SCHOOL OF FUTURE TECH

ITM SKILLS UNIVERSITY

Case Study Report: WEARABLE TECH WEBSITE

PROJECT REPORT:

GARMIN INDIA – PREMIUM E-COMMERCE WEBSITE

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1. WEBSITE DETAILS

Title of the Website

Garmin India – Premium Multi-Page E-Commerce Experience

Purpose of the Website

The purpose of this website is to design and develop a modular, scalable, multi-page e-commerce platform inspired by Garmin's product ecosystem. The website demonstrates:

- Advanced semantic HTML structure
- Modular CSS architecture
- Reusable JavaScript components
- Dynamic product modal system
- localStorage-based shopping cart
- Mega navigation overlay
- Responsive grid + flex layouts
- Performance optimizations (lazy load, intersection observer)

Target Users

- Fitness Enthusiasts
- Outdoor Adventurers
- Athletes
- Automotive & Marine Users
- Indian E-commerce Customers

Tools & Technologies Used

- HTML5 (Semantic Structure)
- CSS3 (Grid, Flexbox, Media Queries, Animations)
- JavaScript (ES6, DOM API, localStorage, Intersection Observer)
- VS Code
- Chrome DevTools

Key Features

- Fully modular navigation system (injected dynamically)
- Mega menu with hover interaction
- Horizontal scroll product filmstrip
- Quick View Modal system
- Persistent shopping cart (localStorage)
- Scroll reveal animations
- Responsive multi-breakpoint layout
- Accessibility enhancements (ARIA, keyboard focus)

2. PROJECT ARCHITECTURE

2.1 File Structure & Modularity

Your system is modular. Components are injected once and reused everywhere.

Core Files

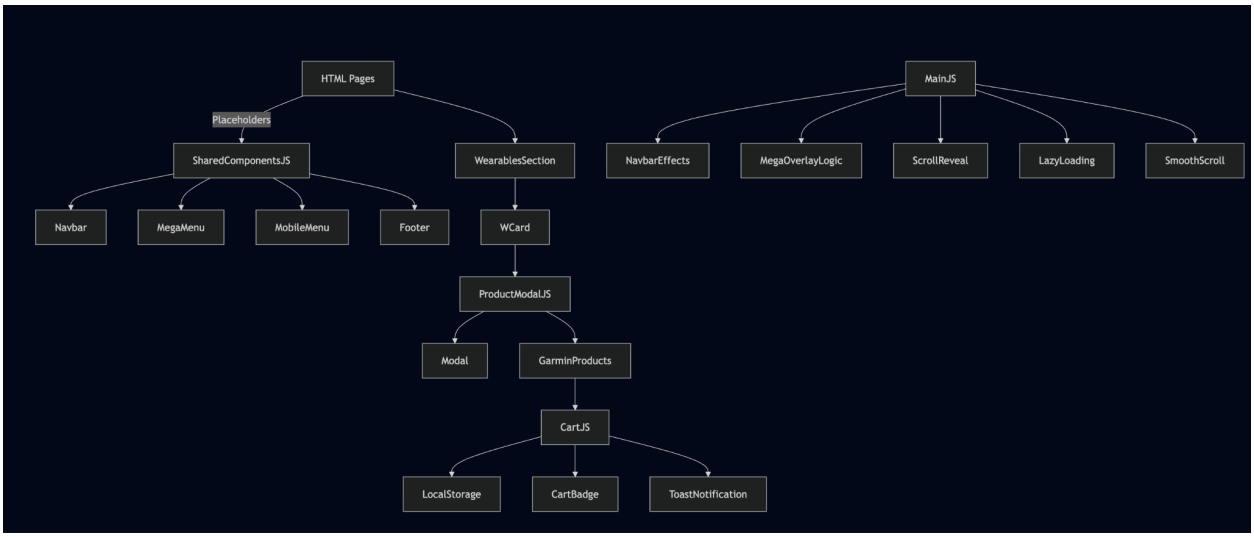
CSS Files

- `footer.css`
- `wearables.css`
- `modal.css`
- (Global styles assumed in main stylesheet)

JavaScript Files

- `main.js`
- `shared-components.js`
- `product-modal.js`
- `cart.js`

2.2 System Architecture Diagram



3. HTML STRUCTURE ANALYSIS

3.1 Semantic HTML Tags Used (Project-Specific Explanation)

Tag	Where It Is Used in This Project	Purpose in Our Website	Technical Importance
`<html>`	Root of every page with `data-depth` attribute	Stores page depth for dynamic path resolution	Enables shared-components.js to correctly generate relative links
`<head>`	All pages	Contains metadata, CSS links, JS links	Loads modular styles and scripts
`<body>`	All pages	Contains visible UI and injected components	JavaScript attaches event delegation to body

`<nav>`	Injected via `shared-components.js`	Main navigation bar (Glass navigation)	Semantic landmark for navigation; supports accessibility
`<footer>`	Injected footer component	Contains company info, links, newsletter, legal	Defines page-ending content using semantic landmark
`<section>`	Wearables, product categories, hero sections	Groups logically related content blocks	Improves semantic structure and SEO clarity
`<div>`	Used extensively in layout structure	Structural wrapper for layout (Grid/Flex containers)	Used for CSS positioning and layout control
`<main>`	Implied through skip link	Primary content area	Improves accessibility for screen readers
`<h2>`	Section titles (e.g., Wearables titles)	Defines major content headings	Helps SEO hierarchy and document structure
`<h3>`	Footer column headings	Secondary content headings	Organizes footer into semantic blocks
`<h4>`	Mega menu headings	Sub-category grouping	Maintains logical heading hierarchy
`<p>`	Newsletter text, feature descriptions	Displays descriptive content	Used inside modal features and footer

`<span>`	Price labels, badges, eyebrow text	Inline text styling	Used for dynamic cart count and feature eyebrow
`<strong>`	Cart toast product name	Emphasizes product name in notification	Semantic emphasis instead of bold styling
`<ul>`	Navigation links, footer links	Unordered list structure	Groups related links semantically
`<li>`	Inside `<ul>`	Individual navigation/footer items	Structured list organization
`<a>`	Navigation links, product links, social links	Hyperlink to pages or sections	Core navigation mechanism
`<form>`	Newsletter subscription form	Captures user email	Structured user input submission
`<input type="email">`	Newsletter form	Collects email address	Enforces email validation at browser level
`<button>`	Buy buttons, modal buttons, menu toggle	Triggers actions (JS events)	Used for interaction rather than navigation
`<img>`	Product images, modal images	Displays product visuals	Lazy-loaded using Intersection Observer

`<video>`	Hero background video	Visual engagement	Paused when not in viewport (performance optimized)
`<svg>`	Icons in nav, modal, cart, footer	Vector-based icons	Scalable, lightweight, styleable via CSS

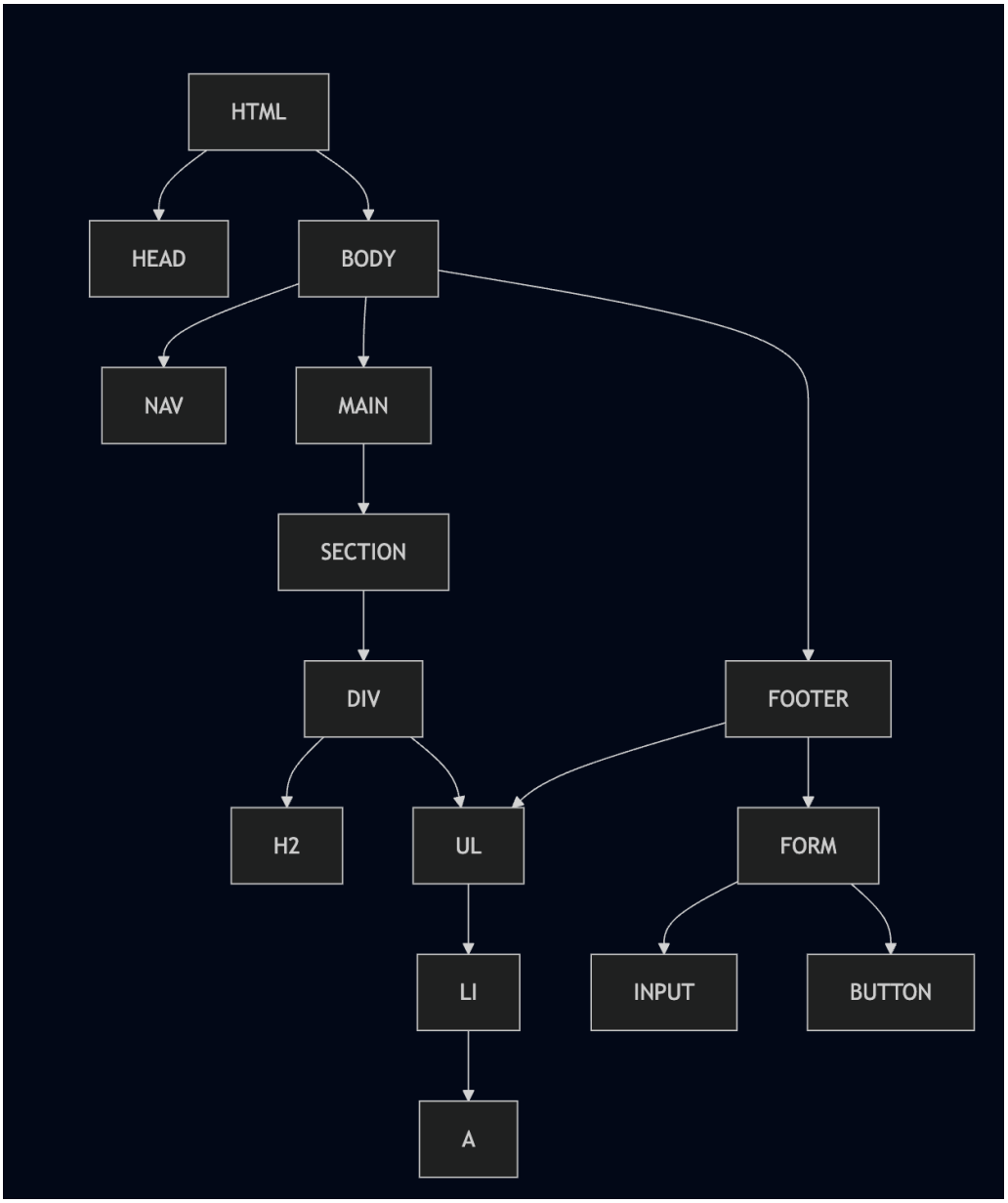
Accessibility Attributes Used

Attribute	Where Used	Purpose in This Project
`role="navigation"`	`<nav>`	Defines navigation landmark for assistive technologies
`role="dialog"`	Modal card	Identifies modal as dialog window
`aria-label`	Buttons, nav, mobile toggle	Provides descriptive label for screen readers
`aria-expanded`	Mobile menu toggle	Indicates open/closed state
`aria-hidden`	Modal backdrop	Indicates visibility state
`aria-modal="true"`	Modal	Signals that modal traps focus

`tabindex="0"`	Country selector	Makes non-button element keyboard accessible

How These Tags Work Together (Structural Hierarchy)

Here is the structural relationship in your project:



Important Insight

The project does NOT use div everywhere blindly.

we used:

• `<nav>` for navigation landmark
• `<footer>` for closing section
• `<section>` for logical grouping
• `<ul>` for grouped navigation links
• `<button>` for actions (not `<a>`)
• `<a>` strictly for navigation

3.2 Shared Components Injection Logic

Your navigation, mega menu, mobile menu and footer are injected using:

document.getElementById("nav-root").innerHTML = navHTML;

This achieves:

- DRY architecture (Don’t Repeat Yourself)
- Centralized navigation management
- Cross-page consistency
- Scalable maintainability

4. CSS ARCHITECTURE ANALYSIS

The project follows a modular CSS architecture where each major UI section is isolated into its own stylesheet:

- `globals.css` – Design system, tokens, utilities
- `hero.css` – Landing page hero section
- `wearables.css` – Product filmstrip & section styling
- `modal.css` – Quick View modal
- `footer.css` – Footer layout & styling

This separation ensures maintainability, reusability, and clarity.

4.1 Layout Systems Used

The project uses **CSS Grid and Flexbox strategically**, not randomly.

4.1.1 Grid Layout Usage

Where Grid Is Used

- `.footer-top`
- `.mega-grid`
- Multi-column footer sections
- Mega menu content columns

Example 1 – Footer Grid (`footer.css`)

```
.footer-top {
 display: grid;
 grid-template-columns: 1.2fr 1fr 1fr 1.5fr;
 gap: 80px;
}
```

What This Code Does

- Creates 4 responsive columns
- Allocates proportional width using `fr` units
- Ensures equal vertical alignment
- Adds controlled spacing with `gap`

Purpose

- Clean multi-column structure
- Professional enterprise-style footer
- Predictable content distribution
- Easy conversion to 2-column and 1-column layouts at breakpoints

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Example 2 – Mega Menu Grid (`shared-components.js` → injected HTML + CSS)

Mega panels use:

```
.mega-grid {
 display: grid;
}
```

This creates structured product category columns.

Purpose

- Organized mega dropdown layout
- Easy scalability (add/remove columns without layout breaking)
- Clean separation between menu groups

Why Grid Was Chosen

Grid is ideal for:

- Two-dimensional layouts
- Structured columns

- Footer architecture
- Mega menu organization

It provides more control than flexbox for column-based structures.

4.1.2 Flexbox Usage

Flexbox is used for alignment, stacking, and dynamic distribution.

Where Flexbox Is Used

- Navbar container
- Modal split layout
- Product card layout
- Footer social icons
- Horizontal product filmstrip
- Card action buttons
- Mobile menu
- Newsletter form

Example 1 – Horizontal Product Filmstrip (`wearables.css`)

```
.wearables-scroll-container {
 display: flex;
 overflow-x: auto;
 scroll-snap-type: x mandatory;
}
```

What This Code Does

- Creates a horizontal row of cards
- Enables scrollable overflow
- Combines with `scroll-snap-type` for smooth snapping

Purpose

- Apple-style filmstrip experience
- Mobile-friendly horizontal scrolling
- Dynamic card expansion

Example 2 – Modal Split Layout (`modal.css`)

```
.modal-card {
 display: flex;
 flex-direction: row;
}
```

What This Code Does

- Splits modal into:
    - Left: image
    - Right: content

At mobile breakpoint:

```
@media (max-width: 768px) {
 .modal-card {
   flex-direction: column;
 }
}
```

Purpose

- Desktop: side-by-side layout
- Mobile: vertical stacking
- Adaptive UI behavior

Example 3 – Card Actions

```
.w-card-actions {
 display: flex;
 justify-content: space-between;
}
```

Purpose

- Align price on left
- Align buttons on right
- Maintain visual balance

Why Flexbox Was Chosen

Flexbox is ideal for:

- One-dimensional layouts
- Aligning items horizontally or vertically
- Distributing space dynamically
- Responsive stacking

4.2 Responsive Design Strategy

The project follows a structured breakpoint system.

Breakpoints Used

- **1024px** → Tablet/Desktop transition
- **768px** → Tablet/Mobile transition
- **480px** → Small mobile devices

Defined across all major CSS files.

Responsive Techniques Used

1. Grid → Single Column Conversion

Example (`footer.css`):

```
@media (max-width: 768px) {
 .footer-top {
   grid-template-columns: 1fr;
 }
}
```

Effect:

- Footer collapses to single column
- Improves readability
- Enhances mobile usability

---

2. Flex Direction Changes

Example (`hero.css`):

```
@media (max-width: 768px) {
 .hero-cta {
   flex-direction: column;
 }
}
```

Effect:

- Buttons stack vertically
- Prevents overflow
- Maintains spacing

---

3. Scroll Padding Adjustments

```
@media (max-width: 768px) {
 .wearables-scroll-container {
   padding: 0 var(--spacing-md);
 }
}
```

Effect:

- Maintains edge spacing on mobile
- Improves swipe interaction

---

4. Mobile Menu Transformation

Desktop:

- Mega menu (hover-based)

Mobile:

- Off-canvas slide menu
- Accordion toggles
- Backdrop overlay

Handled through:

mobileMenu.classList.toggle("active", isActive);

This completely transforms navigation behavior based on viewport.

4.3 Animations & Transitions

The project heavily relies on GPU-accelerated animations.

4.3.1 Properties Used

- `transition`
- `transform`
- `opacity`
- `box-shadow`
- `backdrop-filter`
- `scroll-snap-type`
- `cubic-bezier()`

4.3.2 Hover Animations

Example (`wearables.css`):

```
.w-card:hover {
 transform: translateY(-8px);
 box-shadow: 0 20px 40px rgba(0, 0, 0, 0.12);
}
```

What Happens

- Card lifts upward
- Shadow deepens
- Creates elevation illusion

This simulates physical movement.

4.3.3 Modal Animation

Initial State:

```
.modal-card {
 transform: scale(0.92) translateY(20px);
 opacity: 0;
}
```

Active State:

```
.modal-backdrop.active .modal-card {
 transform: scale(1) translateY(0);
 opacity: 1;
}
```

Effect

- Modal scales up smoothly
- Moves upward
- Fades in

This creates Apple-like motion physics.

4.3.4 Toast Animation (Injected via JS)

From `cart.js`:

```
.cart-toast {
 transform: translateX(100%) scale(0.95);
 opacity: 0;
}

.cart-toast.show {
 transform: translateX(0) scale(1);
 opacity: 1;
}
```

Effect

- Slides in from right
- Slight scale pop
- Fades in
- Auto-dismiss after 3 seconds

4.3.5 Parallax Background Effect

From `wearables.css`:

```
.section-bg {
 background-attachment: fixed;
}
```

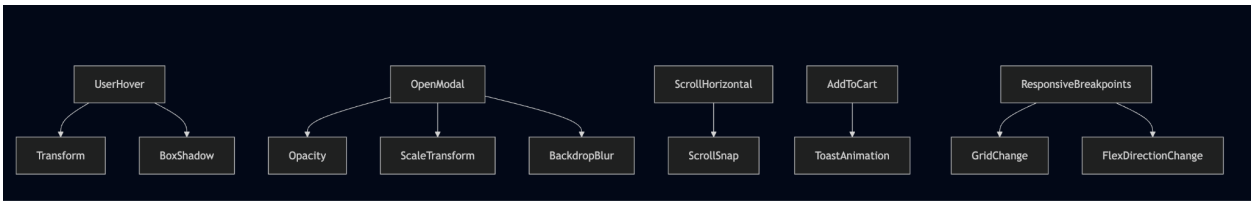
Effect

- Background remains fixed

- Content scrolls over it
- Creates depth illusion

Used for premium product section backgrounds.

CSS Motion Architecture Diagram



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5. JAVASCRIPT SYSTEM ANALYSIS

The JavaScript architecture is modular and responsibility-driven.
Each file controls a specific behavioral domain:

- `main.js` → Core UI interactions & performance
- `shared-components.js` → Component injection system
- `product-modal.js` → Dynamic product quick-view system
- `cart.js` → LocalStorage-based cart engine

This separation ensures:

- Scalability
- Maintainability
- Reusability

- Clear separation of concerns

5.1 `main.js` Responsibilities

This file controls **global UI behavior and performance optimizations**.

5.1.1 Navbar Scroll Effect

Code

```
const navbar = document.getElementById("navbar");

const handleNavScroll = () => {
 const currentScrollY = window.scrollY;

 if (currentScrollY > 50) {
   navbar.classList.add("scrolled");
 } else {
   navbar.classList.remove("scrolled");
 }
};
```

What This Does

- Detects vertical scroll
- Adds `.scrolled` class after 50px
- Removes it when back at top

Why It Is Used

- Enables glass → solid navbar transition
- Improves readability after hero section

- Enhances premium interaction feel

Performance Optimization

```
let ticking = false;

window.addEventListener("scroll", () => {
 if (!ticking) {
   window.requestAnimationFrame(() => {
     handleNavScroll();
     ticking = false;
   });
   ticking = true;
 }
});
```

Why This Is Important

- Prevents excessive scroll event execution
- Uses `requestAnimationFrame`
- Improves performance on low-end devices

This shows performance-aware engineering.

5.1.2 Mega Overlay System

A detached fixed overlay system for desktop navigation.

Overlay Activation

```
const showOverlay = (category) => {
 megaOverlay.classList.add("active");
};
```

Category Switching

```
document.querySelectorAll(".mega-panel").forEach((panel) => {
 panel.classList.remove("active");
});

const targetPanel = document.getElementById(`panel-${category}`);
targetPanel.classList.add("active");
```

What This Does

- All panels exist in DOM
- Only visibility changes
- No DOM injection/removal

Why This Is Smart

- Faster than recreating DOM
- Avoids layout shift
- Smooth UX

Close Mechanisms

- Hover leave delay (150ms)
- Click outside detection
- Escape key support

```
if (e.key === "Escape") {
 megaOverlay.classList.remove("active");
}
```

This ensures full keyboard accessibility.

5.1.3 Mobile Menu System

Completely different navigation logic for mobile.

Toggle Logic

mobileMenu.classList.toggle("active", isActive);
document.body.style.overflow = isActive ? "hidden" : "";

What This Does

- Opens sliding mobile menu
- Activates backdrop
- Prevents background scrolling

ARIA Accessibility

mobileToggle.setAttribute("aria-expanded", isActive);

This ensures:

- Screen readers detect open/close state
- Accessibility compliance

Accordion Submenus

parentItem.classList.toggle("expanded", !isExpanded);

Only one submenu remains open at a time.

This improves usability and prevents clutter.

5.1.4 Scroll Reveal Animation

Uses modern **Intersection Observer API**.

Code

```
const revealOnScroll = new IntersectionObserver(
 (entries, observer) => {
   entries.forEach((entry, index) => {
     if (entry.isIntersecting) {
       setTimeout(() => {
         entry.target.classList.add("revealed");
       }, index * 100);
       observer.unobserve(entry.target);
     }
   });
 },
 {
   threshold: 0.15,
 }
);
```

What This Does

- Detects when elements enter viewport
- Adds `.revealed` class
- Applies staggered animation delay

Why It Is Used

- Smooth entrance animations
- No scroll polling
- Highly performant

This is modern frontend engineering.

5.1.5 Lazy Loading Images

```
const lazyImages = document.querySelectorAll("img[data-src]");

img.src = img.dataset.src;
img.removeAttribute("data-src");
```

What This Does

- Loads images only when visible
- Reduces initial page load
- Improves LCP (Largest Contentful Paint)

Performance-focused implementation.

5.1.6 Hero Video Optimization

```
const videoObserver = new IntersectionObserver(
 (entries) => {
   entries.forEach((entry) => {
     if (entry.isIntersecting) {
       heroVideo.play();
     } else {
       heroVideo.pause();
     }
   });
 },
 { threshold: 0.5 }
);
```

What This Does

- Pauses video when not visible
- Saves CPU & battery
- Prevents background playback waste

This shows advanced UX-performance awareness.

5.2 Product Modal System (`product-modal.js`)

This system is fully dynamic and reusable.

5.2.1 Central Data Store

window.GarminProducts = productData;

Why This Matters

- Single source of truth
- Modal and cart both use same data
- No duplication
- Easy product scaling

5.2.2 Event Delegation

Instead of attaching listeners to every card:

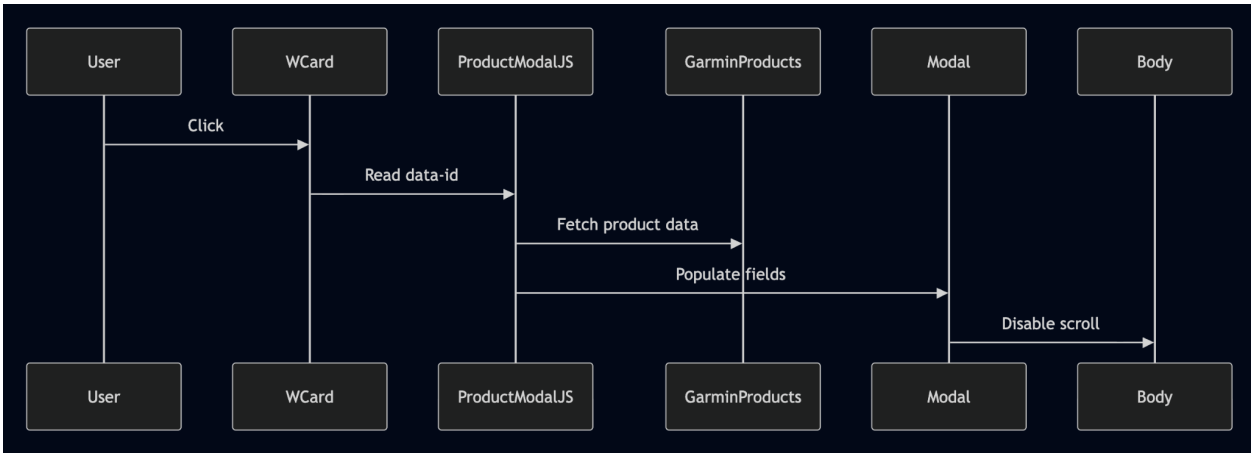
```
document.body.addEventListener("click", (e) => {
 const card = e.target.closest(".w-card");
});
```

Why This Is Better

- Only one listener
- Works for dynamically added cards
- Memory efficient

- Scalable architecture

5.2.3 Modal Lifecycle



Populate Logic

modalTitle.textContent = data.title;
modalPrice.textContent = data.price;

Why This Design Is Good

- Dynamic rendering
- No hardcoded modal HTML
- Easily extensible

5.3 Cart System (`cart.js`)

The cart system uses **localStorage-based persistence**.

5.3.1 Storage Logic

localStorage.setItem("garmin_cart", JSON.stringify(items));

What This Does

- Stores cart data locally
- Persists across page reloads
- Works without backend

5.3.2 Public API Exposure

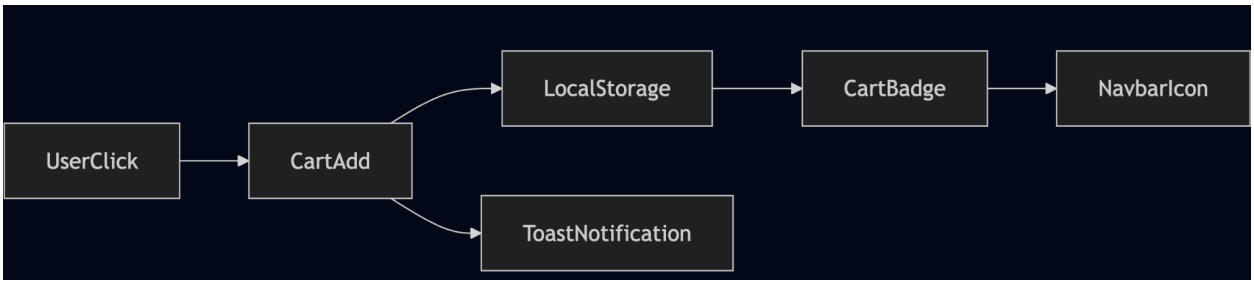
window.GarminCart = Cart;

Available Methods

- `getItems()`
- `getCount()`
- `getTotal()`
- `add()`
- `remove()`
- `updateQty()`
- `updateBadge()`

This is modular API design.

5.3.3 Cart Data Flow



5.3.4 Toast Notification System

Injected dynamically:

toast.classList.add("show");

CSS transition handles animation.

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6. NAVIGATION LOGIC

Navigation works seamlessly due to three advanced systems.

6.1 Shared Component Injection

`shared-components.js` injects:

- Navbar
- Mega menu
- Mobile menu
- Footer

Ensures consistency across all pages.

6.2 Depth Detection System

HTML:

<html data-depth="1">

JS:

const depth = parseInt(document.documentElement.dataset.depth || "0", 10);

Why This Exists

- Calculates relative paths
- Prevents broken links in nested directories
- Makes system scalable

6.3 Dynamic Link Resolver

```
function resolve(href) {
 return base + "/" + clean + ".html";
}
```

What It Does

- Converts root-style paths to relative paths
- Supports nested folders
- Automatically resolves links

This is production-level routing thinking without a framework.

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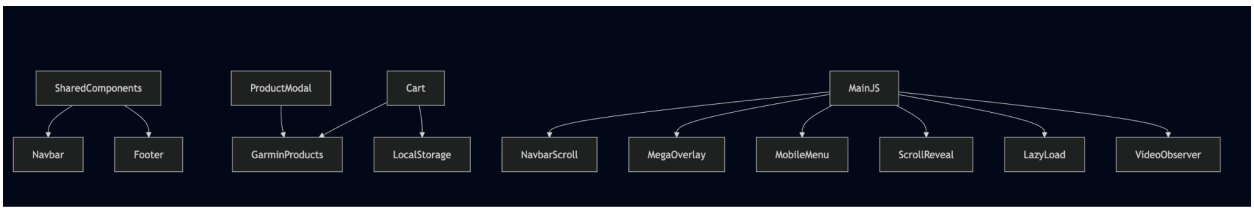
7. MODULARITY ACHIEVED

The project achieves modularity through:

- Component injection
- Centralized product database
- Global cart API
- Reusable CSS class naming
- Event delegation
- Separation of layout and behavior
- Performance-optimized observers
- Accessibility enhancements

System Architecture Overview



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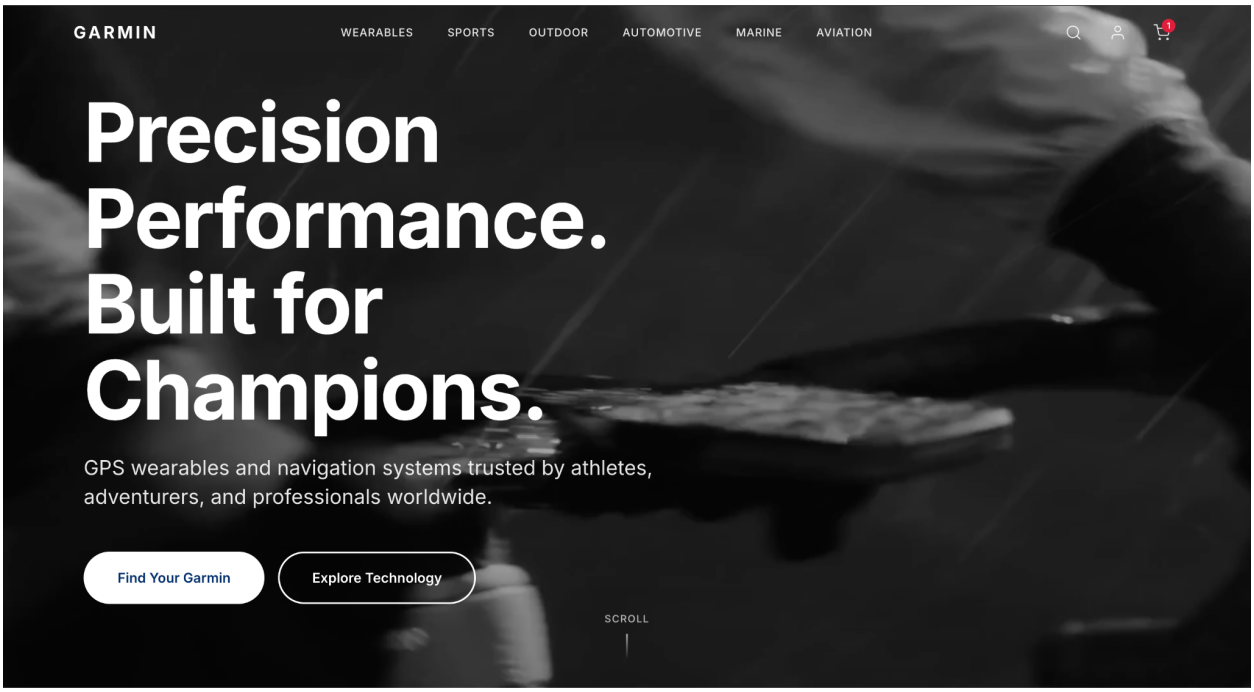
8. SCREENSHOTS

You should include:

- Landing page full view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WEARABLES
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OUTDOOR
AUTOMOTIVE
MARINE
AVIATION
Precision Performance. Built for Champions.
GPS wearables and navigation systems trusted by athletes, adventurers, and professionals worldwide.
Find Your Garmin
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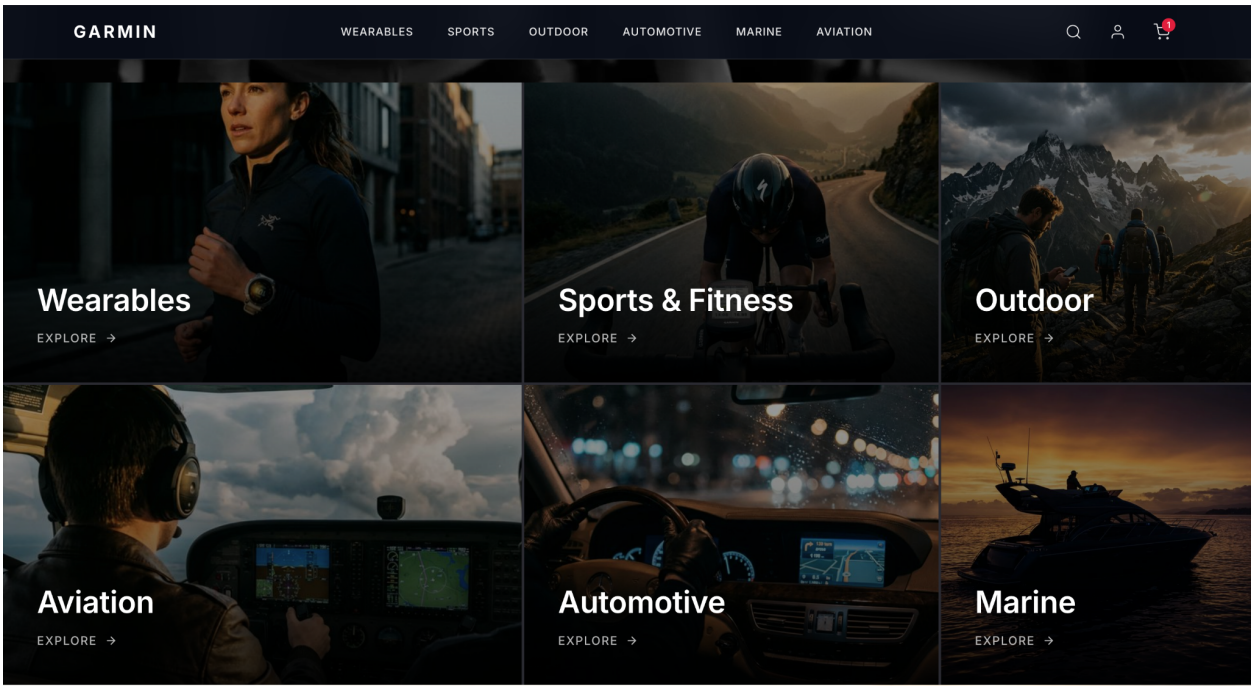
SCROLL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WEARABLES SPORTS OUTDOOR AUTOMOTIVE MARINE AVIATION

01 · FEATURED COLLECTION

Award-Winning Wearables

Discover the power of precision GPS and advanced health monitoring to support your performance journey.

your performance journey.

NEW

Fēnix 8

Ultimate adventure smartwatch with AMOLED display and LED flashlight.

TOP PICK

Forerunner 965

Premium running smartwatch with colorful AMOLED display.

SMART & HEALTH

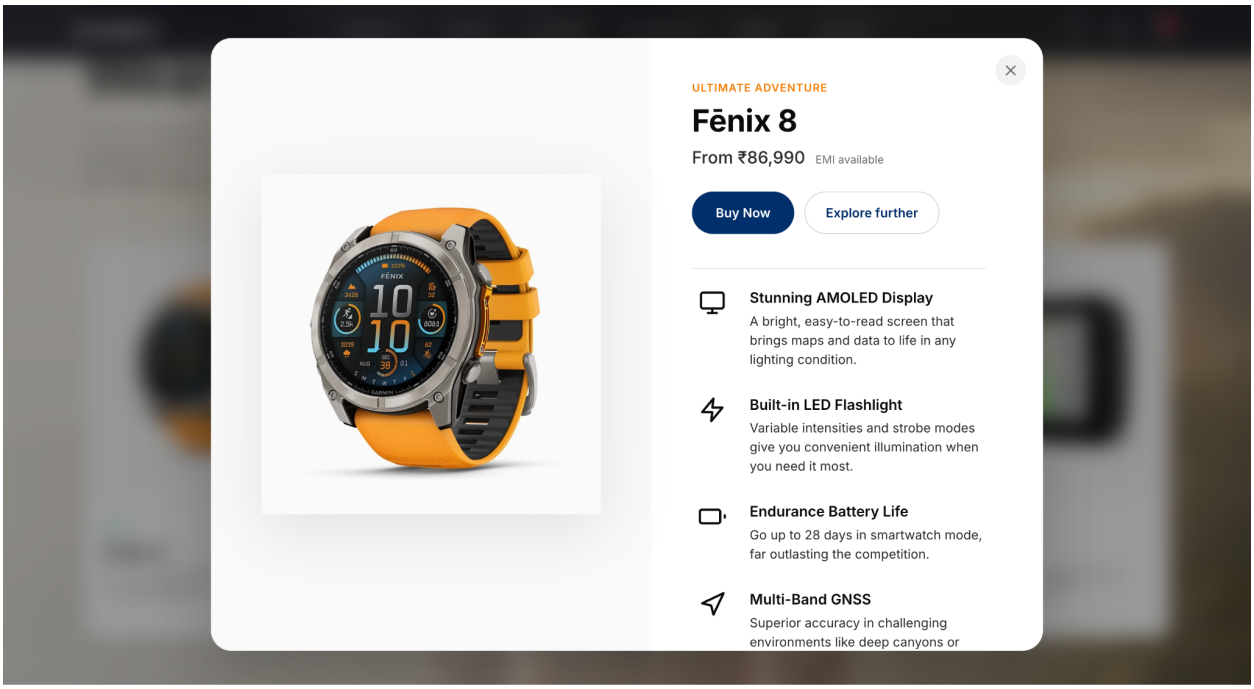
Venu 3

Know the real you with advanced health and fitness features.

CYCLING

Edge 1050

Ultimate cycling computer with the largest Edge display ever.



35+
YEARS OF INNOVATION

#1
GPS ACCURACY

90
DAYS BATTERY LIFE

300M+
DEVICES WORLDWIDE

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WEARABLES SPORTS OUTDOOR AUTOMOTIVE MARINE AVIATION

02 · OFF-ROAD COLLECTION

Conquer Every Trail

Navigate the uncharted with rugged GPS navigators and trackers built for the most demanding off-road adventures.

ALL-TERRAIN

Tread® XL

10" all-terrain navigator built for

ALL-TERRAIN

Tread® 2

8" all-terrain navigator with group

RUGGED

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Rugged GPS navigator with

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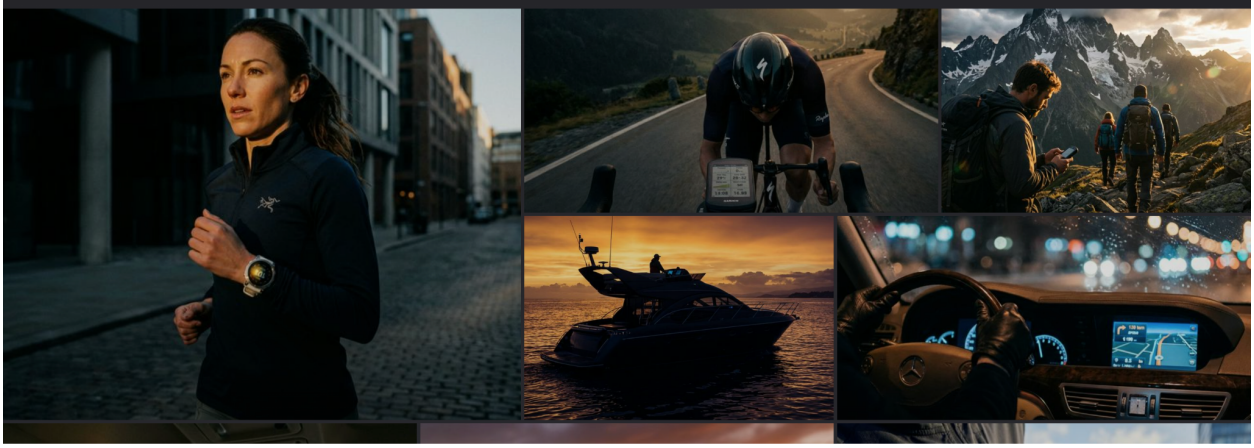
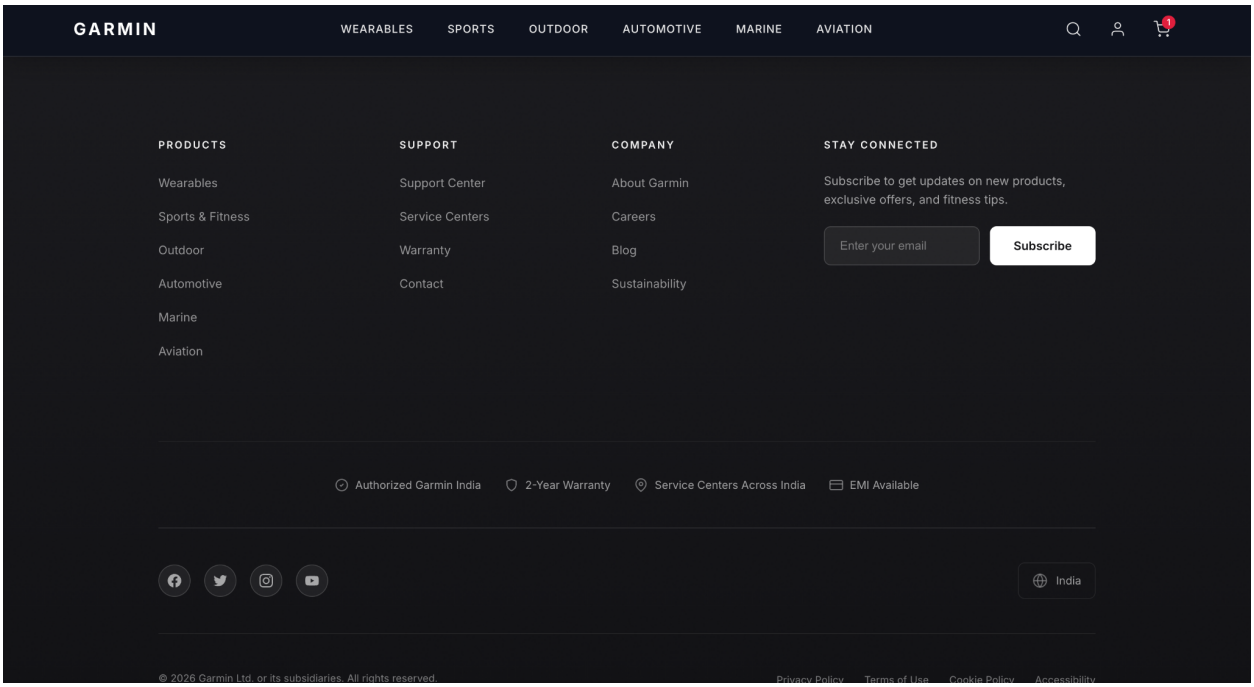
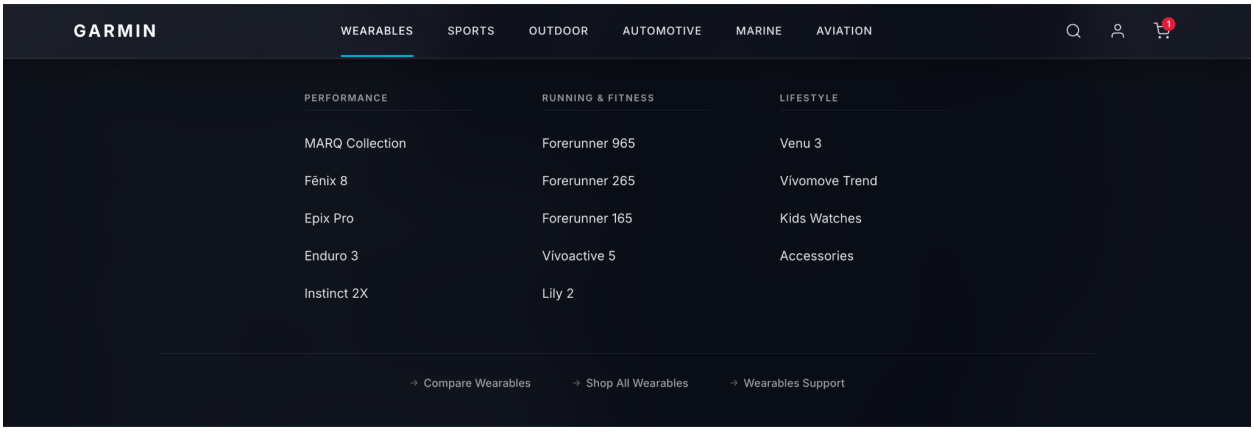
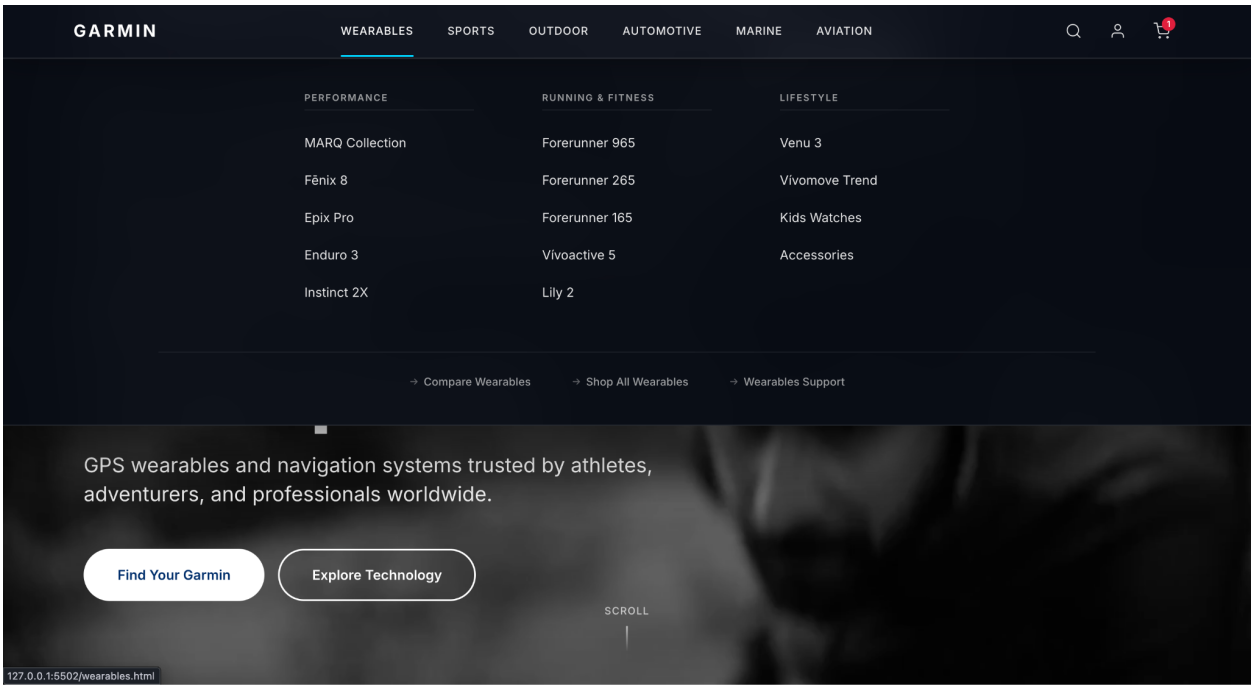


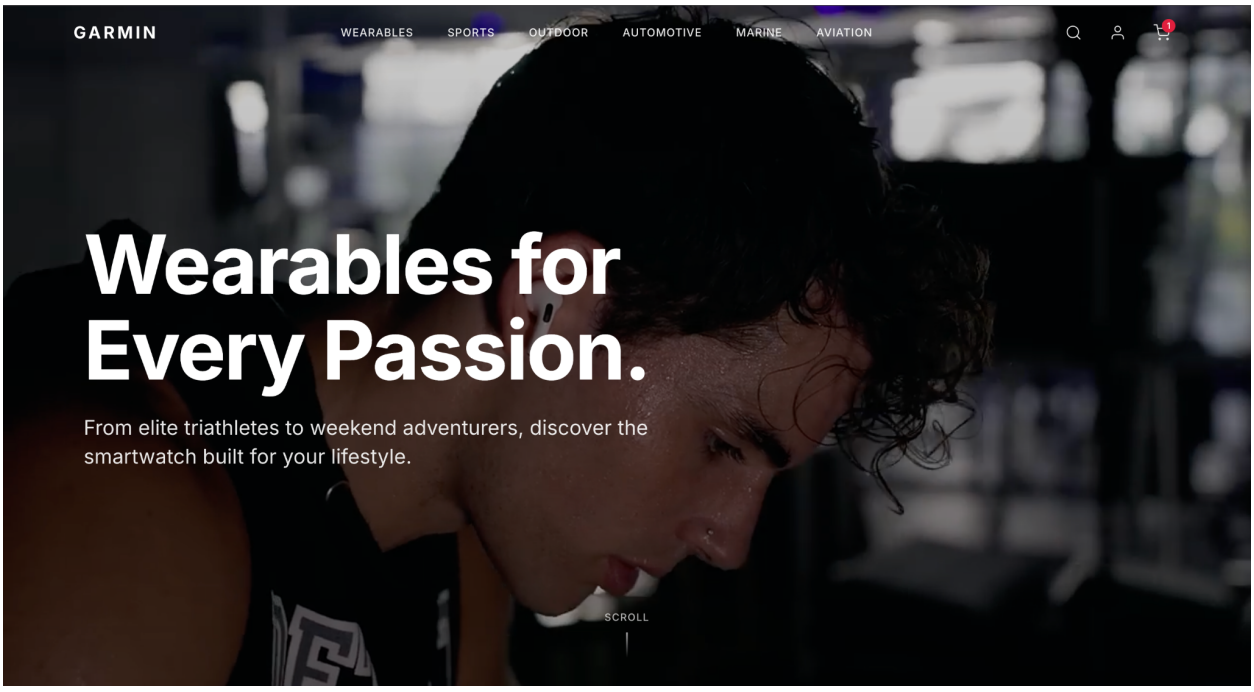


- Mega menu open state





- Wearables section scroll



GARMIN

WEARABLES SPORTS OUTDOOR AUTOMOTIVE MARINE AVIATION

Performance Watches.

Shop all Performance →

NEW

Fēnix 8

Ultimate adventure smartwatch with AMOLED display and LED flashlight.

BEST SELLER

Epix Pro

High-performance GPS watch with stunning AMOLED display.

ULTRA ENDURANCE

Enduro 2

Extreme battery life for the longest races.

RUGGED

Instinct 2X

Built tough with unlimited battery life in smartwatch mode.

GARMIN

WEARABLES SPORTS OUTDOOR AUTOMOTIVE MARINE AVIATION

Running & Fitness.

Shop all Running →

TOP PICK

Forerunner 965

Premium running smartwatch with colorful AMOLED display.

ADVANCED

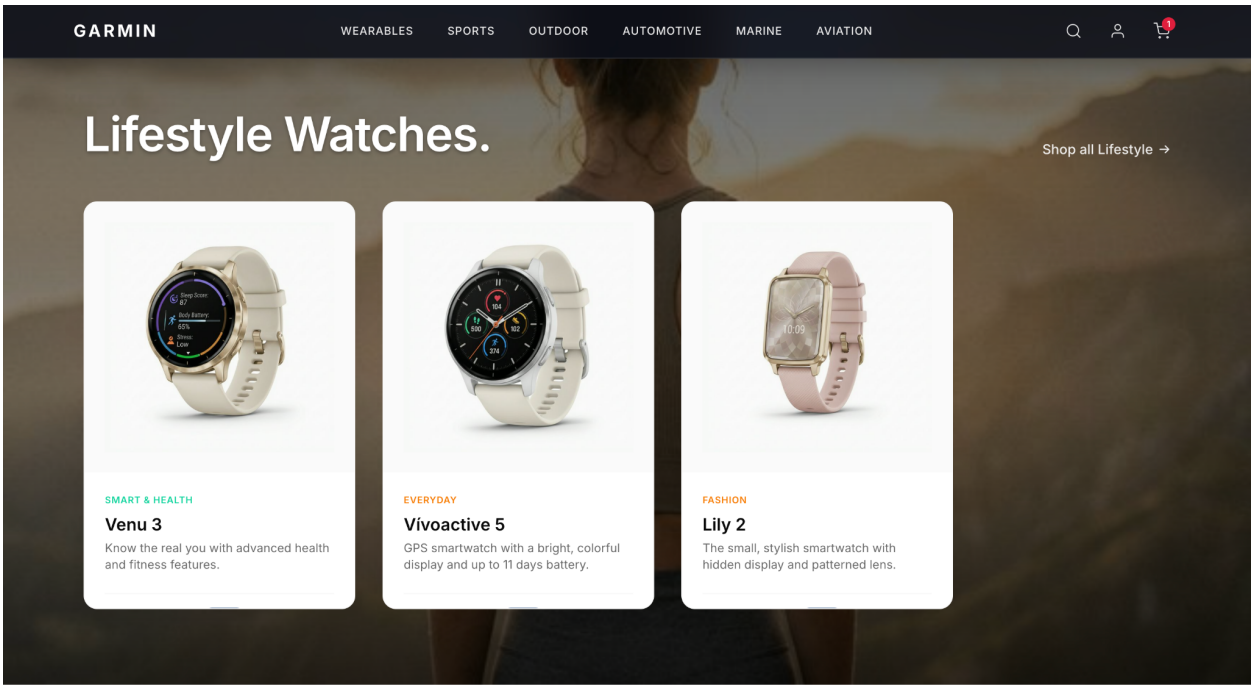
Forerunner 265

Train brilliantly with an AMOLED display and training metrics.

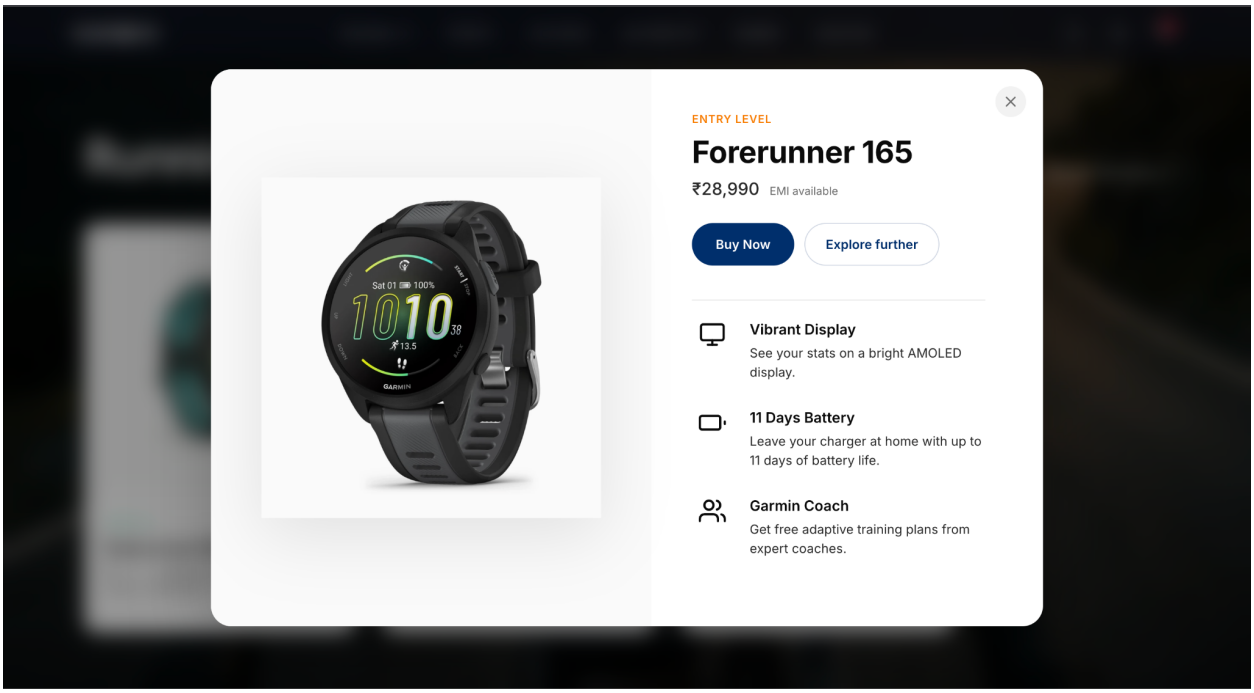
ENTRY LEVEL

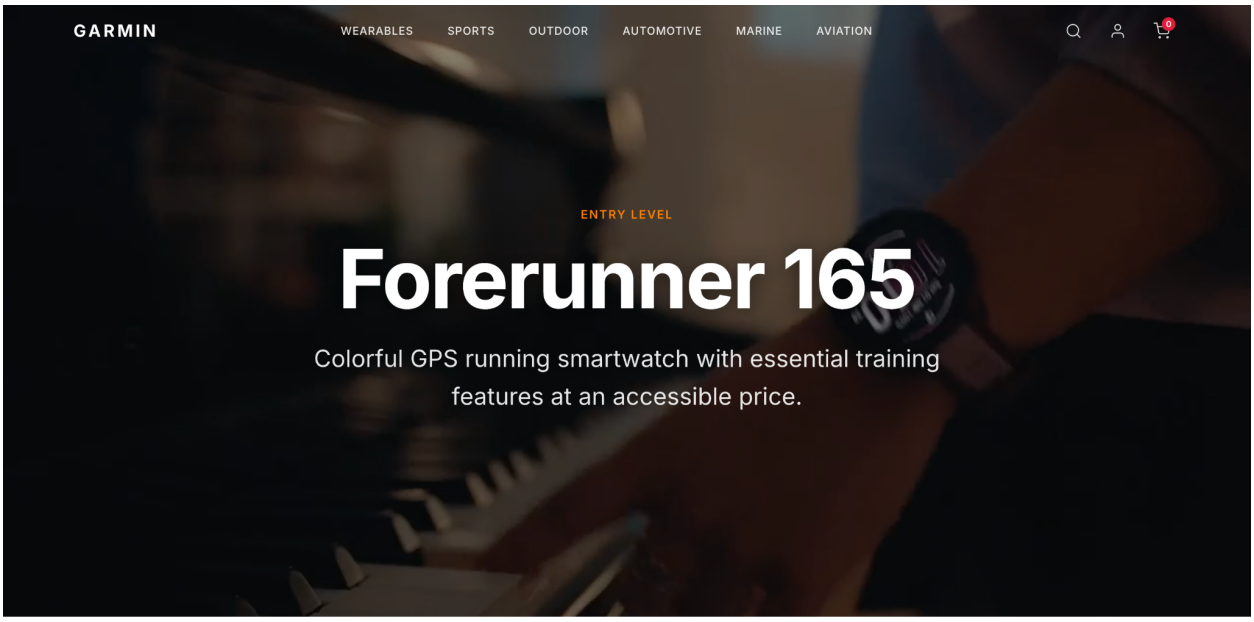
Forerunner 165

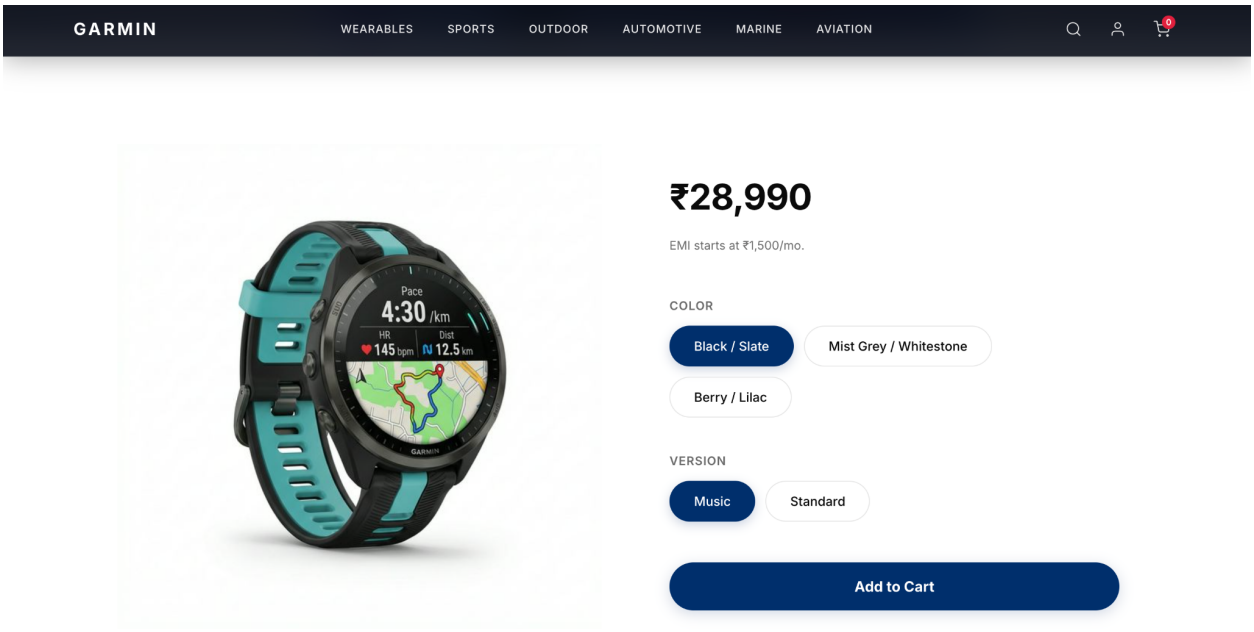
Purpose-built GPS running smartwatch with essential features.



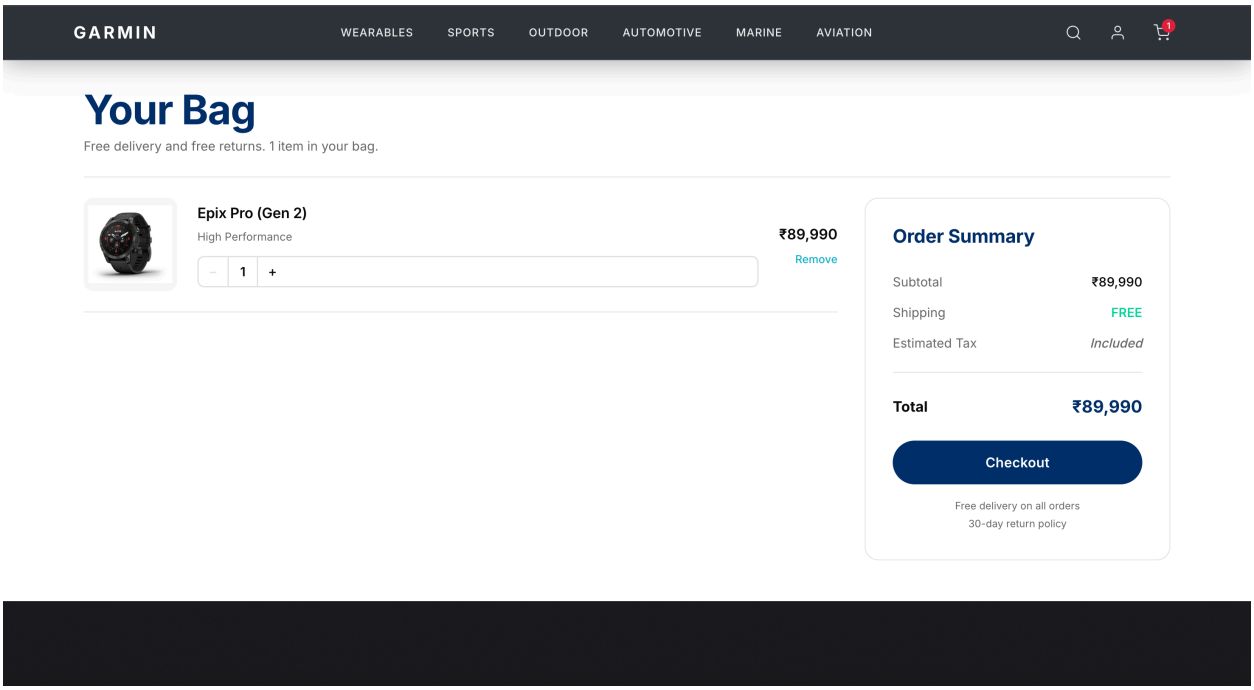
- Product modal open







- Cart toast notification



9. FUTURE SCOPE

- Backend integration (Node.js + MongoDB)
- Payment gateway integration
- User authentication
- Server-side rendering
- Product filtering & sorting
- PWA implementation
- Accessibility audit compliance

10. DECLARATION

I hereby declare that this project entitled
"Garmin India – Modular E-Commerce Website"
is my original work carried out by me. The architecture, styling, and logic have been designed and implemented independently as part of academic practical work.

Name of Student: Aaryan kuchekar
Roll Number: 048
Date: **17/02/2026**