Who?Cares

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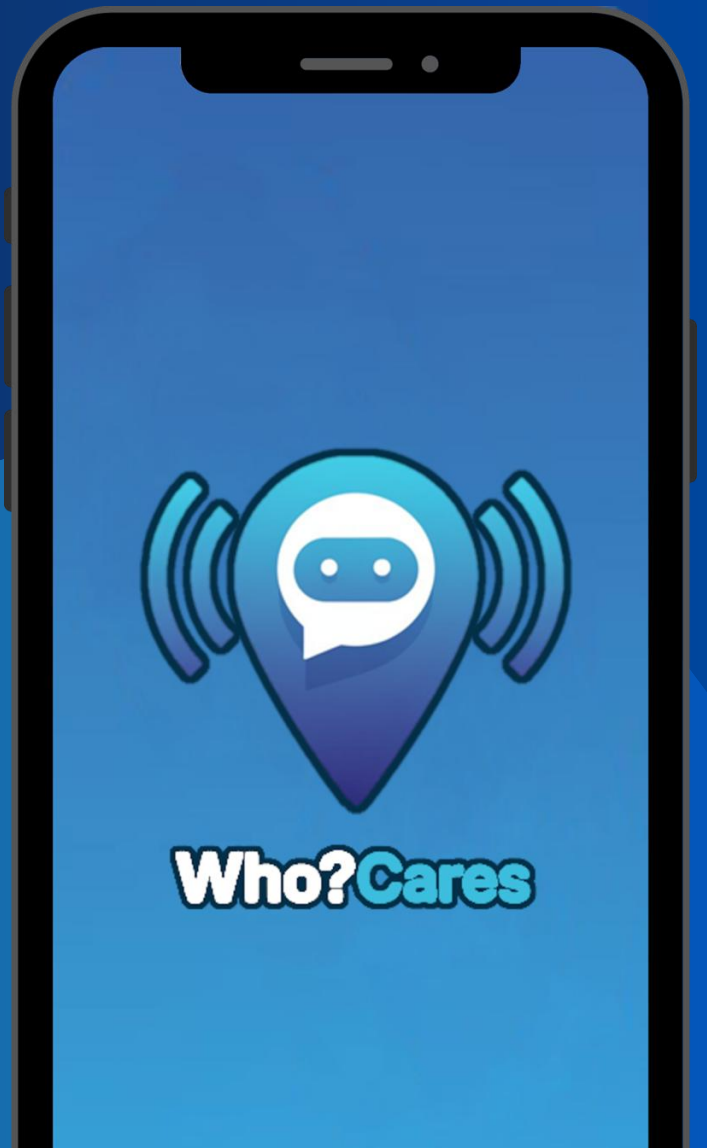

ElectroCap Pitch Deck

Who?Cares

You Do. We Help.
Keeping Loved Ones Safe, Wherever They Are.

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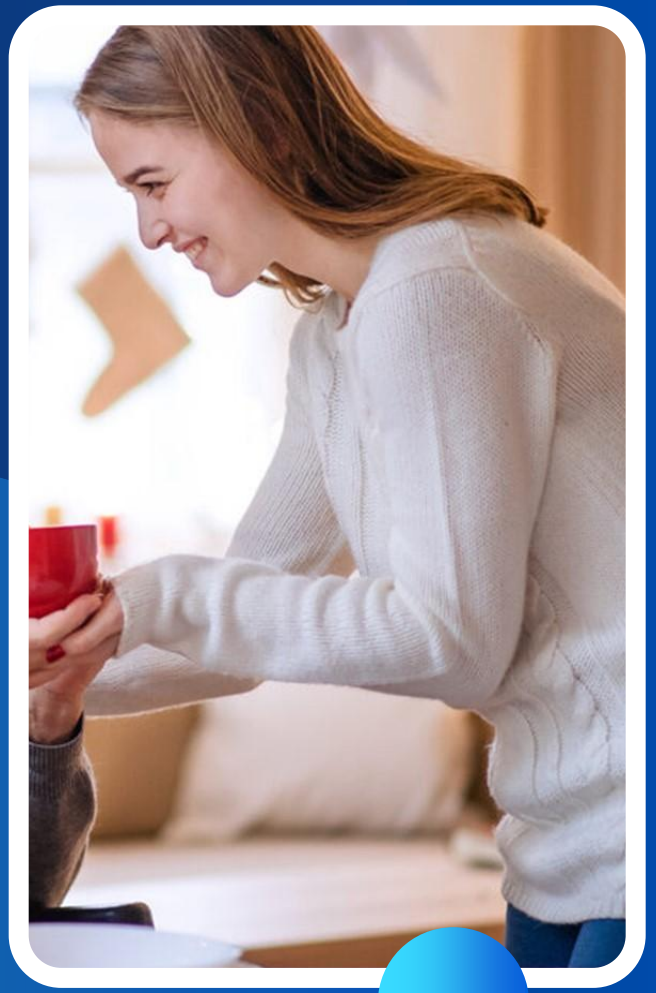

The Problem

As life expectancy rises, so does the number of elderly individuals living alone and requiring daily care – many with conditions like dementia or mobility issues that make them vulnerable to accidents.

Informal caregivers, often untrained family members, struggle with constant worry, a lack of real-time information about their loved ones' well-being and no way to detect potential emergencies quickly and efficiently.

This emotional and logistical burden can lead to stress, exhaustion and difficulty ensuring timely care.

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Our Solution

Our solution aims to provide caregivers with non-intrusive real-time monitoring and intelligent support to ensure the safety of those under their care.

- A wearable device with fall detection communicates via Bluetooth beacons for indoor tracking, while in-home sensors, including presence and door sensors, detect unusual inactivity or wandering behavior.
- Meanwhile, a Raspberry Pi-based hub gathers and processes this combined data, triggering alerts only in critical situations to minimize false alarms and ensure timely intervention.

By offering proactive alerts and real-time assistance, our solution reduces caregiver stress and enhances overall care quality.

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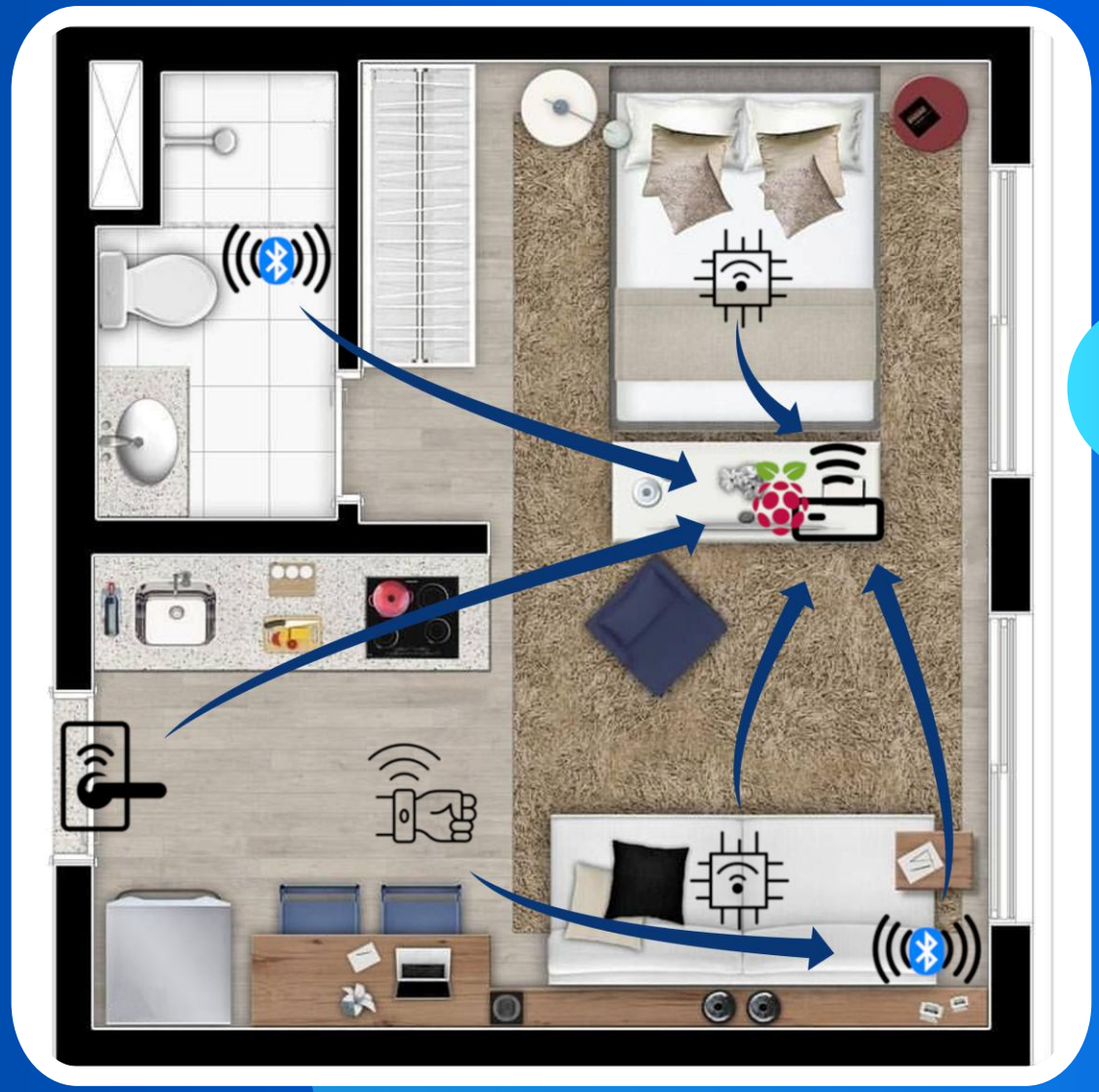
System Architecture

- Wearable Device
  (fall detection + localization)
- BLE Beacons
  (reference points indoor location)
- Raspberry Pi hub
  (local data processor)
- Magnetic Door Sensor
  (entry/exit detection)
- Presence Sensors
  (bed/sofa activity)



Solution Design

Presence Sensors

Presence modules sit under furniture (bed or sofa) and use an onboard accelerometer to detect when someone settles in or stands up by sensing characteristic movement spikes. The microcontroller timestamps each occupancy change and immediately broadcasts it via Bluetooth.

Magnetic Door Sensor

A simple reed switch mounted on the door frame senses open/close transitions. The microcontroller debounces the signal and sends each event via Bluetooth instantly.

Solution Design

Wearable Device

The lightweight wrist wearable continuously reads its accelerometer data to detect normal movement, prolonged stillness and fall patterns (sudden impact + no motion). On detecting a fall or extended inactivity, it broadcasts a Bluetooth message containing its unique ID and event type.

Bluetooth Beacons

Fixed beacons in each room listen for sensor broadcasts, infer the wearer's location by comparing RSSI signal strength, then forward the event tagged with sensor ID via Wi-Fi/MQTT to the Raspberry Pi hub. This lets the system know exactly "what happened, when and where" inside the home.

Solution Design

Raspberry Pi hub

A Raspberry Pi running Home Assistant subscribes to sensor MQTT streams and applies a three-tier alert model - Critical (e.g., fall with no movement), Warning (e.g., exit without return), and Notice (e.g., no bed presence overnight). Only events meeting those thresholds trigger contextual push notifications (time, event type, room) to the caregiver's phone. A dashboard logs occupancy, past events and alerts - available on demand for deeper insight.

Solution Objectives

Context-Aware Alerts

Combines presence, door and motion data to detect deviations in daily routines (falls, exits, prolonged inactivity...)

Privacy-First Design

No cameras - Bluetooth localization and local processing keep data in the home and preserve privacy

Edge Processing

All logic runs on the Raspberry Pi hub for no cloud dependency, lower latency and automated responses, so no constant vigilance is required

Caregiver Confidence

Tiered alerts (Critical, Warning and Notice) that aim to minimize false alarms and focus attention on truly urgent situations

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Primary Beneficiaries: Informal Caregivers

Who Are They?

Informal Caregivers and Family members responsible for ensuring the safety and well-being of elderly individuals, particularly those living alone or with memory-related conditions

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Informal Caregivers

Their Challenges:

- Due to work and daily responsibilities, they can't be physically present at all times, making continuous monitoring difficult
- Worry and uncertainty about their loved one's well-being, especially in situations like nighttime disorientation, falls or prolonged inactivity
- Limited means to detect and respond to potential emergencies quickly and effectively, leading to stress and delayed interventions

How Our Technological Solution Helps:

Remote Monitoring & Smart Alerts
Caregivers receive automatic notifications when the system detects unusual behavior – allowing early intervention before a situation escalates

Peace of Mind Through Insight
By combining wearable data and environmental sensors, our system provides a clear picture of daily routines and anomalies, helping caregivers stay informed and act with confidence

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Secondary Beneficiaries: Elderly Individuals

Who Are They?

Seniors and individuals with memory-related conditions like dementia who maintain some independence but are vulnerable to falls and unnoticed emergencies – especially when living alone

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Elderly Individuals

Their Challenges:

Memory loss and disorientation may lead them to wander inside or even leave home unnoticed, leading to dangerous situations

Traditional emergency alert systems can be ineffective or intrusive and false alarms often lead to unnecessary interventions

Many face reduced independence, relying heavily on caregivers for constant supervision, which may feel restrictive.

How Our Technological Solution Helps:

Subtle In-Home Monitoring

Our wearable and discreet environmental sensors work together to track movement patterns and detect abnormal situations without compromising freedom

Caregiver Protection Without Over-Intrusion

The system allows caregivers to oversee their loved ones' safety remotely, offering a sense of security while allowing the elderly to retain autonomy in their familiar environment

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Competitors

	STRENGTHS	WEAKNESSES
Smartwatches with Health Tracking (Apple Watch, Samsung Galaxy Watch…)	✅ Offer GPS tracking, fall detection and health monitoring	❌ Designed for general users, not caregiver-focused ❌ Complex interfaces may be difficult for elderly users
Emergency Alert Wearables (Bay Alarm Smartwatch & Relógio Cruz Vermelha)	✅ Provide SOS buttons and GPS tracking	❌ Reactive rather than proactive – alerts only trigger when pressed ❌ High rate of false alarms due to misleading button presses
Dementia & Wandering Trackers (Theora Care, AngelSense, AirTags…)	✅ Offer GPS tracking with geofencing alerts	❌ Limited indoor tracking – caregivers may lose visibility inside homes ❌ No AI-driven assistance to clarify caregivers' questions

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	STRENGTHS	WEAKNESSES
Home Monitoring Systems (Vivint & ADT Pulse)	✅ 24/7 professional security and emergency monitoring	❌ Not elderly-focused – lacks automated fall or inactivity alerts tailored to seniors ❌ No wearable integration – cannot track inside home without intrusive cameras
Home Surveillance (Blink & Arlo Security)	✅ Allow caregivers to check on loved ones remotely	❌ Privacy concerns – many elderly individuals dislike constant surveillance ❌ No real-time alerts – caregivers must monitor footage constantly
PSP Identification Bracelet (Estou Aqui – Adultos)	✅ Help authorities identify lost individuals	❌ Passive solution – relies on bystanders to take action ❌ No real-time tracking or caregiver alerts when a person wanders off
Basic Fall-Detection Devices (Detetor Quedas da Teleassistência)	✅ Detect falls and send emergency alerts	❌ Prone to high false-alarm rates from minor movements ❌ No in-home sensor integration for context-based alerts
Manual Caregiving Methods (phone call check-ins)	✅ Simple and familiar for many caregivers	❌ Inefficient – requires constant caregiver intervention ❌ No automation, real-time monitoring or intelligent support

Our Team

Software Developer

Gonçalo Barbosa

- Website design & development
- Monitoring dashboard development
- Raspberry Pi programming & Alert System logic
- Final poster design & Project Proposal

Connectivity Specialist

Hugo Soares

- Magnetic door sensor implementation
- Data transmission & synchronization
- System connectivity (Wearable->Sensors->Hub)
- Blog updates & Project documentation

Prototype Developer

João Azevedo

- Wearable product design
- System design & feasibility analysis
- Component Research and Selection
- Final video

Our Team

Hardware Developer

Rodrigo Gonçalves

- Presence sensor development
- Wearable movement development
- Stakeholder engagement & internal communication
- Pitch Deck presentation

Communication Leader

Vasco Monteiro

- Wearable proximity development
- Testing & troubleshooting
- Fall detection sensor integration
- Mid-Program presentation

Firmware Developer

Henrique Oliveira

- Bluetooth sensor integration (beacons)
- Battery performance optimization
- User & Caregiver testing & feedback collection
- Demo day stand

Our Mentors & Partners

Scientific Advisor

Luís Caldas de Oliveira

Scientific Co-Advisor

Tiago Lourinho

Contributors to Our Mission

- Bombeiros Sapadores de Lisboa
- Centro de Dia do Charquinho (Benfica)
- Centro de Dia Espaço São Domingos
- Triplo Cuidado
- Associação Alzheimer Portugal
- Associação Cuidadores Informais

Project Results

1 Validated Real Needs

At project kick-off, all team members conducted 10+ interviews with caregivers and elderly-care professionals, while Gonçalo simultaneously launched our public website and Hugo started our weekly blog updates. These early tasks grounded our pivot from an automated pillbox to an in-home monitoring safety monitoring solution that truly addresses caregiver worry and elder independence.

2 Refined the System Scope

Guided by those interviews, we decided to redefine the solution - focusing on Bluetooth beacons, presence and door sensors and a wearable. Feedback on privacy, complexity and real-world usability drove us to discard GPS and chatbots in favor of a lightweight, implementable architecture centered on fall detection and movement alerts.

3 Prototype & Integration

Each member delivered a key module - João 3D-modeled the wearable; Vasco (with Rodrigo) implemented its fall/motion logic and Rodrigo also built the presence pad; Henrique (with Hugo) set up the BLE beacon network and Hugo added the door node; Gonçalo integrated everything on a Home Assistant Raspberry Pi hub with alert logic and dashboard. We confirmed seamless data flow (BLE → MQTT/Wi-Fi → Pi) and demonstrated a fully functional end-to-end prototype.

4 Tests & Optimization

Each member tested and tuned their own component - presence pad, door nodes, wearables, beacons, and hub - collaborating on end-to-end trials. Together, we measured detection accuracy, reduced false triggers and refined thresholds to ensure our three-tier alert model meets real-world needs.

5 Final Communication & Demo Preparation

In the final stretch, Gonçalo Barbosa designed the poster, João Azevedo produced the demo video, Rodrigo Gonçalves crafted the final presentation, and Henrique organized our DemoDay stand. These assets narrated WhoCares' journey - from early insights to a fully working prototype.

Project Results

Sensor Accuracy

Presence Sensor
Detected 8/10 sit-stand events in real tests

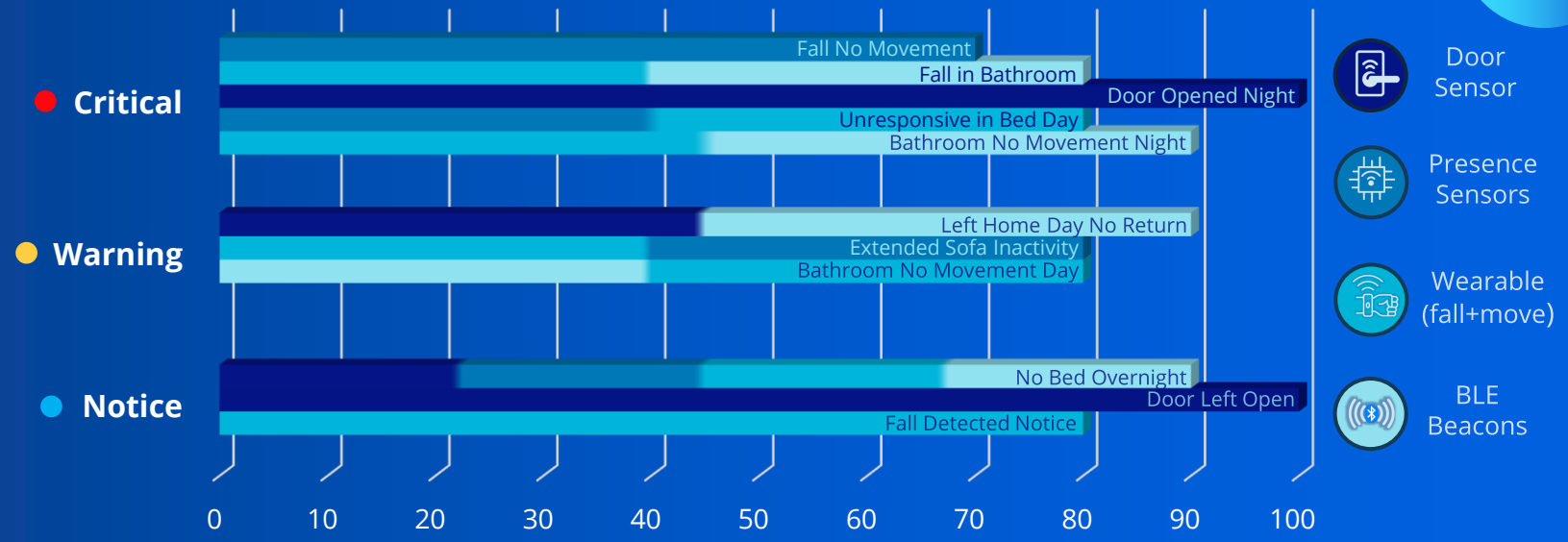
Door Sensor
Registered 10/10 open/close cycles reliably

Fall Detection
Caught 8/10 simulated fall events

Movement
Detected 9/10 still-moving events in real tests

Takeaway: Our sensors reliably capture key daily actions - laying the groundwork for meaningful alerts

Alert Effectiveness



Takeaway: Our three-tier alert system pinpoints true emergencies while filtering out everyday activity.

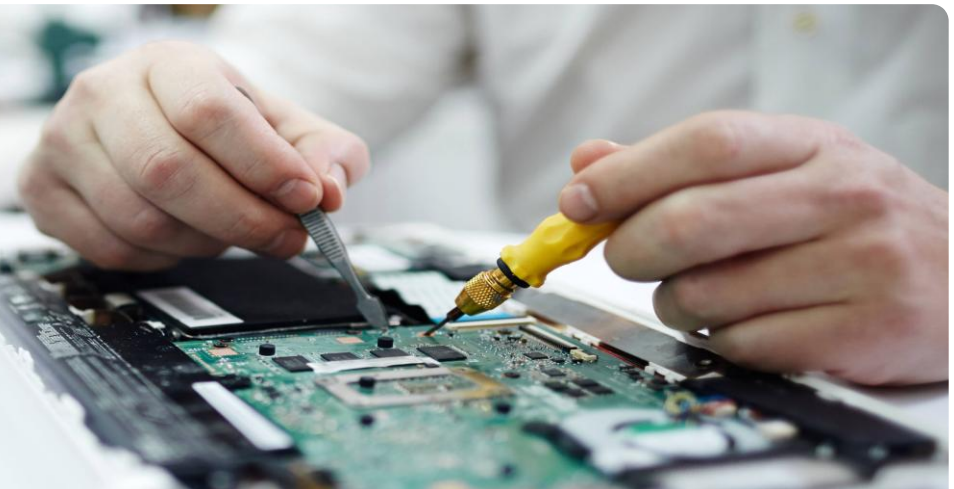
Final Notes

BLE Localization Simulated: Real-world RSSI variability prevented live testing; room-level location was emulated in trials.

User Perception Feedback: Though no field deployment was possible, caregivers and seniors praised the wearable's comfort, the clarity of alerts, and the intuitive dashboard during demos.

Despite this, our end-to-end tests validate that WhoCares functions as expected, proving its potential value in real-world deployments.

Costs & Benefits



Estimated Costs

- **Proof of Concept Prototype:** ~200€ total for wearable, sensors, beacons,Raspberry Pi and related peripherals.
- **R&D & Maintenance:** Several person-months of development, plus minor setup and occasional battery changes or firmware updates.
- **Scalable Add-Ons:** Additional modules (presence pads, beacons) available at incremental per-unit cost to cover larger homes or budgets.

Key Benefits

- **Early Incident Detection:** Automated alerts reduce response times and lower risk of complications.
- **Peace of Mind:** Caregivers receive timely notifications only when necessary, eliminating the need for constant manual monitoring.
- **Independent Living:** Non-intrusive, camera-free monitoring preserves seniors' autonomy and dignity.
- **Affordable & Adaptable:** A low-cost, off-the-shelf solution that scales with user needs - ideal for families or home-care agencies.

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Future Enhancements

Conversational AI Integration

Integrating with virtual assistants (like Alexa or a custom elderly-friendly chatbot) could add companionship to safety. Beyond alerts, the system could engage seniors in friendly chats, guide them through daily routines, check on emotional well-being and help fight loneliness - bridging care and connection in one interface.

Predictive Analytics & Personalized Routines

On-device machine learning could learn each senior's daily habits - like typical meal times or bathroom duration - and adapt alerts when something unusual occurs. This improves proactive notifications and reduces false alarms, offering earlier and smarter caregiver support.

Expanded Sensor Integration & Outdoor Coverage

Future versions could include GPS tracking for outdoor safety (e.g., wandering prevention), heart-rate sensors in the wearable for more health context and smart-home add-ons like water-flow, smart pill box or appliance sensors. Together, these modules deepen awareness without sacrificing privacy, enhancing responsiveness in a broader range of daily scenarios.

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That's all Folks!

Innovation with Care – for Those Who Care!

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- https://web.tecnico.ulisboa.pt/ist1103178/
- https://www.youtube.com/@WhoCares-PIC
- whocares.pic@gmail.com