30 years.

Sources:

- centropr.hunter.cuny.edu

- geopoliticaconomy.com

Homelessness:

- Homeless Population: Recent counts show the homeless population in Puerto Rico to be around 2,096 individuals. For these individuals, clothing is a constant and critical need.

Sources:

- periodismoinvestigativo.com

1.2.2 Need

The purpose of this section is to establish the fundamental needs that motivate the Hand Me Down project, expressed independently of any system-to-be. These needs are grounded in the resale domain and must reflect the concerns of students and families who participate in secondhand exchanges. The articulation of these needs will guide the subsequent development of domain descriptions, requirements, software architecture, and testing activities.

Stakeholders in this domain shall be understood as students and families seeking opportunities for affordable, accessible, and trustworthy secondhand exchanges. Their needs are not for a platform itself, but for solutions to the problems they encounter when attempting to exchange goods in local communities.

The following distinct needs are identified:

- Students and families must have affordable access to secondhand goods that support daily life, education, and well-being.
- Stakeholders must be able to rely on transparent information about the condition and history of pre-owned items.
- Exchanges shall be conducted in a manner that establishes trust, fairness, and safety between participants.
- Opportunities for accessibility and inclusivity must be available so that all families and students, regardless of economic background, will participate in the resale domain without barriers.
- Developers shall have clear requirements, descriptions, and architecture to build upon, since no structured system currently exists to organize this resale context.

These needs form the foundation for further project work. They are deliberately expressed at the domain level, independently of any particular solution, to ensure that subsequent design and implementation activities will remain aligned with the stakeholders underlying motivations.

1.3.1 Scope & Span

Scope

The Hand Me Down project will operate in the broad domain of online resale marketplaces. It will

address the general problem of enabling individuals and communities to exchange secondhand goods in a structured, reliable, and sustainable manner. The scope will cover activities in domain engineering, requirements engineering, and software architecture to ensure a well-founded solution.

The project will emphasize the following areas:

- Domain:: Resale of pre-owned items across categories such as clothing and accessories.
- Requirements:: Identifying user needs related to affordability, sustainability, accessibility, and usability.
- Architecture:: Defining a framework that supports secure and scalable interactions between sellers and buyers.
- Project Activities:: Documentation, validation, and design processes that must accompany implementation.

Span

The span narrows the focus of the Hand Me Down project to **specific concerns and audiences** within the general resale domain. The platform must primarily serve individuals and families who wish to exchange items affordably, students and young adults seeking budget-friendly goods, and community members interested in sustainable consumption.

The span includes the following project-specific aspects:

- User Interaction:: Individuals must be able to list, browse, and search for secondhand items.
- Categorization:: Items will be organized into categories that facilitate discovery.
- Transaction Support:: The system must provide structured means for creating and viewing listings, including optional prices or donation markers. Negotiation and exchange are arranged outside the platform.
- Trust and Transparency:: Item conditions and relevant metadata must be clearly described to support informed decisions.

1.3.2 Synopsis

This Synopsis provides overview of the Hand Me Down project from the perspective of students and families engaged in secondhand exchanges. It articulates the domain, affordability, accessibility, trust, safety and states that stakeholders must be able to discover, evaluate, and exchange pre-owned goods with transparent information about item condition and history. The project shall be conducted through structured domain acquisition to produce a domain description, a requirements prescription that specifies goals, constraints, and quality attributes with traceability to stakeholder needs and a software architecture that evaluates alternatives and justifies decisions, prototyping where necessary to mitigate risk. Component design and iterative implementation will realize prioritized capabilities while preserving traceability. Verification and validation shall include a test plan that covers functional fitness, usability, and trust/safety concerns, supported by versioned documentation, change control, risk tracking, and metrics.

1.4 Other Activities than Just Developing Source Code

This project will not be limited to writing source code. To satisfy the needs identified for affordability, accessibility, trust/safety, and transparency in the Mayagüez/UPRM context, the team shall execute the following activities in addition to implementation. Each activity is mandatory, tied to a stakeholder need and justified by the current situation.

Domain engineering

The team shall elicit and model the domain of donation and resale of clothing and accessories for students and families (actors, workflows, vocabulary, constraints).

- **Need satisfied:** developers must share a precise vocabulary and mental model to preserve accessibility, affordability, and transparency.
- **Current situation:** rough sketches are based on team self-observation; no external interviews conducted yet; stakeholder roles are not enumerated; internal terminology seems consistent but remains unvalidated in the field.
- **Contributions to date:** condition labels and verification practices were researched; the **Sell** vs **Donate** category structure was standardized; initial personas were drafted to ground concepts.
- **Planned outcomes:** domain glossary, context diagram, concrete exchange workflows, and domain verification norms (tag photo, full-item photos, defect call-outs).

Requirements engineering

The team shall prescribe goals, user-level functional requirements (listing, browse/search, donation/resale flows, offer/negotiation) and quality attributes (trust/safety, transparency, usability, accessibility) with explicit traceability to needs and acceptance criteria.

- **Need satisfied:** developers must clearly understand system functionality and nonfunctional expectations that build trust and reduce effort.
- **Current situation:** no consolidated requirements baseline or acceptance criteria exist.
- **Contributions to date:** epics were linked to user stories (buyer/seller perspectives) against stakeholder needs; interface requirements at the system boundary were authored; measurable machine requirements (response time, uptime, user capacity) were drafted.
- **Planned outcomes:** requirements set with SHALL statements and acceptance criteria; traceability matrix (Need → Requirement → Test); nonfunctional thresholds made testable.

Software architecture

The team shall select and justify an architecture addressing security, privacy, modifiability, and campus-scale usage; architectural views and decision records will be maintained.

- **Need satisfied:** stakeholders must receive a reliable, maintainable basis for transparent, safe exchanges.
- **Current situation:** direction is leaning toward Supabase for authentication (Google sign-in compatibility) with a full custom backend; no UPRM hosting/privacy constraints identified; ADRs and C4 views are not yet written.
- **Contributions to date:** search and map integration approaches were evaluated and

geolocation/privacy considerations documented; authentication backends (Firebase vs. Supabase) and session-management implications were analyzed; page-level layouts were produced to inform view composition and navigation flows.

- **Planned outcomes:** C4 views (context/container), Architectural Decision Records (auth, data, map/search), quality-attribute scenarios, and targeted risk spikes where uncertainty is high.

Component design

The team shall define modules, interfaces, and data contracts to preserve testability and changeability (catalog/search, profiles/auth, exchange/offer, reporting/moderation, “items circulated” metrics).

- **Need satisfied:** maintainable, verifiable components are required to deliver transparency (clear item/condition data) and accessibility (predictable flows).
- **Current situation:** boundaries and interfaces are only partially documented.
- **Contributions to date:** the user/auth schema (roles, profile fields, donation/sell history) was initiated and APIs for login/registration/logout were defined; search behavior and map-related data interactions were documented; wireframes and page designs (Homepage, About, Clothes Listing, Individual Item, Favorites, Checkout, Log In/Sign Up, Profile) clarify interface responsibilities and data needs.
- **Planned outcomes:** module responsibilities, interface specs (inputs/outputs/preconditions/postconditions), initial schemas with migration notes, and example queries.

Implementation planning

The team will establish a delivery roadmap, Definition of Done, contribution standards, and a branching/CI strategy suitable for a student-run service.

- **Need satisfied:** predictable, reviewable progress must be ensured to realize stakeholder value without regressions.
- **Current situation:** a branch is created per team with controlled pull requests and merges to main when working; no CI pipeline is in place; review checklist/PR template usage is minimal.
- **Contributions to date:** the AsciiDoc documentation structure and conventions were established; documentation issues with acceptance criteria were created; a step-by-step Node.js/npm installation and verification guide was produced to bootstrap the development environment.
- **Planned outcomes:** roadmap with dates/owners, Definition of Done, CONTRIBUTING guidelines, PR template, and CI workflow for lint/tests on pull requests.

Testing and validation

The team shall produce a test plan spanning unit, integration, end-to-end, and usability/acceptance with students and families; trust/safety validations shall be included (e.g., prohibited items policy, condition/fit etiquette).

- **Need satisfied:** stakeholders must have confidence that behavior and quality attributes match the prescription.
- **Current situation:** no automated tests exist and the test plan is not started;

usability/acceptance testing is deferred to later milestones; recruitment will be informal (“ask around UPRM”); top priority requirements for acceptance scenarios are not selected yet.

- **Contributions to date:** machine requirements were expressed in measurable terms (e.g., support ~100 simultaneous users) to anchor performance testing; trust-building practices (verification methods, condition labels) were documented to translate into validation checks.
- **Planned outcomes:** test plan, seeded test suites, acceptance scenarios (Given–When–Then) mapped to requirements, trust/safety validations, and a defect taxonomy with triage protocol.

Deployment considerations

The team will define dev/staging environments, configuration, seed/reset data, rollback procedures, and a minimal operations runbook for a student-operated service.

- **Need satisfied:** availability and safe adoption are necessary for accessibility and affordability benefits to materialize.
- **Current situation:** no documented path to deploy, recover, or roll back; backend selection work is informing environment and secrets management but is not yet consolidated in docs.
- **Contributions to date:** Docker usage was explored to standardize developer environments and setup was documented; backend evaluations (Supabase/Firebase) inform environment and secret management decisions.
- **Planned outcomes:** environment definitions, secrets/config guidance, release/rollback steps, seed scripts, and a basic ops runbook.

Stakeholder liaison and feedback (cross-cutting)

The team shall schedule and document periodic touchpoints with students and families in Mayagüez to validate assumptions early (quotes/anecdotes shall be recorded in §2.1.1).

- **Need satisfied:** continuous alignment is required to keep requirements correct and trust high.
- **Current situation:** no formal liaison cadence is defined; external interviews are not planned at this time; consent/ethics approach is undefined.
- **Planned outcomes:** contact cadence, feedback and decision logs, and lightweight consent notes for any future interactions.

Documentation & governance (cross-cutting)

The team shall maintain versioned documentation, change control, risk tracking, and metrics to ensure durable traceability across activities.

- **Need satisfied:** traceability is required to justify decisions and onboard contributors without rework.
- **Current situation:** a docs index/navigation page is considered established (initial draft); changelog and risk register are not started; project metrics beyond “items circulated” are not yet defined.
- **Contributions to date:** the docs/ layout and AsciiDoc style were standardized and most documentation issues were created; branding (logo, color palette, typography) was

established to keep artifacts consistent and legible.

- **Planned outcomes:** docs index and navigation (maintained), changelog, risk register (e.g., technology choice risk, schedule slip, data/privacy misconfiguration), and basic metrics (e.g., items circulated as a primary signal).

1.5 Derived Goals

In addition to the primary goals (needs, scope, and core functionality), the project shall pursue secondary outcomes that respond to the realities of Mayagüez and the UPRM community. These outcomes are substantially different from core system behavior and emphasize long-term social, educational, and community benefits for students and families.

- Promote sustainability literacy and circular practices in Mayagüez:: The project shall normalize reuse, repair, and responsible disposal behaviors among students and families through donation and resale norms. **Broader impact:** item lifecycles will be extended and textile waste pressure will be reduced without prescribing any specific technical solution.
- Strengthen community engagement and mutual aid through UPRM-led outreach:: The project will cultivate equitable sharing practices (donation, fair resale) centered on UPRM as the primary touchpoint. **Broader impact:** social capital will increase and households will respond more effectively to clothing and accessory needs across semesters and seasons.
- Raise awareness of affordability and access constraints faced by local households:: The project shall make visible how structured sharing reduces acquisition cost and effort for students and families. **Broader impact:** schools and neighborhood groups will make more informed choices about drives, sizing priorities, and targeted outreach.

These derived goals will guide outreach, education, and validation activities alongside the primary objectives, and shall not be construed as mandates for any specific platform or implementation approach.

2.1 Domain Description

The domain of **hand-me-down clothing exchange** in Puerto Rico is shaped by social, environmental, and economic realities. It exists independently of any digital platform or technical system and can be understood through the people, practices, artifacts, and norms that sustain the circulation of clothing and accessories among students, families, and local communities.

At its core, the domain revolves around two primary actors:

- **Sellers:** Individuals or households who post garments they no longer need, offering them for reuse or resale.
- **Buyers:** Individuals who discover these garments through listings and arrange exchanges directly with the seller, outside the system.

The central entity in this domain is the **Piece**, any individual article of clothing or accessory that circulates between actors. Each Piece carries attributes such as:

- **Type:** The category of clothing.

- **Condition Rating:** A measure of quality or usability.

Pieces move between states through events:

- **Listing Published:** Occurs when a Seller makes a garment visible to potential Buyers.
- **Interest Expressed:** Occurs when a Buyer contacts a Seller regarding a listed garment.
- **Listing Closed:** Occurs when a garment has been exchanged offline or removed from visibility.
- **Discard Event:** Occurs when a Piece leaves circulation, feeding into the wider **Textile Waste Stream**.

The domain is sustained by informal practices and behaviors:

- **Discovery Flows:** The recurring sequence in which garments are listed, browsed, and handed over in person.
- **Condition Disclosure Norms:** The expectation that Sellers will show tag photos, highlight defects, and represent garments honestly.
- **Informal Price Bands:** Symbolic or suggested valuations (typically USD \$8–\$15), distinguishing resale from donation or commercial sale.
- **Dormant Stock:** Clothing stored in homes awaiting redistribution, resale, or disposal.
- **Meetup Spots:** Semi-public locations (e.g., campus benches, apartment lobbies) chosen for exchanges.
- **Ad-hoc Channels:** Informal digital venues (e.g., Facebook Marketplace, WhatsApp groups, Instagram stories).
- **Trust Cues:** Bilingual communication, recognizable names, or clear photos that influence whether an exchange proceeds.
- **Seasonal Demand Pulses:** Cyclical increases in demand, such as back-to-school or weather-driven surges for uniforms or outerwear.

These elements form an interconnected web of events, actions, and behaviors. Sellers and Buyers rely on ad-hoc digital channels for discovery, agree on terms through direct contact, and meet in semi-public spaces to exchange items offline. Exchanges are underpinned by implicit rules of trust and fairness, while also constrained by larger social and environmental forces such as poverty rates, limited recycling infrastructure, and overflowing landfills.

From a functional perspective, the domain can be represented through abstract operations:

- `publishListing(Piece, Seller, Locale) → ListingPublished`
- `expressInterest(Listing, Buyer) → InterestExpressed`
- `rate(Piece, ConditionRating) → ConditionRating`
- `review(Seller, Buyer, Review) → ReviewSubmitted`
- `categorize(Piece, Type) → Piece`
- `closeListing(Listing) → ListingClosed`

Each function captures an action that transforms the state of a **Listing** or **Piece** within the domain,

producing observable changes such as entering circulation, connecting interested parties, or leaving visibility once the exchange occurs offline.

In sum, the domain of secondhand clothing discovery in Puerto Rico is defined by the **visibility of Pieces**, the **actors who list and find them**, the **events that mark transitions**, and the **behaviors and norms** that make these exchanges trustworthy, affordable, and sustainable. This description provides a foundation for later requirements and design work, while remaining independent of any specific system or implementation.

2.1.1 Domain Rough Sketches

This section captures domain facts, phrases, anecdotes, and observations. It SHALL NOT mention features or designs of any future system. Interviews with external stakeholders are pending.

Stakeholder & Settings

- Team self-observation (students), Mayagüez/UPRM: identified a recurring need for affordable access to clothing and accessories among students and families.
- **No interviews conducted yet.** Contacts to schedule: students, families, school/university staff, local resale participants.

Observed Practices

- Discovery: Facebook Marketplace, Facebook groups, WhatsApp groups, Instagram stories.
- Handoff: in-person meetups at UPRM (on/near campus) or at apartment complexes.
- Typical flow (as reported by students): look up item → contact seller → agree on specifics (price, size, time/place) → meet in person to exchange the item. The agreement on price and pickup is handled entirely by the users outside any system.

Artifacts, Condition Language, and Pricing

- Item types seen/expected: all kinds of clothing and accessories (no restricted categories observed yet).
- Condition/fit phrasing used: “lightly used,” “like new,” and explicit size labeling.
- Typical price range mentioned for clothing items: USD \$8–\$15, treated as an informal or symbolic resale range for students.

Trust, Safety, and Informal Norms

- Common concerns: item hygiene, no-shows, scams, and unsafe meetups.
- Informal norms reported: include a **photo of the size tag**, full-item photos (front/back/defects), and respond promptly.
- Moderation: minimal to none in ad-hoc chats; Facebook groups **may** apply basic moderation or post approval (to confirm).

Language & Access

- Languages used: Spanish + English (bilingual exchanges common).
- Access barriers reported so far: none explicitly identified by team; requires external confirmation.

Existing Channels (local)

- Facebook Marketplace (general Mayagüez and student-adjacent listings).
- Facebook groups (specific group names to be gathered during interviews).
- WhatsApp groups/lists (student and family circles).
- Instagram stories (peer-to-peer sharing).
- Moderation/ownership of channels: typically user- or admin-managed groups; to verify.

Micro-notes / Anecdotal Fragments

- Price sensitivity remains high; low-cost clothing listings (\$8–\$15) are the usual reference point for students.
- Meetups generally occur in familiar, semi-public locations such as campus benches or apartment lobbies.
- Sellers are expected to show **tag photos** and **clear images** of items; size miscommunication is a recurring issue.
- Exchanges happen quickly once contact is established — often same-day or next-day pickup.

Open Questions (for later concept analysis)

- Which groups or chat channels are most active in Mayagüez/UPRM, and who moderates them?
- What concrete safety practices are considered “standard” locally (meetup spots, daylight hours, bringing a friend, ID at gates)?
- How is **condition** described locally beyond “lightly used/like new”? (e.g., semester-used uniforms, visible defects, hygiene notes)
- Are there predictable seasonal peaks (back-to-school, semester start, graduation, weather shifts)? Which items surge in demand?
- For pricing, when do buyers and sellers treat \$8–\$15 as “firm” vs. negotiable (OBO, bundles)?
- Are there categories socially excluded (e.g., certain intimate apparel), and how do participants communicate those boundaries?
- Does the primary language (Spanish vs. English) of a listing or message affect engagement or trust among participants?

2.1.2 - Terminology

The following terminology consolidates entities, events, functions, and behaviors in the domain. Each entry specifies the type of concept it represents and the phase in which it is introduced

(domain, requirements, design, implementation). This approach avoids circular definitions and ensures alignment with both domain knowledge and system concerns.

Term	Concept Type	Phase Introduced	Definition / Notes
Seller	Entity	Domain	A person who posts a clothing item on the platform to make it visible for reuse or resale.
Buyer	Entity	Domain	A person who browses listings and contacts sellers to express interest in an item.
Piece	Entity	Domain	An individual clothing item, defined independently of the system.
Listing	Representation	Design	A published representation of a Piece in the platform, visible to potential buyers.
Listing Published	Event	Domain	Instantaneous occurrence when a Seller makes a clothing item publicly visible.
Interest Expressed	Event	Domain	Instantaneous occurrence when a Buyer contacts a Seller about a listed item.
Listing Closed	Event	Domain	Occurrence when a Listing is manually closed by the Seller after the exchange is completed offline or the item is withdrawn.
Condition Rating	Attribute / Function	Domain	A measure (e.g., scale 1–10) of quality for a Piece.
Review	Artifact	Domain	Feedback associated with a completed offline exchange between Buyer and Seller.
Locale	Entity	Domain	Physical location where exchanges typically occur (e.g., campus area, public spot).
Type	Attribute	Domain	Category of clothing (dress, pants, shirt, etc.).
rate(Piece, ConditionRating) → ConditionRating	Function	Design	Updates the condition rating of a Piece using the new rating value; no pre-existing rating is required.
publishListing(Piece, Seller, Locale) → ListingPublished	Event Function	Design	Function that triggers the publication of a new Listing by a Seller at a given Locale.
expressInterest(Listing, Buyer) → InterestExpressed	Event Function	Design	Function that triggers the event when a Buyer contacts a Seller about a Listing.

Term	Concept Type	Phase Introduced	Definition / Notes
closeListing(Listing, Seller) → ListingClosed	Event Function	Design	Function that closes a Listing, indicating that the exchange has been completed offline or the item is no longer available.

2.1.3 Domain Terminology in Relation to Domain Rough

This section explains how several of the terms defined in **2.1.2 – Terminology** were derived through the analysis of the material captured in **2.1.1 – Domain Rough Sketch**. Its purpose is to make explicit the reasoning that transformed informal notes, phrases, and anecdotes into the concepts that organise our description of the hand-me-down clothing domain. It does not repeat the glossary presented in 2.1.2; instead, it narrates the steps that led from raw wording to stable vocabulary.

The rough sketch included an observation that students commonly **“look up an item, contact the seller, agree on price, size, and place, then meet to exchange the item.”** This line was analysed as evidence of a recurring, recognisable structure in how people organise exchanges. Rather than a random set of moves, it revealed a social routine for arranging garment handoffs: identify an article, reach out to whoever offers it, discuss its details, and complete the handoff face-to-face. From this analysis emerged the term **Exchange Flow**, which designates the sequence of actions that shapes informal clothing listings and exchanges in the Mayagüez/UPRM setting.

Several fragments in the sketch referred to sellers showing **a photograph of the size tag and full images of the garment, including any flaws**. These snippets suggested an implicit rule: before an exchange, the seller is expected to disclose enough detail to reassure the buyer about size, hygiene, and hidden damage. By organising these remarks, we formulated the term **Condition Disclosure Norm**, a name for the informal convention that garments be represented honestly, with visual evidence, before a meeting occurs. This term encapsulates how participants try to manage uncertainty and build trust.

Price information appeared in multiple places. Notes such as **“symbolic prices between eight and fifteen dollars are common reference points”** hinted at an unwritten valuation practice. The figures were neither arbitrary nor fixed by any authority; they functioned as a social guideline for what counts as reasonable in low-cost exchanges among students. Processing this evidence produced **Student Resale Price Band**, a phrase describing the monetary interval that frames conversations and distinguishes a low-cost resale from a donation.

Other material dealt with what happens when garments do not re-enter circulation. Mentions of **discarded clothes left in open areas or delivered directly to landfill, with only rare opportunities for recycling** highlighted a backdrop of disposal routes. These lines were interpreted as documenting the “exit channels” of clothing once it ceases to be worn. We named this phenomenon **Textile Waste Stream**, referring to the set of pathways — municipal collection, careless dumping, or limited recycling — through which clothing leaves everyday use. This term anchors the environmental dimension of the domain.

A different cluster of notes described **bags of outgrown clothing kept at home while owners decided whether to give them away or sell them**. Here the sketch captured a liminal state: garments were no longer needed, yet had not been reassigned. Analysing this condition produced **Dormant Stock**, a concept for clothing retained in domestic spaces after its initial life, awaiting a new role or final disposal.

The sketch also documented preferred locations for handing over items: students mentioned **campus benches, apartment lobbies, and other familiar public corners**. Rather than isolated remarks, these examples pointed to a shared concern for safety and practicality. We consolidated them under the term **Meetup Spot**, which denotes semi-public environments chosen because they balance accessibility, visibility, and comfort during an exchange.

Another strand involved the digital places where clothing is discovered. Notes cited **Facebook Marketplace, WhatsApp groups, and Instagram stories** as typical sources. Instead of treating each separately, we recognised a broader category — lightly moderated online venues where offers, requests, and quick negotiations happen. From this reasoning came the expression **Ad-hoc Channel**, describing the informal communication spaces that enable the visibility of available garments.

Scattered remarks highlighted how participants assess reliability. Seeing clear pictures, recognising a name, or receiving bilingual messages were all said to make people more comfortable proceeding with an exchange. Bringing these hints together led to the concept **Trust Cue**, a label for the small but influential signals that reduce perceived risk in peer-to-peer exchanges.

Finally, the rough sketch posed questions about changes in activity during **back-to-school periods, semester starts, or seasonal weather**. Even without full data, the presence of these queries suggested that demand for particular items is not constant. To represent this dynamic aspect we coined **Seasonal Demand Pulse**, a term for the predictable fluctuations in which garments are offered or sought as academic and climatic cycles progress.

By articulating these derivations, this section clarifies the analytical bridge between the exploratory material of the rough sketch and the structured vocabulary presented in the Terminology section. Understanding this path is essential for tracing how domain knowledge was built and for ensuring that later requirements remain anchored in the observed environment.

2.1.4 Domain Narrative

In Puerto Rico, the flow of clothing and accessories between individuals and families is shaped by pressing social, economic, and environmental realities. Each year, hundreds of millions of pounds of garments and textiles are discarded, adding to the nation's mounting waste crisis and overwhelming local landfills. Despite the recyclability of most textiles, the majority end up as landfill waste — a reflection of both limited recycling infrastructure and a culture still transitioning toward sustainability. At the same time, clothing represents a basic need, one that is often out of reach for families facing high rates of poverty and for individuals experiencing homelessness. Within this context, the circulation of pre-owned items is not a marginal activity, but a vital process that supports daily life, education, dignity, and well-being.

The domain of secondhand clothing exchange involves a variety of actors and informal practices. Sellers — individuals or families with surplus or outgrown clothing — choose to make these items

available for others, motivated by a mix of practicality, sustainability, and community-mindedness. Before posting, a seller may inspect each garment for cleanliness and condition, annotating the listing with information about size, wear, or visible defects. The act of publishing a listing marks the point at which the garment enters public visibility within the discovery space, allowing others to view and express interest.

Buyers — those seeking clothing and accessories — browse these visible listings through ad-hoc online channels or digital platforms. A buyer may be a student whose family cannot afford frequent purchases, a parent searching for affordable uniforms, or a community member simply aiming to reduce waste by reusing what already exists. When evaluating listings, buyers typically consider both the stated condition and the suitability of the garment. Interactions are often personal and conversational: buyers may send a message asking about fit or defects, while sellers provide reassurance through photos or clarifications. Once both parties agree, they coordinate to meet in person — completing the exchange directly and outside any digital system.

These exchanges are embedded in a broader cycle of reuse and redistribution. Garments often pass through multiple owners, with each transition adding to the item's social history. Some pieces re-enter circulation when outgrown, while others are repaired or repurposed to extend their lifespan. The community sustains informal norms of honesty and trust: sellers are expected to represent item condition accurately, while buyers are encouraged to respect agreed meeting times and terms. Occasional misunderstandings — such as no-shows or misrepresented condition — are resolved through communication or social feedback, reinforcing a shared ethic of fairness.

Through these ongoing practices, the domain fosters sustainability, mutual aid, and local connection. The circulation of clothing and accessories in Puerto Rico is thus a living narrative — one shaped by economic hardship, environmental necessity, and the collective will of its people to reduce waste and support one another. This narrative frames the motivation for structured, transparent, and community-driven listing systems, enabling participants to access what they need with dignity and trust while maintaining the informal, person-to-person character that defines this exchange culture.

2.1.5 Events, Actions, and Behaviors

This section presents the main events, actions, and behaviors observed in the environment of informal clothing exchanges around the University of Puerto Rico at Mayagüez. They were derived from the material collected in **2.1.1 – Domain Rough Sketch** and organised to separate:

- **Events** – instantaneous occurrences (“has just ...”),
- **Actions** – individual, intentional steps, and
- **Behaviors** – extended patterns composed of multiple actions.

All descriptions are domain-oriented and independent of any future system.

Listing and Discovery of Clothing

Event

The instant a new listing has just been published, making a garment visible to potential buyers. This marks the start of its discovery phase in the informal exchange ecosystem.

Action

Steps such as photographing the garment, writing a short caption, setting a suggested price (optional), and posting the item for others to see. Each is purposeful and can succeed or fail (e.g., insufficient visibility, missing photos).

Behavior

The broader social practice of making items discoverable within community networks. It involves browsing existing listings, publishing new ones, refreshing or updating posts, and sharing links in messaging groups. This behaviour sustains circulation and visibility of reusable clothing.

Disclosure of Item Condition**Event**

A seller has just provided evidence about a garment's state — e.g., sending a tag photo or mentioning a stain. The recipient gains new knowledge that may influence their decision.

Action

Taking photographs of the size tag or fabric, writing short notes about wear or washing, mentioning that an article is “lightly used” or “like new,” or warning of a missing button.

Behavior

An established norm of transparency in which participants consistently present information about cleanliness, durability, or flaws. By embedding honesty into exchanges, this behaviour fosters trust and helps avoid disputes over quality.

Pricing and Valuation**Event**

A suggested price has just been indicated, accepted, or adjusted for a garment.

Action

Comparing a proposed amount with informal references, adjusting for size or condition, or confirming that an item will be free rather than priced. Prices are symbolic and serve as indicators only; any monetary exchange happens directly between participants outside the platform.

Behavior

A continuing process of social valuation. Participants rely on a tacit “student resale price band” (often eight to fifteen dollars) to anchor expectations while allowing flexibility for free exchanges or bundles.

Management of Dormant Stock**Event**

A household member has just set aside garments that no longer fit or are not in active use.

Action

Reviewing wardrobes, classifying items as “keep,” “give away,” or “maybe later,” placing them in bags or boxes, and storing them out of daily reach.

Behavior

The tendency for unused clothing to accumulate in homes. Owners postpone decisions about destination, creating an intermediate state between active use and disposal. This behaviour feeds both resale and reuse opportunities and, if left too long, textile waste.

Arranging and Conducting Meetups**Event**

Two participants have just arrived at a chosen place to finalise an exchange.

Action

Selecting a bench, lobby, or café corner as the site; confirming time via message; travelling to the location; greeting and checking the garment.

Behavior

A familiar choreography in which actors choose semi-public, convenient spots that reduce risks of theft or fraud while making hand-offs efficient. This behaviour reflects unwritten safety norms within the community.

Use of Ad-hoc Channels**Event**

A new offer or request for clothing has just been posted or noticed in an online group.

Action

Opening a marketplace app, composing a caption, adding photos, scrolling through listings, or sending a direct message to express interest.

Behavior

The regular reliance on lightly moderated platforms—Facebook Marketplace, WhatsApp groups, Instagram stories—to discover, promote, and coordinate exchanges. This behaviour keeps circulation active and widens the reach beyond immediate acquaintances.

Expressing Interest and Communication**Event**

A buyer has just sent a message or inquiry expressing interest in a listed garment.

Action

Clicking “Contact Seller,” asking about size, color, or price, or arranging a time and place to meet. Communication may occur in-app or through external messaging tools.

Behavior

An essential part of peer-to-peer discovery that turns visibility into connection. These behaviors

form the bridge between digital discovery and offline exchange.

Closing a Listing

Event

A listing has just been marked as closed, either because the exchange occurred offline or the item is no longer available.

Action

Seller toggles the status to “Closed,” adds an optional note (“Given away,” “Sold,” “No longer available”), or removes the post from visibility.

Behavior

A responsible cleanup action that keeps listings accurate and maintains trust among participants by ensuring only available items remain visible.

Building Trust

Event

A participant has just received a reassuring sign, such as recognising a familiar name, seeing unedited pictures, or receiving a message in their preferred language.

Action

Choosing clear, well-lit photos; greeting bilingually (Spanish/English); mentioning mutual contacts or personal references to confirm credibility.

Behavior

The underlying social effort to manage uncertainty in face-to-face exchanges. By scanning cues of reliability, people decide whether to meet and complete a handoff. Trust-building behaviours make the informal market viable despite the lack of formal guarantees.

Responding to Seasonal Demand

Event

Interest in a category of garment (e.g., uniforms, sweaters, raincoats) has just increased due to academic or weather cycles.

Action

Sorting and preparing clothes needed for the coming semester, advertising jackets before the rainy season, or searching for graduation attire.

Behavior

A cyclical pattern in which attention to certain garments rises and falls. Back-to-school weeks, semester openings, and cooler months create pulses of activity, stimulating listing and discovery at predictable times.

2.1.6 - Function Signatures

Objective

Define domain-level function signatures that describe how actions are carried out, including inputs, outputs, and possible changes in the domain.

Description

Function signatures are formal specifications of functions or actions that define:

- **The name of the function:** The action being performed.
- **The input parameters:** The information required by the action.
- **Output:** Type of data the function produces.
- **State changes:** How the action affects the domain.

The general format of a function signature is:

- `FunctionName: Input1 >< Input2 >< ... → OutputType`

This expresses the action's name, its input parameters with their types, the output type it produces, and any state changes in the domain.

Function signatures do not describe how the function is implemented. Instead, they focus on the relationship between inputs, outputs, and possible state changes.

Examples

`publishListing : Piece >< Seller >< Locale → ListingPublished`

A Seller publishes a Piece in a given Locale, producing a ListingPublished event.

`expressInterest : Listing >< Buyer → InterestExpressed`

A Buyer expresses interest in a specific Listing, producing an InterestExpressed event that signals contact between Buyer and Seller.

`rate : Piece >< ConditionRating → ConditionRating`

A Piece receives a ConditionRating, producing or updating the ConditionRating attribute.

`review : Seller >< Buyer >< Review → ReviewSubmitted`

A review is submitted by a Buyer or Seller after an offline exchange, creating a ReviewSubmitted event associated with the interaction.

`closeListing : Listing >< Seller → ListingClosed`

A Seller closes a Listing after the offline exchange or withdrawal, producing a ListingClosed event and removing the item from visibility.

`categorize : Piece >< Type → Piece`

A Piece is assigned a Type, returning the updated Piece.

discard : Piece → Void

Removes a Piece from active circulation, marking it as no longer available.

Example Scenario: From Listing to Offline Exchange

1. Seller publishes a listing using `publishListing(Piece, Seller, Locale)` → produces `ListingPublished`.
2. Buyer browses available items and finds one of interest.
3. Buyer clicks “Contact Seller,” triggering `expressInterest(Listing, Buyer)` → produces `InterestExpressed`.
4. Both users coordinate offline to exchange the item.
5. Seller closes the listing via `closeListing(Listing, Seller)` → produces `ListingClosed`.
6. Buyer leaves a review using `review(Seller, Buyer, Review)` → produces `ReviewSubmitted`.

2.2.1 Epics, Features, and User Stories

Epics

Epics are a higher-level overview of goals that are large enough in scope that they can be broken down into multiple sprints. They provide direction and group related work together.

Buyer Epics

1. Listing Discovery
 - a. As a buyer, I want to search for listings by category, filters, and keywords, so that I can quickly find clothing items that meet my needs.
2. Saved Listings
 - a. As a buyer, I want to save or bookmark listings I am interested in, so that I can revisit them later when deciding whether to contact the seller.
3. Trust and Transparency
 - a. As a buyer, I want to view detailed seller profiles and leave reviews after exchanges, so that I can make informed and confident decisions about future interactions.

Seller Epics

1. Listing Management
 - a. As a seller, I want to create, edit, and close listings with detailed information, so that I can effectively manage the items I am offering for reuse or resale.
2. Interest Notifications
 - a. As a seller, I want to receive notifications when someone shows interest in my item, so that I can promptly respond and arrange the exchange offline.
3. Seller Profile and Trust

- a. As a seller, I want to maintain a profile with personal and location details, so that I can establish credibility and attract buyers interested in my listings.

Features

Features specify the functionality required to deliver the goals described in the epics to the user. They serve to provide more concrete goals related to development.

Buyer Features

1. Listing Discovery
 - a. Filtering (clothing type, size, color, condition, category, price/free marker, etc.).
 - b. Keyword search.
 - c. Sorting options (newest first, alphabetical, etc.).
2. Saved Listings
 - a. Ability to bookmark or save listings for later consideration.
 - b. Saved listings persist across sessions and devices.
3. Trust and Transparency
 - a. Seller profile page (location, account age, bio).
 - b. Seller ratings & reviews system.
 - c. Buyer-to-seller review submission flow.
 - d. Reporting mechanism for problematic listings or suspicious behavior.

Seller Features

1. Listing Management
 - a. Create listing form (title, description, tags, price/free marker, category).
 - b. Upload multiple images per listing.
 - c. Edit listing details (update description, condition, images, price).
 - d. Close or deactivate a listing once the exchange is complete offline.
2. Interest Notifications
 - a. Push/email/in-app notifications when a buyer expresses interest in a listing.
 - b. Notification center showing recent messages or contact attempts.
3. Seller Profile and Trust
 - a. Editable seller profile (profile picture, name, location, short bio).
 - b. Seller dashboard displaying active and closed listings, as well as reviews and ratings.

User Stories

User stories are derived from Features, breaking them down into smaller, individual tasks to be

added to the backlog. These stories focus on user needs and help make development more user-focused.

Buyer User Stories

1. As a buyer, I want to browse listings by category to find a specific type of item I want.
2. As a buyer, I want to filter my search by size, condition, and category to tailor my search to my preferences.
3. As a buyer, I want to search for listings using keywords to find specific items that may not fit predefined categories.
4. As a buyer, I want to save interesting listings so I can revisit them later.
5. As a buyer, I want to view a seller's information such as location, reviews, and account details to feel confident before contacting them.
6. As a buyer, I want to leave reviews for sellers after an offline exchange so others can trust the process.

Seller User Stories

1. As a seller, I want to create listings for my items with options such as adding multiple pictures, a description, and a condition rating so interested buyers can find me easily.
2. As a seller, I want to edit my listings so I can update details whenever necessary.
3. As a seller, I want to close listings once the item is exchanged offline so the system stays accurate.
4. As a seller, I want to receive notifications when someone contacts me about a listing so I can respond quickly.
5. As a seller, I want to provide information on my profile such as my name and location to increase trust with buyers.

2.2.2 - Personas

A persona is a fictional yet plausible representation of a user within the platform's ecosystem. The following personas illustrate different motivations, behaviors, and constraints to help align development goals with user needs. They represent typical users participating in the **listing and discovery** of secondhand clothing, where all exchanges and payments occur directly between parties, outside the system.

Adriana Gómez

- **Age:** 20 years old
- **Occupation:** University student on financial aid working part-time on campus
- **Build / Appearance:** Dark, straight hair; average height; dresses in vintage clothes and colorful accessories
- **Personality:** Creative, expressive, community-driven

Adriana loves expressing herself through unique outfits. She often mixes styles and prefers pre-owned or vintage pieces that stand out from mainstream fashion. However, she finds it difficult to locate affordable, distinctive items near Mayagüez since many local thrift stores have little to no online presence. Between classes and her part-time job, she has limited time to explore in person.

- **Pain Points:** Limited access to local secondhand clothing options; lack of time to search physically; difficulty finding one-of-a-kind pieces online.
- **Needs:** A trusted way to browse nearby listings from local sellers and individuals offering unique or free clothing.
- **Platform Interaction:** Scrolls listings during short study breaks, saves her favorite posts, and messages sellers when something catches her eye.

Manuel Torres

- **Age:** 35 years old
- **Occupation:** Middle school teacher
- **Build / Appearance:** Brown, curly hair; average height; prefers casual, comfortable wear such as polos and witty t-shirts.
- **Personality:** Patient, organized, practical, approachable

Manuel is preparing to move apartments and wants to downsize. He has a closet full of gently used clothing that could benefit others, but he doesn't want to waste time organizing garage sales or posting on multiple apps. He wants an easy, local way to share listings that reach people nearby without having to handle payments through the platform.

- **Pain Points:** No streamlined way to share or list his pre-owned items locally.
- **Needs:** A simple listing tool that allows him to post clothing quickly and connect with potential buyers or donors without complicated transactions.
- **Platform Interaction:** Creates listings from his work computer, uploads a few photos, sets prices or marks items as free, and arranges pickups directly through chat.

Daniela López

- **Age:** 27 years old
- **Occupation:** Nurse practitioner
- **Build / Appearance:** Tall, brunette with wavy hair; prefers relaxed styles such as denim, scrubs, and athleisure.
- **Personality:** Outspoken, empathetic, eco-conscious

Daniela believes in sustainability and fights against the culture of fast fashion. She values durability and ethics in clothing choices and enjoys supporting local reuse initiatives. When her favorite thrift store closed, she began looking for new ways to find secondhand clothes that align with her values, but she prefers interacting directly with other people instead of large e-commerce sites.

- **Pain Points:** Frustrated by the dominance of fast fashion and the scarcity of convenient local alternatives.

- **Needs:** A platform that connects her directly with local sellers offering high-quality secondhand clothing, helping her make eco-conscious choices.
- **Platform Interaction:** Uses search filters to narrow listings by condition and material, contacts sellers directly, and shares sustainable fashion tips in her messages.

2.2.3 Domain Requirements

The system shall manage clothing listings according to the inherent properties of categories, items, and taxonomy structures observed in local resale and donation discovery platforms. It must allow users to browse, publish, and filter listings efficiently without facilitating in-platform payments or transactions.

- DR1: The system must classify every listing under exactly one primary category (e.g., tops, bottoms, shoes, accessories) to ensure consistent organization and discoverability across the taxonomy.
- DR2: The system must allow categories to have hierarchical subcategories, reflecting how real-world resale and reuse spaces organize clothing by type, gender, or size.
- DR3: The system must distinguish between **Resale** and **Free/Donation** listings, preserving the domain difference in motivation and visibility while keeping both accessible through a unified discovery interface.
- DR4: The system shall provide means to enforce item-to-category compatibility, ensuring that each listing aligns with an appropriate clothing category (e.g., shirts cannot be placed under footwear).
- DR5: The system must support category evolution, allowing the taxonomy to incorporate new categories or subcategories (e.g., uniforms, vintage) without invalidating existing listings.

Each of these requirements directly ties to observed domain properties: - **DR1** reflects the necessity of a single, authoritative classification per item for consistent search results. - **DR2** enforces hierarchical organization used in established discovery platforms like Facebook Marketplace or Craigslist. - **DR3** maintains the conceptual distinction between resale and giveaway behavior while allowing both to coexist. - **DR4** ensures semantic alignment between items and categories, avoiding misclassified listings. - **DR5** enables adaptability and scalability as the listing ecosystem evolves and new categories emerge.

Sources

- **Facebook Marketplace (Meta):** <https://www.facebook.com/marketplace/>
- **OfferUp:** <https://offerup.com/>
- **Craigslist:** <https://www.craigslist.org/about/sites>
- **Goodwill (Donation):** <https://shopgoodwill.com/all-categories>

2.2.4 Interface Requirements

Objective

Define how users interact with the system through visible UI elements, controls, states, and feedback. These **Interface Requirements** specify the behavior of forms, buttons, validation, navigation, and visibility rules. The platform facilitates listing and discovery but does not process payments or host transactions; all exchanges occur directly between buyers and sellers outside the system.

Interface Requirements

Create Listing Form - The authenticated user is implicitly the seller; **no seller field is displayed**. - Required fields: **Title, at least one Image, and Category**. Optional fields: **Price** (if absent, listing is marked **Free**), **Description, Condition, and Size**. - The **Publish** button is **disabled** until all required fields are valid. - On submit with missing or invalid fields, show **inline errors**; **focus moves** to the first invalid field. - On success, navigate to the **Listing Details** page and show a **toast**: “Listing published.”

Listing Details (Seller View) - Shows editable fields (Title, Description, Images, Price, Condition) while **Status = Active**. - Includes a **Status** dropdown with transitions: **Active** → **Reserved** → **Closed** (no skipping). - When **Status = Closed**, all edit controls are **disabled**, and a ‘**Closed**’ badge is displayed. - Displays **Contact Requests** received for that listing, sorted by most recent.

Browse & Search (Buyer View) - Buyers can **search by keyword** and **filter by Category, Condition, Size, and Price/Free marker**. - Sorting options include **Newest first, Lowest price, and Condition rating**. - Each listing card shows **Title, Thumbnail, Price/Free marker, Condition, and Seller rating (if available)**. - Clicking a card opens **Listing Details**, where the **Contact Seller** button is visible if the viewer is not the owner.

Saved Listings (Buyer View) - Buyers can **Save/Unsave** a listing from both the card and details views. - Saved items persist across sessions and appear in the **Saved Listings** section under the user menu. - Saved icons visually change state (e.g., outlined vs. filled heart).

Contact Seller / Messaging - **Contact Seller** opens a message composer prefilled with the listing title. - On send, show confirmation (“Message sent”) and add it to **Message Threads**. - Seller receives a **notification badge** in the header or inbox. - Messages are displayed chronologically, grouped by listing.

Profile & Reviews - Sellers and buyers each have a **profile page** displaying their listings, ratings, and reviews. - Users can **edit their own profile** (profile picture, bio, location). - Reviews are **read-only** for the profile owner but can be submitted by others after an offline exchange. - The **average rating** and total reviews are displayed prominently at the top of the profile.

Accessibility & Feedback - All interactive elements are **keyboard-accessible** (Tab/Shift+Tab) with visible **focus outlines**. - Inline validation messages are **ARIA-live announced** to screen readers. - Toasts and banners are **non-blocking** and dismissible via keyboard. - Forms include descriptive labels and placeholder text for clarity.

Examples

1. **Create Listing:** A seller opens the **Create Listing** form. Title is empty and there are no images, so **Publish** is disabled. The user enters a title, selects a category, and uploads a photo. **Publish** becomes active. On submit, a success toast appears and the app redirects to the Listing Details page.
2. **Reserve Then Close:** A seller opens their Listing (Status = Active), selects **Reserved** from the dropdown. After completing the exchange offline, they select **Closed**, disabling all edit controls.
3. **Contact Seller:** A buyer opens a listing and clicks **Contact Seller**, writes a message, and sends it. A confirmation appears, and the seller's header shows a **1** notification badge.

Relation to Domain Requirements

- Domain Requirements define what must exist (e.g., Listing entity, User, Saved association).
- Interface Requirements define how users **create, view, modify, and interact** with those entities through UI components.
- Each interface rule directly supports a domain rule by providing a visible, testable interaction.

Justification

This section ensures that UI behaviors are intuitive, consistent, and verifiable. It separates internal representation (domain) from what users experience, providing a clear mapping between actions and visible states. These behaviors reinforce trust and usability while aligning with accessibility and real-world discovery practices.

Testing Plan

- Test each form and button for proper enable/disable states and validation.
- Confirm that “Publish” and “Close” actions trigger correct navigation and feedback messages.
- Verify that saved listings persist across sessions.
- Ensure that editing is disabled once a listing is closed.
- Check accessibility by tab-navigating forms and validating screen reader output.
- Confirm that notifications appear when a buyer sends a contact message.

2.2.5 Machine Requirements

Objective

The web server must support reliable and efficient operation of a React + JavaScript clothing discovery platform, enabling users to create, browse, filter, and save listings. Requirements are defined in measurable, testable terms to ensure responsiveness, reliability, and scalability. The platform does not handle payments, carts, or checkout operations; all exchanges between buyers and sellers occur offline after contact through the system.

Requirements

Performance - The system shall return **search results within 2 seconds** on average, with a maximum of **4 seconds** under peak load (defined as 150 concurrent active users). - The system shall support **200 simultaneous browsing users** without response time exceeding 4 seconds, including actions such as searching, filtering, saving listings, and viewing listing details. - Listing creation and updates (e.g., uploading images, editing descriptions, updating status) shall complete within **3 seconds** on average.

Reliability - The web server shall maintain an uptime of **99.7% per month**, allowing no more than **2.1 hours** of unscheduled downtime. - Core operations — creating, editing, saving, and closing listings — must be processed reliably, with **no more than 0.1% of requests** failing due to server errors. - Scheduled maintenance shall be limited to **3 hours per month**, announced with at least **48 hours of notice**.

Scalability - The system shall scale to support **500 concurrent users** performing mixed actions (browsing, searching, creating listings, saving favorites, sending messages) while maintaining average response times ≤ 3.5 seconds. - The system shall handle a database of up to **50,000 active listings** without significant degradation (response time increase $\leq 20\%$ compared to baseline). - The system shall support both **vertical scaling** (increasing server resources) and **horizontal scaling** (adding more servers or instances) without major architectural changes.

Clarifications

- “Peak load” is defined as \geq **150 concurrent active users** browsing or searching, with at least **10% performing listing creation or updates**.
- “Minimal outages” means \leq **2.1 hours per month** of unplanned downtime.
- “Acceptable performance” means \leq **3.5 seconds response time** for 95% of requests.
- No transaction throughput metrics are required, as **the system does not process financial operations**.

Areas for Refinement

- Stress tolerance for **extreme traffic spikes** (≥ 1000 users during semester openings or local donation drives) remains under evaluation.
- Optimization for **mobile devices under slow network conditions** needs further benchmarking.
- Additional testing required for concurrent **image upload** operations and cache efficiency under high demand.

Justification

The clothing discovery platform requires fast, consistent responses to maintain usability and trust. Defined thresholds ensure users can browse and post listings smoothly, even during busy periods such as the start of a semester or community events. These benchmarks align with standard web performance expectations for lightweight, image-based listing platforms similar to Facebook Marketplace or OfferUp.

Testing Plan

- Conduct **load tests** at 150, 250, and 500 concurrent users simulating real-world actions (searching, filtering, creating, editing, and saving listings).
- Perform **stress tests** with simulated traffic spikes to evaluate degradation and recovery patterns.
- Monitor uptime logs to confirm 99.7% reliability.
- Benchmark database performance against a dataset of **50,000+ listings** with image attachments.
- Measure latency on both desktop and mobile clients to validate acceptable response times across devices.

2.3 Implementation

Objective

Describe the overall architecture and design of the clothing repurposing application, showing how the React frontend, JavaScript logic, and Supabase database/storage/auth components work together. Include mockups and example code fragments to complement the explanation.

Description

The application is structured as follows:

- Frontend (React)
 - Handles the user interface, including browsing clothing listings, saving favorites, uploading new listings, basic messaging/contact, and viewing nearby donation centers.
 - Planned pages/screens include:
 - Home Page: shows recent listings and quick navigation to other pages.
 - Clothing Listing Page: displays a scrollable list of available clothing items with filters and sorting options.
 - Upload Page: allows sellers to publish clothes as **listings** (with price or **free** marker); no checkout or payment is provided.
 - Saved Listings Page: lets buyers review items they bookmarked.
 - Map Page: integrates with Leaflet to display donation centers.
 - Styling is implemented with CSS modules or CSS-in-JS for maintainability.
- Backend Logic (JavaScript functions)
 - Manages business logic through modular JavaScript functions that act as an interface between the frontend and Supabase.
 - Responsibilities include:
 - Validating form inputs for listing creation and user registration.
 - Handling image uploads to Supabase Storage.

- Authenticating users via Supabase Auth.
- Querying and updating data in Supabase Database (listings, user profiles, reviews, saved listings).
- Enforcing invariants such as mandatory seller ID and required listing fields.
- Managing contact flows (e.g., expressing interest, message thread creation) without processing payments.
- Database & Storage (Supabase)
 - PostgreSQL database stores structured application data, including:
 - User profiles (name, email, role, reputation score).
 - Clothing listings (item ID, seller ID, title, description, category, size, condition, price/free marker, status).
 - Reviews and ratings for trust-building.
 - Saved listings (buyer ↔ listing associations).
 - Donation center metadata.
 - Supabase Storage manages image uploads and retrieval.
 - Supabase Auth handles authentication, role assignment, and secure access.
- External Services
 - Leaflet.js provides interactive map functionality for donation center locations.
 - Optional geocoding APIs convert addresses into map coordinates when new donation centers are added.

Architecture Diagram

The architecture of the application is designed to separate concerns between the frontend, backend logic, and Supabase services. This structure ensures maintainability, scalability, and clarity for both developers and users.

[Architecture Diagram] | ../../../../images/Architecture_Diagram.png

1. Architecture Overview

a. React Frontend

- Provides the user interface where users can browse, search, and filter clothing listings, upload new items, save favorites, contact sellers, and view donation centers on a map.
- User actions (e.g., creating a listing, saving an item, updating profile info, sending a message) trigger requests to backend functions.

b. JavaScript Logic (Backend Logic)

- Bridges communication between the React frontend and Supabase services.
- Validates input (e.g., required fields for new listings).
- Formats data before insertion into the database.

- Handles error responses gracefully, ensuring the frontend receives useful feedback.

c. Supabase Services

- Database (PostgreSQL) stores listings, user profiles, reviews, saved associations, and donation center data.
- Cloud Storage securely manages clothing images, keeping them accessible for display in listings.
- Auth enforces authentication and authorization, ensuring data privacy and correct user roles.

d. Data Flow

- Requests flow downward from the React frontend through JavaScript logic into Supabase.
- Responses flow upward, updating React state dynamically so users see fresh listing data.
- The platform **does not** perform or mediate payments; messaging/contact supports offline coordination only.
- This separation ensures that the UI, application logic, and data persistence remain decoupled and maintainable.

Layer Mapping (Clean Architecture / DDD Alignment)

- **Domain Layer:** Core concepts and rules (Listing, Piece, User, Review; invariants like required fields; aggregate boundaries).
- **Application Layer:** Use-case functions (publishListing, expressInterest, closeListing, saveListing), validation, orchestration of repository calls.
- **Interface/Adapters Layer:** React components/pages (forms, lists, profile, messaging UI), adapters to call application services, view models.
- **Frameworks/Drivers Layer:** Supabase (PostgreSQL, Storage, Auth), Leaflet, geocoding APIs, HTTP client libraries.

2.3.1 Selected Fragments of the Implementation

This section provides selected fragments of the implementation that complement the architecture described in Section 2.3. Instead of full code listings (not yet implemented), this section includes visual representations of the application's main pages and flows.

Home Page

[Home Page] | [../..../images/HomePage.png](#)

The entry point of the application. Displays recent clothing listings and quick navigation options for uploading new listings, browsing available items, viewing saved (liked) items, and accessing the map page for local donation centers. There is **no cart or checkout option**, since all exchanges occur directly between users outside the platform.

Clothing Listing Page

[Listings Page] | [../..../images/ListingsPage.png](#)

Shows a scrollable interface filled with clothing listings that include a photo, title, price (or “Free”), size, condition, and category. Each listing links to a detailed view where users can see more information or contact the seller. Search and filtering options are available by category, size, condition, location, and price/free marker. Users can also add items to a “Saved Listings” list to revisit later.

Item Detail Page

[Individual Listing] | [../..../images/IndividualListing.png](#)

Provides detailed information about a specific clothing listing selected from the Listings Page. Displays images, descriptions, size, condition, price/free marker, and location. Includes buttons to **Save**, **Share**, or **Contact Seller**, initiating an in-app message or redirection to the seller’s contact channel. Related listings are displayed at the bottom to encourage continued browsing.

Map Page

[Map 1] | [../..../images/Map1.png](#)

[Map 2] | [../..../images/Map2.png](#)

[Map 3] | [../..../images/Map3.png](#)

Displays nearby donation and repurposing centers using Leaflet. Locations stored in Supabase include name, address, hours, and type of service (e.g., “Donation Only,” “Donation-for-Credit”). The map helps users identify offline drop-off or pickup options near their area.

These images complement the architecture by showing how the frontend components (React pages) map to backend logic (JavaScript functions) and Supabase services (Database, Storage, Auth).

Item Upload Flowchart

[Item Upload Flowchart] | [section-images/HandMeDown_ItemUpload.png](#)

Illustrates the process for creating a new listing: 1. User logs in or registers. 2. Opens the **Create Listing** form. 3. Fills in title, category, description, condition, and optional price/free marker. 4. Uploads one or more images. 5. Submits the listing. 6. Listing is stored in Supabase with its associated seller ID and displayed publicly in the marketplace.

The upload process enforces required fields but **does not create or manage any transaction**; once published, all further exchanges between users occur externally.

3 Analytic Part

3.1 - Concept analysis

Description

The domain rough sketch was reviewed to identify recurring ideas and terminology. Ambiguities were noted, compared, and resolved by introducing consistent abstractions. This ensures traceability from observations to domain-level concepts while avoiding system-to-be details.

Piece

- **Observation:** Notes reference “clothing,” “garments,” and “items” in different contexts.
- **Issue:** Terms overlap without clarity on whether they refer to a single piece or a category.
- **Resolution:** Standardized as **Piece**, representing any individual piece of apparel.
- **Justification:** Provides a neutral, unambiguous unit of exchange within the domain.
- **Concept:** **Piece** (entity).

Donation vs. Recycling

- **Observation:** Actions include “donating clothes,” “claiming items,” and “recycling textiles.”
- **Issue:** Donation and recycling are sometimes mentioned together, though they represent different flows.
- **Resolution:** — **Donation** = action of giving away clothing to others in the community. — **Recycling** = action of sending clothing to government/private services for textile reuse.
- **Justification:** Separation maintains clarity between peer-to-peer exchanges and organizational processes.
- **Concepts:** **Donation** (action), **Recycling** (action).

Services and Community

- **Observation:** Mentions of “government services,” “private services,” and “community sharing.”
- **Issue:** Ambiguity between individuals and organizations as actors.
- **Resolution:** — **User** = individual participant (donor or claimant). — **Service Provider** = organizational actor (government or private) that manages recycling/donation.
- **Justification:** Differentiation enables consistent treatment of human vs. institutional participation.
- **Concepts:** **User** (actor), **Service Provider** (actor).

Terminology Resolution

- **Clothes, garments, items:** standardized as **Piece**.
- **Donation** vs. **Recycling**: separated to reflect community exchange vs. institutional process.
- **Users** vs. **Services**: clarified as **User** (individual) and **Service Provider** (organization).

Conclusion

The domain analysis produced a clear vocabulary: - **Piece** as the primary entity. - **Donation** and **Recycling** as distinct actions. - **User** and **Service Provider** as actors.

3.2 Validation and Verification

Validation and verification activities ensure that the Hand Me Down project's deliverables meet the intended quality standards, align with stakeholder needs, and remain consistent with the domain description, requirements, and architecture. These activities are conducted as an ongoing, shared responsibility across all teams.

Validation

Validation activities focus on confirming that our understanding of the domain and requirements is accurate and complete, even before implementation:

- **Scenario Walkthroughs::** Draft scenarios were created and reviewed internally within the team to test whether our domain terminology, requirements, and workflows are coherent. For example, walkthroughs of donation and resale flows helped highlight whether our categorization and pricing assumptions were consistent.
- **Requirement Exploration::** At this stage, no external validation with students or families has been performed. Instead, internal reviews are used to identify potential gaps, such as safety practices for meetups or the way condition disclosure norms are represented.
- **Planned A/B Testing::** As the UI/UX evolves, A/B testing will be used to validate design hypotheses. Examples include testing filter placement in the item search page, or checkout button positioning. Metrics such as time-to-action and user satisfaction will guide design decisions.

Verification

Verification ensures that system components behave as prescribed and that deliverables can be tested against measurable criteria:

- **Unit Testing::** Individual components of the system will be tested using unit tests to verify correctness in isolation. This includes authentication functions, item listing logic, and condition rating updates.
- **Integration Testing::** Selected flows (e.g., creating a listing, completing a transaction) will be tested across multiple modules to ensure interactions remain consistent.
- **Load Testing with k6::** Performance and scalability will be evaluated using the k6 framework.

Initial load tests will target ~150 concurrent users, scaling up to 500, to verify that response times remain within the defined machine requirements.

- **Traceability Checks::** Deliverables will be reviewed against the requirements and terminology to ensure completeness and consistency. Each requirement will be linked to validation and verification artifacts (test cases, scenarios).

Roles and Responsibilities

Validation and verification are a **shared responsibility** across the team. While individual sub-teams focus on different aspects (e.g., listings, authentication, documentation), every member contributes to writing, reviewing, and executing tests and walkthroughs. This ensures that quality is embedded throughout the project rather than isolated in a single role.

Outcomes

The combination of walkthroughs, scenario-based validation, unit and integration testing, load testing, and A/B experimentation provides a balanced approach:

- **Validation** ensures that the concepts and requirements are correctly understood and aligned with the domain.
- **Verification** ensures that implementation artifacts conform to measurable standards and deliver the expected performance.

Together, these practices guarantee that the Hand Me Down project remains trustworthy, usable, and scalable in the context of secondhand exchanges.