Categorization of Requirements

Functional Requirements

**Core Ride-Sharing Functions:**

* + **User Registration and Digital ID verification (campus credentials, government ID/selfie matching, multi-factor authentication):**
    - **Campus Credentials & Basic Profile:** Must-be (Essential for identifying users within the campus ecosystem).
    - **Government ID/Selfie Matching, Multi-factor Authentication:** Attractive (Enhances security significantly, likely delighting security-conscious users, but basic registration is the must-be).
  + **Geolocation and Route Optimization (GPS for pick-up/drop-off, optimal routes with real-time traffic):** One-dimensional (The better the optimization and accuracy, the higher the satisfaction).
  + **Real-time Vehicle Tracking (live map tracking of driver, ETA):** One-dimensional (Already identified; accuracy and reliability are key).
  + **Fare Estimation and Cost Splitting (dynamic shared-ride costs, automatic splitting):** One-dimensional (Already identified; transparency and fairness drive satisfaction).
  + **Payment Processing and Multiple Payment Options (credit/debit, campus account billing, mobile wallets, cash toggle):**
    - **Basic Digital Payment (Credit/Debit):** Must-be.
    - **Campus Account Billing, Mobile Wallets:** Attractive (Adds significant convenience for specific user groups).
    - **Cash Toggle:** Could be Attractive for some, but potentially Indifferent or even Reverse for others if it complicates the system or raises safety concerns. Depends on user base.
  + **Payment History (details: driver, vehicle, time, method, location):** Must-be (Basic expectation for any financial transaction system for record-keeping and dispute resolution).
  + **In-App Communication and Notifications (chat/call between riders/drivers, push notifications for ride status/campus alerts):**
    - **Ride Status Notifications & Basic Rider/Driver Chat:** Must-be (Essential for coordination).
    - **Campus Alerts Integration:** Attractive (Added value beyond core ridesharing).
  + **Ride Scheduling and Reservations (advance booking, easy cancellation/reschedule):** One-dimensional (Flexibility and ease of use directly impact satisfaction).
  + **User Profile Management (name, contact, vehicle details for drivers, preferences, rating):** Must-be (Essential for service operation and trust).
* **Parking System Integration Functions:**
  + **Real-Time Parking Availability (integrate with sensors/gate systems, display live occupancy):** One-dimensional (Accuracy and comprehensiveness are key).
  + **Parking Reservation and Prebook (reserve spots with ride booking or for individual parking):** Attractive (A significant convenience and stress reducer, likely to delight users).
  + **Automated Entry / Exit Gate Control (RFID or license-plate recognition, automate barriers):** Attractive (Already identified as a delighter).
  + **Dynamic Pricing and Incentives (adjust parking fees by demand, ride-sharing discounts when lots near capacity):**
    - **Dynamic Pricing for Parking:** Could be One-Dimensional (if seen as fair and transparent) or potentially Reverse (if perceived as price gouging). Requires careful implementation and communication.
    - **Ride-sharing Discounts:** Attractive (Incentivizes desired behavior and provides tangible benefits).
  + **Digital Parking Permit and Enforcement (issue/validate digital permits, integrate citation management):**
    - **Digital Parking Permit:** Attractive (Modernizes and simplifies an existing process).
    - **Integrated Citation Management/Enforcement:** Likely Indifferent to most end-users (students/staff riders/drivers) unless they are directly involved in enforcement. More of an administrative requirement.
* **Safety and Security Functions:**
  + **In-App Safety tools (SOS/emergency button, “Trusted Contacts” trip sharing, speed-alert notifications, settable emergency contact):** Attractive (Already identified; these go beyond basic expectations and provide peace of mind).
  + **Driver Background Checks and Ratings (display driver profiles, regular background screening):**
    - **Driver Ratings:** Must-be (Standard in ridesharing).
    - **Background Screening:** Must-be (Fundamental for safety and trust).
  + **Vehicle and License Plate Verification (cross-check against approved campus list):** Must-be (Essential for security and ensuring authorized vehicles).
* **Administrative and Analytics Functions (Admin Account):**

(These are primarily for administrators and not directly experienced by general users. For admins, many would be Must-be or One-dimensional for effective system management. For general users, their indirect impact might be felt through better service quality.)

* + **Admin Dashboard:** Must-be (for admins).
  + **Reporting and Usage Analytics:** One-dimensional (for admins).
  + **Policy and Permission Management:** Must-be (for admins).
  + **Alerts and Maintenance:** Must-be (for admins).
* **Feedback and Continuous Function:**
  + **Ratings and Reviews (collect rider/driver feedback):** Must-be (Standard for service improvement and trust).
  + **Suggestion Function:** Attractive (Shows responsiveness to user needs and can lead to delight if suggestions are acted upon).
* **Multi-Platform Access:**
  + **Mobile app for iOS and Android (bug-free, good display):** Must-be (Essential for a mobile-first service).
  + **Web Platform (desktop access, administrative tasks):**
    - **Desktop access for users:** Attractive (Provides flexibility).
    - **Administrative tasks:** Must-be (for admins).

**Performance Requirements (Response Time, Throughput, Scalability, Availability & Reliability, Concurrency & Capacity, Data Volume, Latency, Resource Utilization, Peak Load & Stress Conditions)**

**Overall Categorization:** These are primarily **Must-be** and **One-dimensional**.

* + **Must-be:** The system must meet a baseline level of performance to be usable. Failure to do so (e.g., extremely slow, frequently unavailable) would cause extreme dissatisfaction.
  + **One-dimensional:** Beyond the baseline, better performance (faster response times, higher reliability, ability to handle more users smoothly) directly leads to higher user satisfaction. Users will notice and appreciate a snappy, reliable system. Poor performance in these areas is a major source of frustration.
  + Specific targets (e.g., "≤ 2 seconds for UI operation," "≥ 99.9 % availability") define the expected level of performance. Meeting them is expected; exceeding them enhances satisfaction.

**Usability Requirements (Ease of Use, Accessibility, Efficiency, Error Management, Memorability)**

**Overall Categorization:** These lean heavily towards **Must-be** and **One-dimensional**.

* + **Must-be:** A certain level of usability is fundamental. If the app is too difficult to use, users will abandon it (e.g., confusing navigation, frequent errors with no guidance).
    - Examples: Intuitive Interface (basic level), Quick Onboarding (basic flow), Clear Error Messages (basic help), Logical Navigation.
  + **One-dimensional:** The more usable the app is, the more satisfied users will be.
    - Examples: Minimal Steps for Core Tasks, Fast Load Times, Robust Validation, Consistent Design, Assistive Technologies Compatibility.
  + **Accessibility (Language Options, Assistive Technologies):** While core accessibility is a Must-be (e.g., readable text), extensive support like multiple languages or full compatibility with all assistive techs can be an Attractive feature for affected user groups, and One-dimensional for overall quality perception.

**Interface Requirements (Clear Navigation, Minimalist Layouts, Touch-Friendly Controls, Immediate Feedback, Basic Accessibility, Responsive Behavior, Consistent Branding)**

* **Overall Categorization:** Like Usability, these are largely **Must-be** and **One-dimensional**.
  + **Must-be** Core interface elements must be functional and understandable for the app to be usable at all.
    - Examples: Persistent Menu (basic navigation), Clear "Back" control, Adequate Hit Areas, Loading Indicators, Basic Text Alternatives for accessibility.
  + **One-dimensional:** A well-designed, aesthetically pleasing, and highly responsive interface will significantly enhance user satisfaction. The better these aspects are, the more users will enjoy using the app.
    - Examples: Minimalist Layouts, Generous White Space, Standard Components (leading to intuitive interaction), Action Confirmation, Good Contrast & Text Scaling, Responsive Behavior across devices, Consistent Branding.
  + A truly exceptional or innovative UI could even be **Attractive**, but the listed requirements mostly define good, expected design (Must-be) and quality execution (One-dimensional).

Summarize and Justification

**1. Dissatisfiers (Must-be Requirements)**

**Definition**: These are basic, essential features that users expect as a minimum standard. If absent, users become dissatisfied, but their presence does not significantly increase satisfaction beyond a neutral level—they are simply taken for granted.

**Categorized Requirements**:

* Safety Features (SOS button, trusted contacts, live tracking)
* MMU ID Login Access
* Real-Time Parking Spot Information
* Digital Payments
* User Registration and Digital ID Verification
* Geolocation and Route Optimization
* Real-time Vehicle Tracking
* Payment Processing and Multiple Payment Options
* Payment History
* User Profile Management
* Digital Parking Permit and Enforcement
* In-App Safety Tools
* Driver Background Checks and Ratings
* Vehicle and License Plate Verification
* Admin Dashboard
* Policy and Permission Management
* Alerts and Maintenance
* Mobile App for iOS and Android
* Performance Requirements (e.g., fast response time)
* Usability Requirements (e.g., intuitive interface)
* Interface Requirements (e.g., clear navigation)

**Justification**:  
These features form the foundational backbone of the app, addressing core needs like safety, security, functionality, and usability. For instance:

* **Safety Features**: Users (e.g., Sarah and Jen from interviews) emphasized the necessity of SOS buttons and live tracking, with 18 out of 22 survey respondents strongly agreeing or agreeing on their importance. Without these, users would feel unsafe, leading to dissatisfaction, but their presence is expected rather than exciting.
* **MMU ID Login Access**: Secure campus credential login is a baseline expectation for trust, supported by 17 out of 22 survey respondents. Its absence would undermine security, causing dissatisfaction.
* **Real-Time Parking Spot Information**: Interviewees highlighted parking frustrations, and 19 out of 22 survey respondents deemed this critical. Without it, the app fails its core purpose, dissatisfying users.
* **Digital Payments**: In a digital era, users expect seamless payment options, as confirmed by interviewee preferences and survey results. Lack of this feature would inconvenience users significantly.

Other requirements, such as geolocation, payment processing, and a mobile app, are similarly non-negotiable for basic operation. Performance, usability, and interface requirements ensure the app works efficiently and intuitively—without them, users would be frustrated, but their presence is assumed rather than celebrated.

**Conclusion**: These are Must-be requirements because their absence would render the app unusable, unsafe, or untrustworthy, leading to dissatisfaction. Their inclusion meets basic expectations but does not exceed them.

**2. Satisfiers (One-dimensional Requirements)**

**Definition**: These requirements have a linear relationship with satisfaction—the better they are implemented, the higher the satisfaction, and the worse they are, the lower the satisfaction. Users actively evaluate these based on performance.

**Categorized Requirements**:

* Fare Estimation and Cost Splitting
* Live Driver Tracking
* Advanced Ride Scheduling
* Automated Gate Access
* Parking Reservation and Prebook
* Ratings and Reviews
* Reporting and Usage Analytics (admin-specific)

**Justification**:  
These features enhance the user experience proportionally to their quality:

* **Fare Estimation and Cost Splitting**: Interviewees preferred automated, accurate pricing, and 18 out of 22 survey respondents strongly agreed or agreed it’s desirable. A transparent, precise system increases satisfaction; inaccuracies or unfairness decrease it.
* **Live Driver Tracking**: Beyond basic safety (a Must-be), the quality of tracking (e.g., real-time updates, accuracy) matters. Users value this (per interviews and surveys), and better execution boosts satisfaction.
* **Advanced Ride Scheduling**: Flexibility in booking was appreciated by users like Sarah, with 15 out of 22 survey respondents supporting it. Reliable, user-friendly scheduling increases satisfaction; delays or glitches reduce it.
* **Automated Gate Access**: Efficient gate entry improves convenience, especially during peak times. Survey support indicates that smoother operation heightens satisfaction, while delays frustrate users.

Features like parking reservations and ratings follow suit—high-quality implementation (e.g., easy booking, meaningful reviews) enhances satisfaction, while poor execution diminishes it.

**Conclusion**: These are One-dimensional requirements because satisfaction scales with their performance. Users consciously assess these features, making them key to improving the app experience beyond the basics.

**3. Delighters (Attractive Requirements)**

**Definition**: These are unexpected or innovative features that significantly boost satisfaction when present but do not cause dissatisfaction if absent. They differentiate the app and exceed user expectations.

**Categorized Requirements**:

* In-App Chat and Notifications
* Campus Map with Parking Zones
* Reporting Illegal Parking
* Dynamic Pricing and Incentives
* Suggestion Function
* Web Platform

**Justification**:  
These features go beyond core needs, offering pleasant surprises:

* **In-App Chat and Notifications**: While convenient, it’s not essential—14 out of 22 survey respondents found it desirable, but only 2 strongly disagreed if absent. Its inclusion would delight users by enhancing communication.
* **Campus Map with Parking Zones**: Navigation aid is helpful but not critical (16 out of 22 survey respondents valued it). It would delight users, especially newcomers, without being a deal-breaker if omitted.
* **Reporting Illegal Parking**: This empowers users to address parking issues, a bonus feature that could excite those frustrated with violations, though not a core need.
* **Dynamic Pricing and Incentives**: Discounts or rewards for peak-time ride-sharing would thrill users and encourage usage, but they’re not expected.
* **Suggestion Function**: Letting users provide feedback feels inclusive and could delight those who value input, though it’s not a necessity.
* **Web Platform**: A mobile app is essential, but a desktop option is an unexpected convenience that could impress users who prefer it.

**Conclusion**: These are Attractive requirements because they aren’t required for basic functionality but can significantly elevate satisfaction if included, surprising and delighting users.

**Summary of Justification**

The categorization aligns with the Kano Model and user data:

* **Dissatisfiers (Must-be)**: Essential for safety, security, and functionality (e.g., safety features, parking info, digital payments). Their absence causes dissatisfaction, as users expect them as a minimum standard.
* **Satisfiers (One-dimensional)**: Performance-driven features (e.g., fare estimation, scheduling) where quality directly impacts satisfaction, meeting user demands for efficiency and reliability.
* **Delighters (Attractive)**: Innovative extras (e.g., chat, incentives) that exceed expectations, boosting satisfaction without being critical if absent.

Requirements Categorization Table

|  |  |  |  |
| --- | --- | --- | --- |
| **Kano Model Category** | **Requirement** | **Description** | **Source** |
| **Must-be (Basic Needs)** | Safety Features | Includes SOS button, trusted contacts, and live tracking for user safety. | Interviews, Survey |
|  | MMU ID Login Access | Allows users to sign in using their MMU ID for security and verification. | Interviews, Survey |
|  | Real-Time Parking Spot Information | Provides live updates on parking availability to reduce frustration. | Interviews, Survey |
|  | Digital Payments | Supports digital payment methods for convenience and transparency. | Interviews, Survey |
|  | User Registration and Digital ID Verification | Essential for secure sign-up and identity verification. | Document (requirements.docx) |
|  | Geolocation and Route Optimization | Fundamental for accurate ride navigation and optimization. | Document (requirements.docx) |
|  | Real-time Vehicle Tracking | Necessary for tracking rides in real-time for safety and convenience. | Document (requirements.docx) |
|  | Payment Processing and Multiple Payment Options | Essential for seamless transactions with various payment methods. | Document (requirements.docx) |
|  | Payment History | Provides access to transaction records for transparency. | Document (requirements.docx) |
|  | User Profile Management | Allows users to manage their personal and vehicle information. | Document (requirements.docx) |
|  | Digital Parking Permit and Enforcement | Essential for parking access and compliance. | Document (requirements.docx) |
|  | In-App Safety Tools | Includes SOS features for user safety. | Document (requirements.docx) |
|  | Driver Background Checks and Ratings | Ensures trust by vetting drivers. | Document (requirements.docx) |
|  | Vehicle and License Plate Verification | Verifies vehicles for security. | Document (requirements.docx) |
|  | Admin Dashboard | Essential for system oversight (admin-specific). | Document (requirements.docx) |
|  | Policy and Permission Management | Required for governance (admin-specific). | Document (requirements.docx) |
|  | Alerts and Maintenance | Necessary for system reliability (admin-specific). | Document (requirements.docx) |
|  | Mobile App for iOS and Android | Core access method for users. | Document (requirements.docx) |
|  | Performance Requirements (e.g., Response Time, Availability) | Essential for app functionality and user experience. | Document (requirements.docx) |
|  | Usability Requirements (e.g., Ease of Use, Efficiency) | Fundamental for a positive user experience. | Document (requirements.docx) |
|  | Interface Requirements (e.g., Clear Navigation, Minimalist Layouts) | Essential for intuitive app usage. | Document (requirements.docx) |
| **One-dimensional (Performance Needs)** | Fare Estimation and Cost Splitting | Accurate and fair pricing enhances satisfaction. | Interviews, Survey |
|  | Live Driver Tracking | Quality of tracking impacts trust and convenience. | Interviews, Survey |
|  | Advanced Ride Scheduling | Flexibility in scheduling improves user experience. | Interviews, Survey |
|  | Automated Gate Access | Efficiency of gate operations affects satisfaction. | Interviews, Survey |
|  | Ride Scheduling and Reservations | Greater flexibility boosts satisfaction. | Document (requirements.docx) |
|  | Parking Reservation and Prebook | Easier booking increases satisfaction. | Document (requirements.docx) |
|  | Reporting and Usage Analytics | Detailed insights improve admin satisfaction (admin-specific). | Document (requirements.docx) |
|  | Ratings and Reviews | Better feedback systems enhance trust and experience. | Document (requirements.docx) |
| **Attractive (Delighters)** | In-App Chat and Notifications | Convenient for communication but not essential. | Survey |
|  | Campus Map with Parking Zones | Enhances navigation but not critical. | Survey |
|  | Reporting Illegal Parking | Appeals to users frustrated with parking issues. | Survey |
|  | Dynamic Pricing and Incentives | Discounts and dynamic fees pleasantly surprise users. | Document (requirements.docx) |
|  | Suggestion Function | Allowing user input is an appealing bonus. | Document (requirements.docx) |
|  | Web Platform | Desktop access is an unexpected convenience. | Document (requirements.docx) |
| **Indifferent** | Ride Matching Across Roles | Mixed feelings; not a priority for most users. | Survey |
|  | Freeing Occupied Parking Spots | Low consensus; niche appeal. | Survey |
|  | Driver Approval Request | Mixed responses; not a major concern. | Survey |
| **Reverse** | Manual Pick-Up/Drop-Off Entry (No GPS) | Frustrates users accustomed to GPS automation. | Survey |
|  | No Payment History or Ride Details | Erodes trust and convenience. | Survey |

**Notes**

* **Must-be**: These are essential features users expect; their absence causes dissatisfaction.
* **One-dimensionale**: These features increase satisfaction when improved and are tied to performance.
* **Attractive**: These are unexpected bonuses that delight users when present.
* **Indifferent**: Users are neutral about these features.
* **Reverse**: These features cause dissatisfaction when present and are better avoided.

Elicitation Methods

Google Form Survey: Structured feedback collected via paired questions assessing user reactions to the presence and absence of each feature.

Interviews: In-depth discussions with stakeholders to uncover detailed needs and pain points.

Observation: Real-time monitoring of commuting and parking behaviors to validate reported issues.