



Eartech

Songro

Smart tools for hearing-impaired couriers in China

Product Capstone Project

25FA

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Design Brief

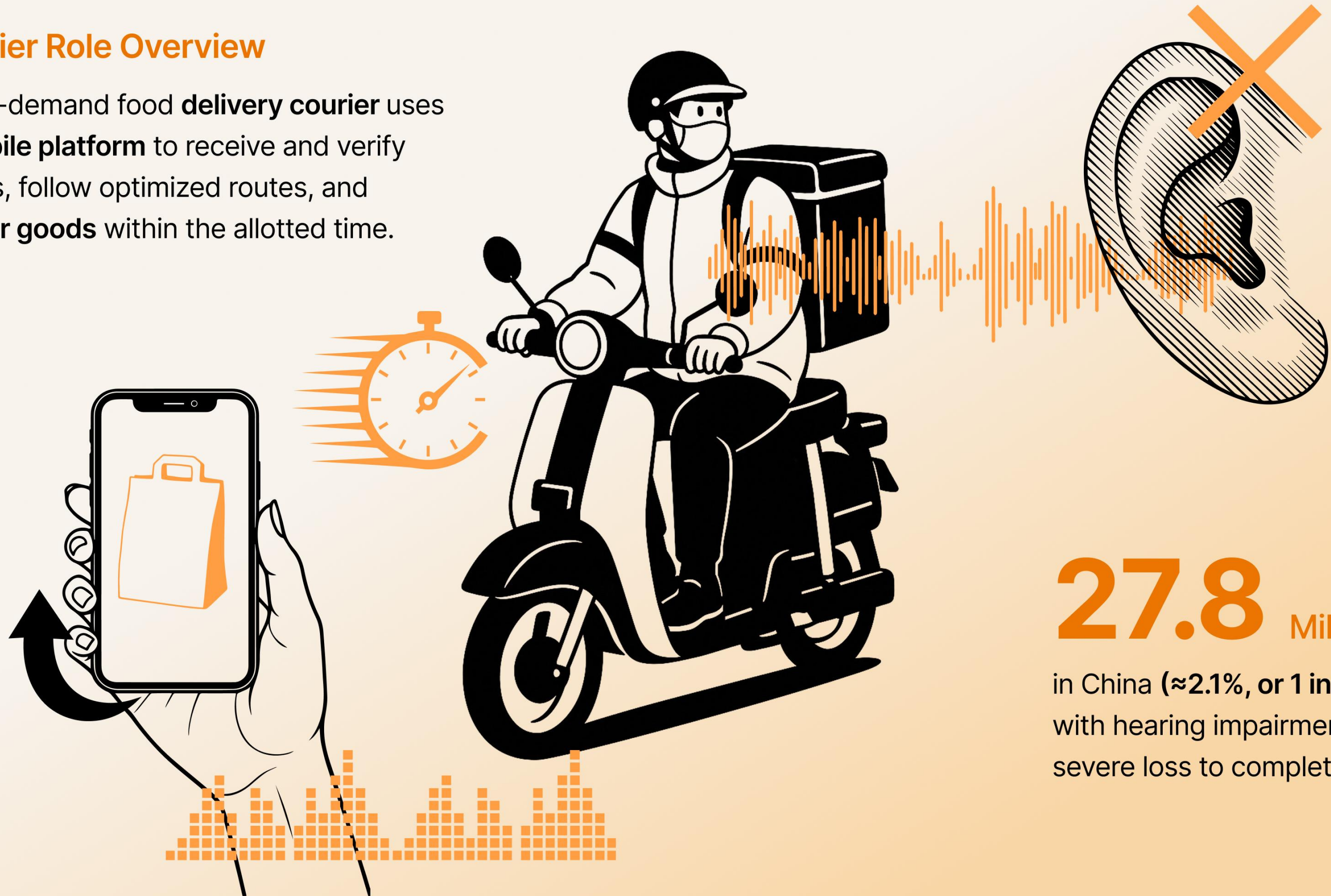
Design an integrated riding system that helps hearing-impaired delivery riders **navigate, communicate, and stay safe** through visual alerts, AR guidance, and a sustainable modular power design.



Backgrounds

Courier Role Overview

An on-demand food **delivery courier** uses a **mobile platform** to receive and verify orders, follow optimized routes, and **deliver goods** within the allotted time.



27.8 Million

in China ($\approx 2.1\%$, or 1 in 50) live with hearing impairment, from severe loss to complete deafness.

Backgrounds



Population

Hearing-impaired riders in China (2023) with higher dedication and retention than non-disabled riders.



Retention

of disabled riders continue working for over eight weeks, compared to only one-third of regular riders.



Performance

More weekly tasks completed despite ~10s longer pickup and ~27s longer delivery per order

Hearing-Impaired Delivery Couriers Work Conditions



Traffic Safety

Cannot hear surroundings, often honk, ride fast, struggle with voice prompts or phone use.



Communication & Pickup Barriers

Misunderstandings, delays, unclear address/order confirmation.



Difficult Information Access

Constant screen checks; weak vibrations, small fonts, low contrast hinder access.



Social Bias & Review Pressure

Impairment not understood; face bias, negative reviews, extra proof demands.

Consequences of Inaction



Reduced Platform Efficiency

Missed pickups delay orders, lowering platform efficiency.



Communication & Pickup Barriers

Eye strain, fatigue, traffic risks, discrimination increase quitting.



Chain Reaction to Loss

Poor communication leads to customer complaints, negative reviews, and the loss of reliable riders.

Causes of Communication Barriers

Hearing impairment

Miss urgent calls, struggle with instant communication.

Limits of text communication

Short messages seem cold, easily misunderstood by others.

False rewards, longer hours

Virtual badges or points encourage riders to work extra hours, without real income or health benefits.

Gamified competition

Ranking and task systems push riders to speed up, often at the cost of rest and safety.

Late alerts, lost orders

Delayed visual/vibration reminders cause missed orders and fines.

Limited communication

Pre-set text or AI calls cannot meet riders' diverse communication needs.

Hearing-Impaired Rider Perspective



Delivery Platform Perspective



Merchant Perspective



Customer Perspective

Delayed preparation causes overtime

Merchant delays push riders into overtime, often wrongly blamed by customers.

Inaccessible pickup alerts

Small shops shout order numbers, making pickups difficult for hearing-impaired riders.

Low efficiency

Text messages are not always checked in time, causing delays in address, progress, or request communication.

Misunderstanding

Without verbal explanation, disability proof may be seen as shirking or begging.

Prejudice

Some customers show impatience or bias, venting frustration on riders even without late deliveries.

Barrier Causes

User Journey Map

How can hearing-impaired couriers reduce misunderstandings and stress at each stage of the delivery process, while identifying pain points and opportunities for improvement?



User Persona

“I try my best on every order, but I hope the system helps me avoid risks and misunderstandings.”



Minghao Li

Age: 28

Occupation: Hearing-impaired food delivery courier

Location: Shanghai

User Traits

Tech-savvy /
Beginner

Risk-conscious

Highly Motivated

Relies on visual cues



Background

Completely or partially deaf, relies on delivery platform apps, navigation, and text communication to complete work

Goal

Deliver efficiently & safely
Gain fair reviews & stable income
Be understood & respected for hearing loss
Use clearer, user-friendly tools

Pain Points

Safety: Can't hear horns/alerts
Communication: Misses calls, verbal pickup
Access: Small fonts, weak vibration
Bias: Misunderstood, unfair reviews

Needs

Visual/vibration reminders
“Hearing-impaired” rider tag
Text, icons, quick replies
More safety & support

Existing Pain Points



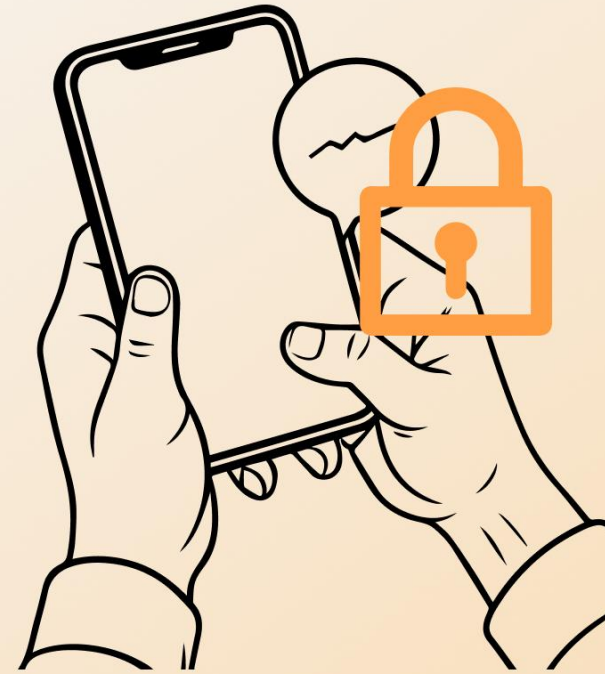
Inefficient Information Filtering & Decision-Making

Riders struggle to quickly screen and assess orders due to complex interfaces, unclear information, and low screening efficiency, increasing decision stress.



Complicated Order-Grabbing & Navigation Process

Frequent refreshing, slow order confirmation, and inaccurate or delayed navigation guidance make it difficult to maintain workflow speed and focus.



Communication Barriers with Merchants & Users

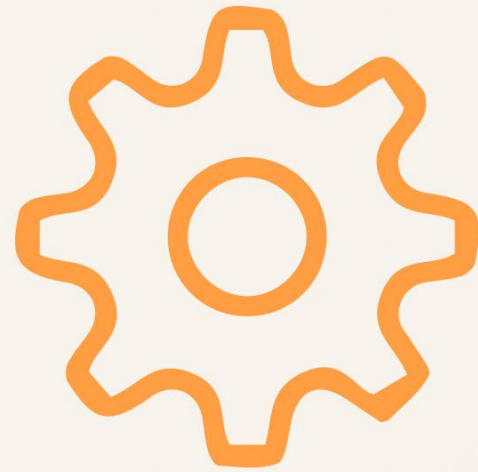
High communication cost, blocked calls, and unclear user locations cause coordination issues, especially for hearing-impaired riders.



Safety & Delivery Efficiency Concerns

Sudden road changes, lack of timely updates, and inefficient tools lead to safety risks and delivery delays, impacting overall service reliability.

Actionable Insights



Streamlined Order Interface

How might we simplify the order-screening process to help riders quickly assess and accept tasks with less stress?



Inclusive Communication Interface

How might we create an accessible communication system that reduces misunderstandings for hearing-impaired riders?



Real-Time Navigation & Safety Alerts

How might we provide riders with real-time route updates and AR-based safety cues to improve awareness on the road?



Efficient Coordination & Feedback System

How might we enable smoother coordination between riders, merchants, and customers to minimize waiting time and errors?

Design Opportunities



Accessible Communication Ecosystem

Comfortable, inclusive, and user-friendly tech
Universal design and co-creation with disabled users



Context-Aware Navigation & Feedback

Develop adaptive AR guidance using real-time data, color cues, and spatial feedback to simplify decision-making.



Emotional & Cognitive Support

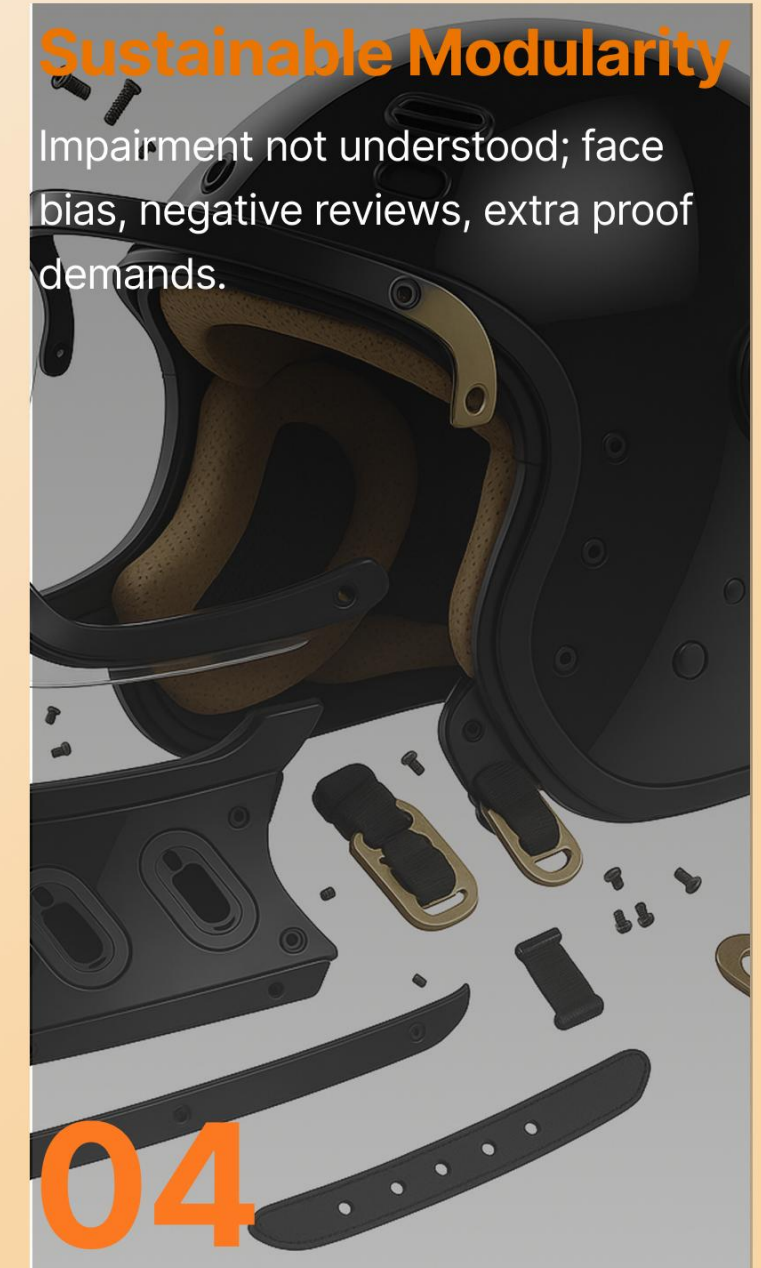
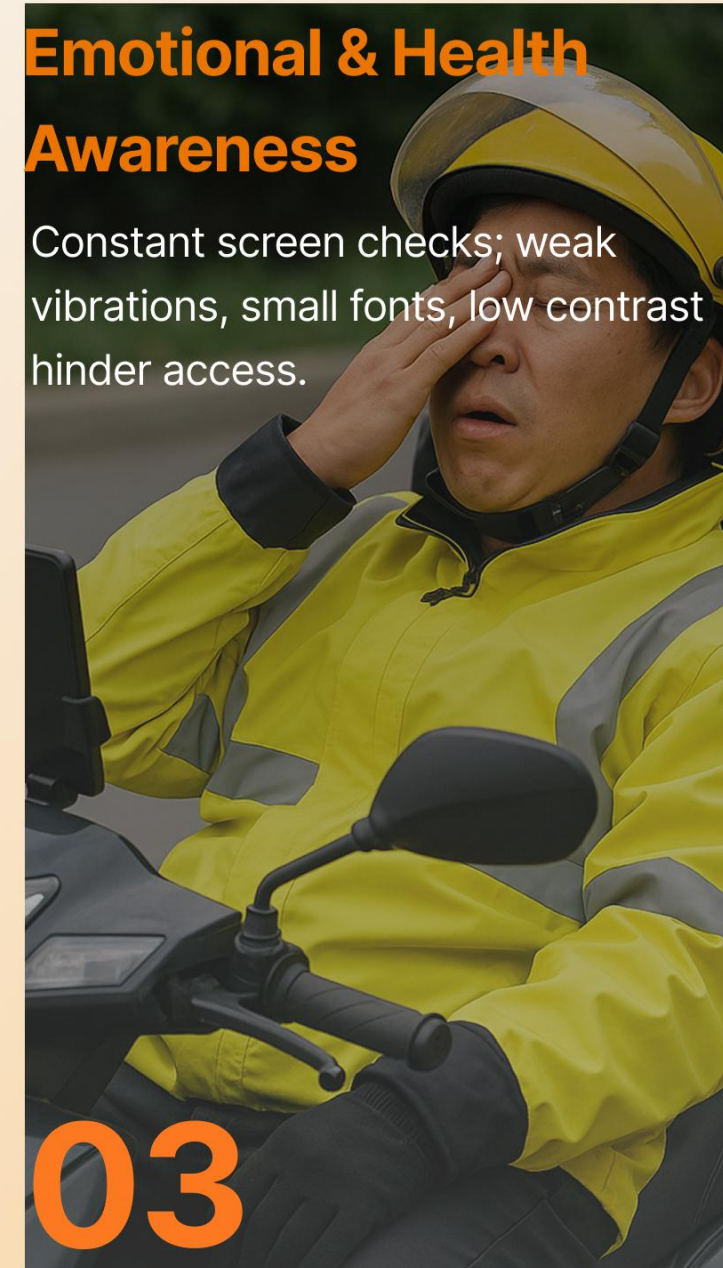
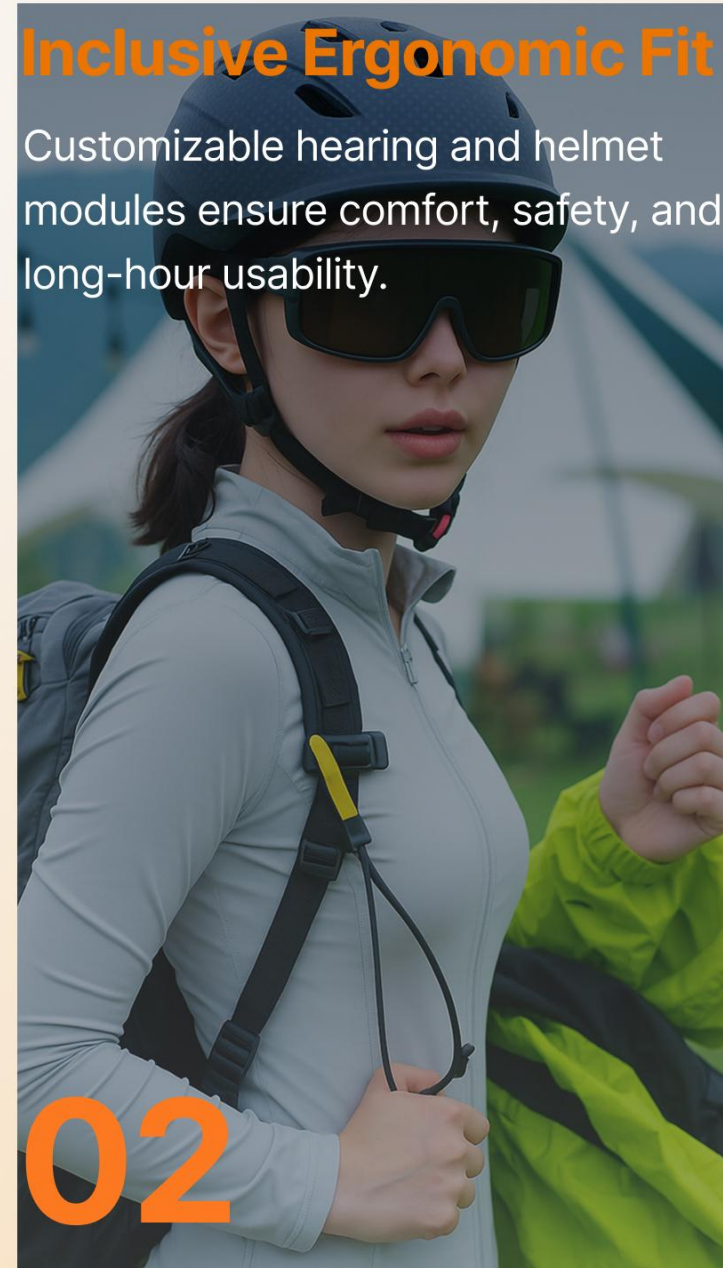
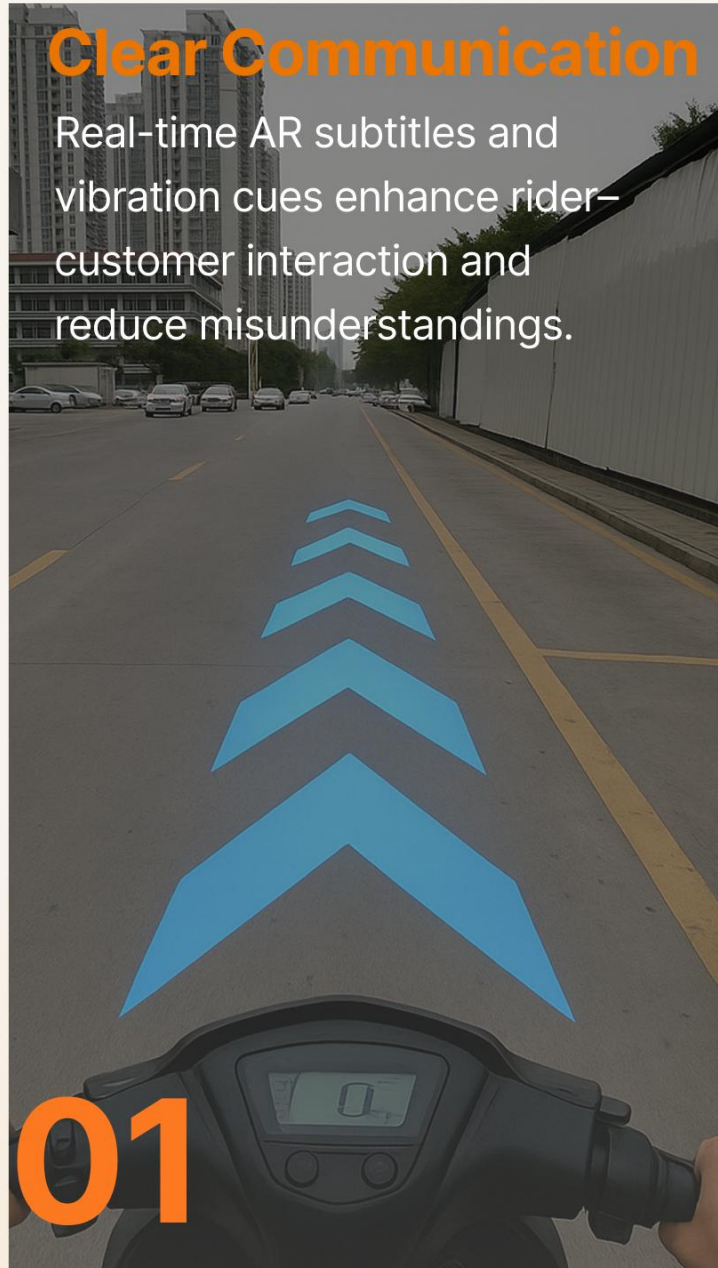
Introduce emotion-sensing and stress-monitoring features that provide calming haptic feedback and well-being reminders.



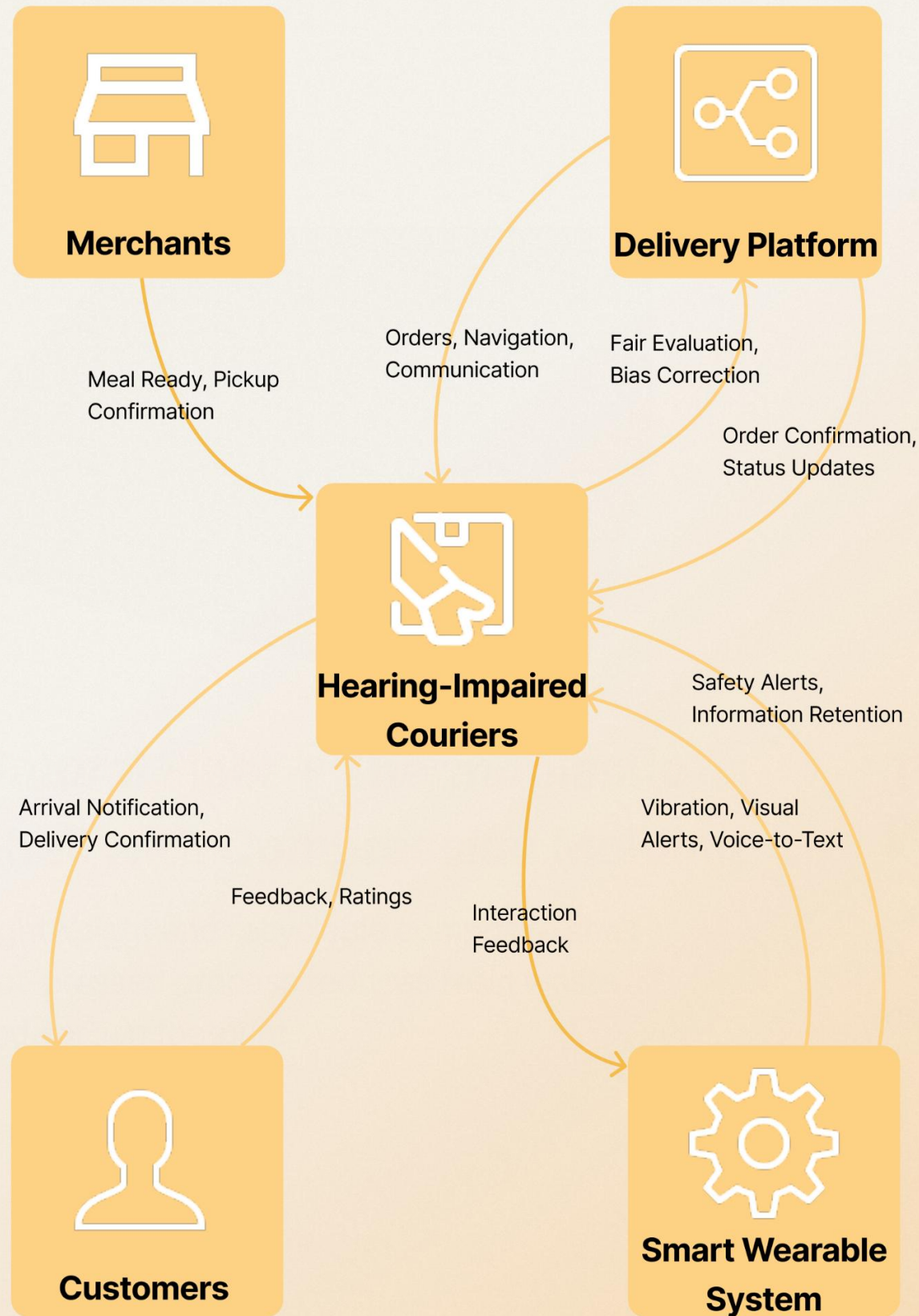
Circular & Modular Design for Sustainability

Apply modular construction, bio-based materials, and trade-in systems for sustainable product lifecycles.

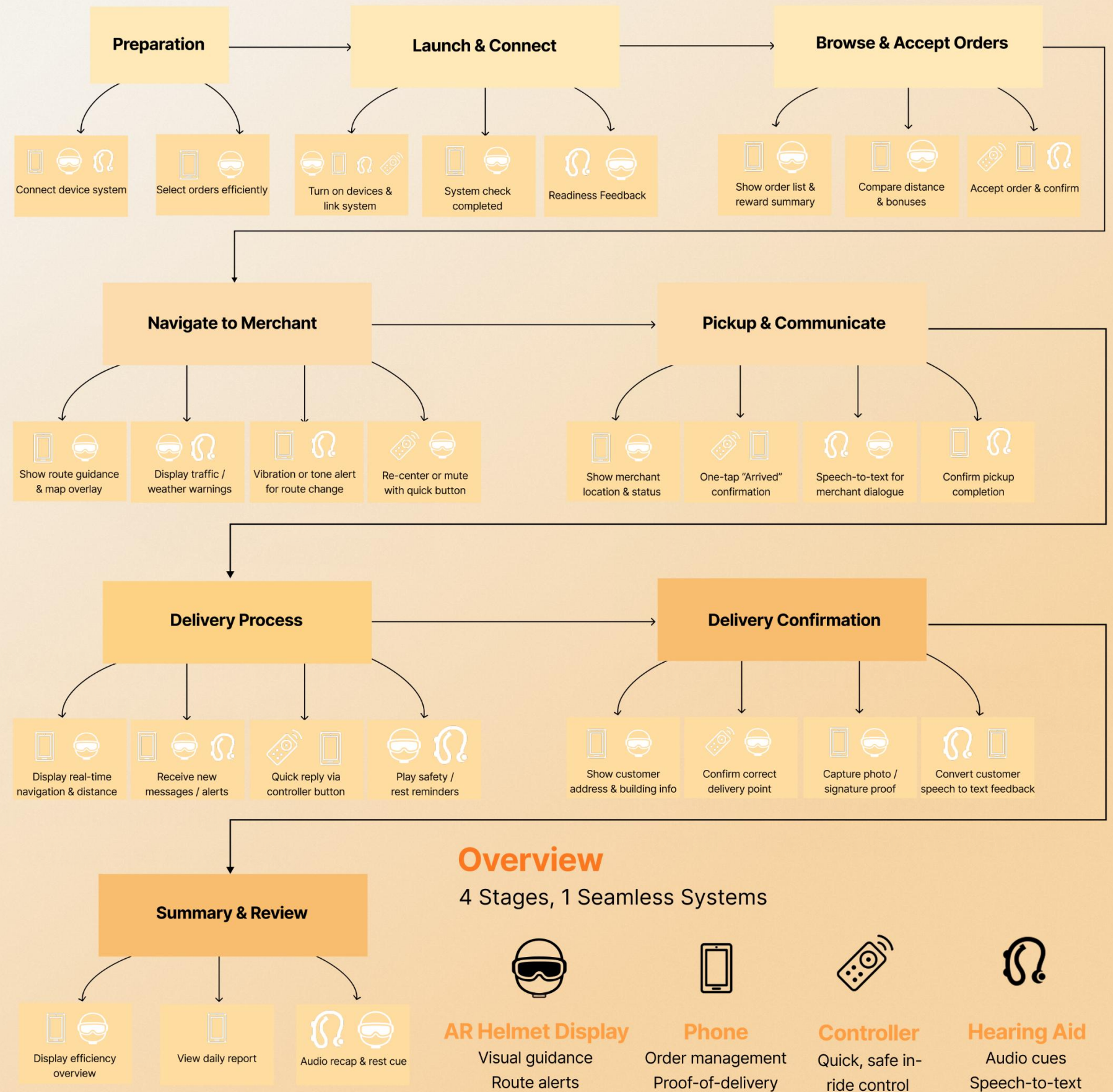
Design Criteria / Goals with Functions and Features



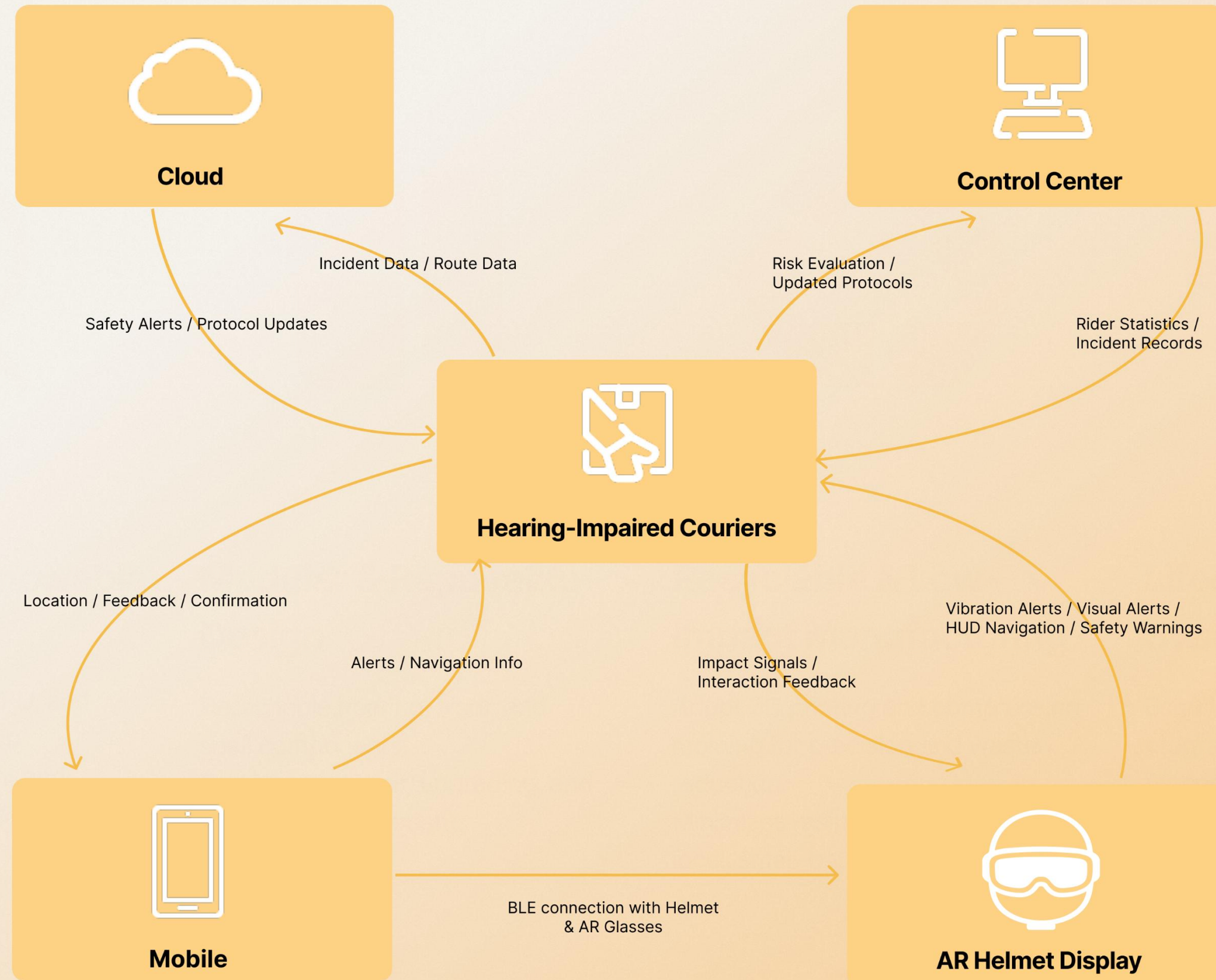
System Map



User Flow



Safety Riding System Map

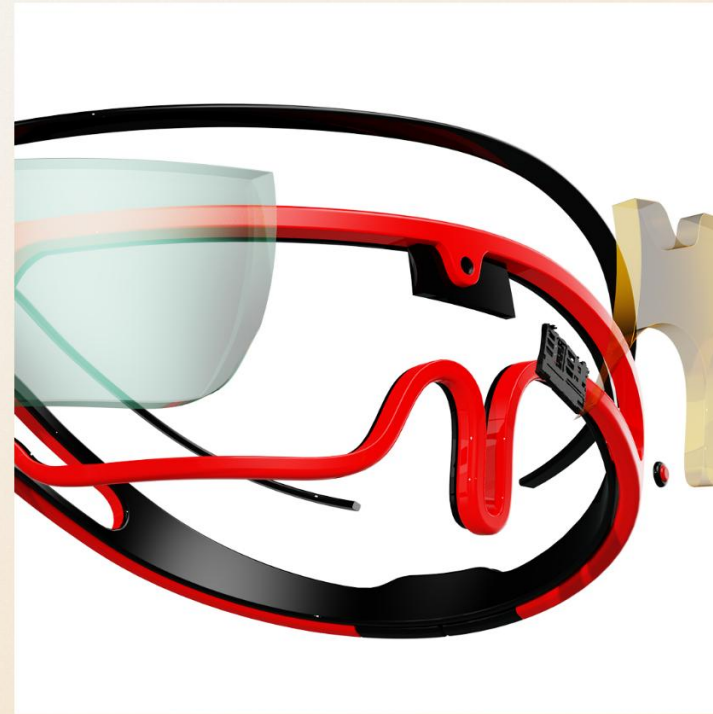


Sustainable Battery Innovation



Material Circularity

Thin, detachable, recyclable design
Water-soluble binder for direct recycling
Symmetric, replaceable battery modules



Modular Repairability

LFP: stable, cobalt-free, recyclable
Sodium-ion: safe, low-cost future option
Hot-swappable 2S module with clear labeling



Lifecycle Optimization

Modular, recyclable structure
USB-C PD link to glasses
Battery Passport for traceability

The Front 3/4 Perspective



• **High-Mounted Warning Light Strip**

Provides clearer visibility to surrounding vehicles.

• **Magnetic Helmet-Visor Fit**

Magnetic alignment ensures a secure integrated form.

• **180° Camera Coverage**

Front and side cameras expand the rider's field of view for safer hazard detection.

The Side Perspective



Streamlined Form

Reduces wind resistance and improves riding stability.

Ventilation Layers

Multi-layer vents enhance airflow and keep riders cool.

Comfort Strap

Soft, ergonomic strap provides a more secure and comfortable fit.

The Rear 3/4 Perspective



Rear Warning Light Strip

Enhances rear visibility for safer night riding.

USB-C Charging Port

Offers fast, universal charging for everyday convenience.

Rear Locking Clip

Keeps the visor firmly secured to the helmet, preventing unwanted detachment.

The Rear-Side Perspective

Rear Vent Flow

Rear-side vents guide airflow and reduce heat buildup.

Integrated Form Language

Ensures a consistent visual flow from the helmet shell to the visor system.



Ear-Conforming Geometry

A sculpted frame curve avoids the ear and enhances comfort.

Precision Bone Conduction Fit

Places the conduction module at the optimal position for stable, clear audio delivery.

Adaptive LiDAR Distance Alerts



Immediate Danger — 5 ft (1.5 m)

Critical proximity detected;
take immediate action.



Caution Zone — 15 ft (4.5 m)

Object is getting closer; prepare
to slow down or adjust position.



Safe Distance — 25 ft (7.6 m)

Object is far enough;
continue riding safely.



**Modular power system using
a cobalt-free solid-state cell
for improved safety and
energy density.**

AR Glasses — Exploded View



AR Glasses — Exploded View



- **Top Warning Light Strip**
Silicone Light Diffuser
Embedded LED Strip
- **Outer Shell**
Natural Fiber
Thermoplastic Composite
- **Cobalt-free solid-state battery**
- **Rear Warning Light Strip**
Silicone Light Diffuser
Embedded LED Strip
- **Impact Absorption Layer**
Koroyd Thermowelded Tubes
- **Internal Liner**
3D-Printed TPU Lattice
- **Comfort Padding Layer**
Bio-based TPU Foam

Colorways



Taobao Flash Delivery Orange

High-visibility reflective orange for instant-delivery branding



JD Delivery Red

Iconic JD red to maintain brand recognition in urban streets.





Thanks for watching!

I'd love to hear your feedback.