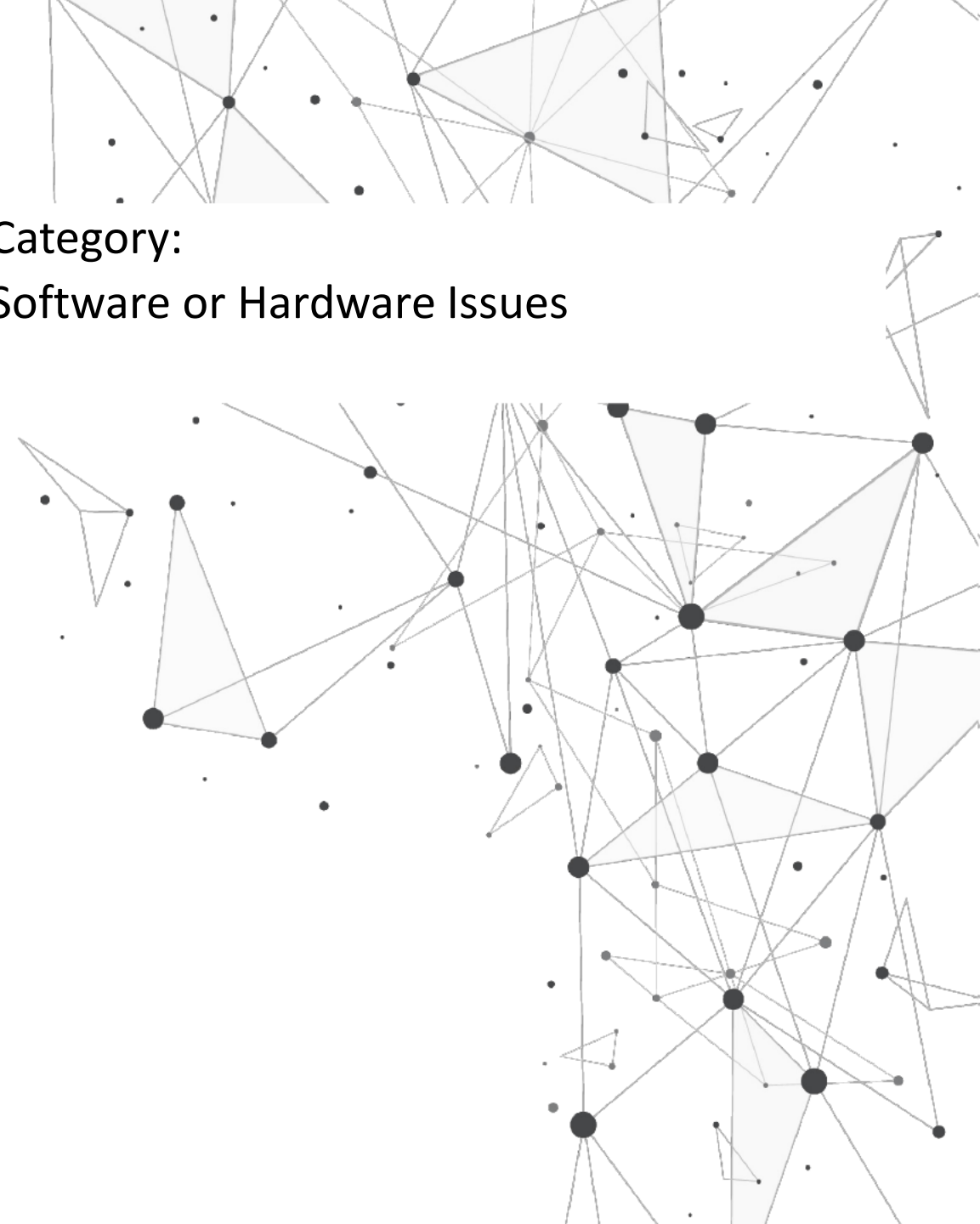


Seeing Clearly Through AR – A Comparative Study of Visual Acuity, Contrast Sensitivity, and Legibility Across Enterprise Headsets

Category:
Software or Hardware Issues



Problems this Research Would Address?

1. Enterprise workers wearing AR headsets must still see the real world clearly - reading labels, identifying small components, detecting visual details - yet no neutral published comparison exists of how well current headsets preserve basic visual acuity.
2. A finding from the AREA Research Committee confirmed that users wearing Meta Quest 3 in video passthrough mode cannot reliably read a piece of paper held in their hands - a clear obstacle to successfully meeting one of the basic industrial use case requirements
3. Enterprise buyers have no objective visual performance metrics or specifications to compare headsets, so device selection is made on marketing specs rather than validated real-world capability.
 - a) Workers who cannot see clearly through a headset will **remove it**, defeating the AR deployment entirely
 - b) **Optical see-through and video passthrough devices** present fundamentally different visual profiles — not documented in comparable, task-relevant terms
 - c) Device manufacturers lack neutral benchmark data to drive display and optics improvements for enterprise use

How would this research be conducted (1 of 2)?

1. **Develop a validated headset visual test protocol** - adapt established optometric methods (LogMAR visual acuity, Pelli-Robson contrast sensitivity, standard legibility tests) for the AR headset context, reviewed and approved by the Research Committee.
2. **Select a representative headset test set** - identify at least 5 enterprise AR headsets: minimum 2 optical see-through (e.g., HoloLens 2, Magic Leap) and minimum 2 video passthrough (e.g., Meta Quest 3, Apple Vision Pro).
3. **Recruit test participants** - assemble a minimum of 20 participants per device with normal or corrected-to-normal vision, drawn from enterprise practitioner populations to reflect real-world user demographics.
4. **Execute the test protocol across all selected devices** - run the full validated battery under standardised lighting and distance conditions, collecting visual acuity, contrast sensitivity, and legibility scores per device.

How would this research be conducted (2 of 2)?

5. **Analyse test results across devices and participant groups** - apply statistical methods to produce per-device scores with confidence intervals, identifying which devices meet defined minimum thresholds for industrial task performance.
6. **Map performance to industrial task scenarios** - cross-reference scores against at least 5 defined industrial tasks (e.g., reading a label at arm's length, identifying a component marking, reading a printed instruction sheet) to translate metrics into task-relevant conclusions.
7. **Compare optical see-through vs. video passthrough categories** - produce a category-level analysis identifying systematic visual performance differences between device types, with implications for use case suitability.
8. **Validate findings and publish** - present draft findings to the AREA Research Committee and a panel of optometry and human factors experts before final publication, ensuring the report is scientifically defensible and immediately usable by enterprise buyers.

Project Deliverables



1. **Validated AR headset visual performance test protocol** - a reproducible methodology based on established optometric standards, reusable by AREA members and device manufacturers as new headsets enter the market
2. **Comparative visual performance matrix** - structured comparison of visual acuity, contrast sensitivity, and text legibility scores across all tested headsets, linked to at least 5 representative industrial task scenarios
3. **Enterprise Buyer's Guide to AR Headset Visual Performance** - practical, non-technical guidance for enterprise decision-makers on which headsets preserve adequate visual function for specific task categories
4. **Manufacturer recommendations report** - a formal document identifying the display and optics improvements most needed to meet enterprise visual performance requirements.
5. **Executive summary of findings for public release and member exclusive webinar**

Benefits to AREA Members



- **Make evidence-based device decisions.** For the first time, buyers can compare headsets on validated visual performance data rather than manufacturer specifications or anecdotal reports.
- **Protect workforce performance and safety.** Members can identify which devices preserve adequate visual function for their specific tasks — reading labels, identifying components, detecting hazards — before committing to a deployment.
- **Apply a reusable evaluation standard.** The validated test protocol gives members a repeatable method to assess every new headset that enters the market, without commissioning new research each time.
- **Strengthen internal procurement decisions.** The Buyer's Guide and comparative matrix give AR champions credible, neutral evidence to present to procurement, IT, and health-and-safety teams.
- **Influence manufacturer roadmaps.** Member participation in this research gives the enterprise community a direct channel to communicate visual performance requirements to device manufacturers.
- **Understand the optical see-through vs. video passthrough trade-off.** Members gain a clear, task-relevant comparison of two fundamentally different device categories — critical as video passthrough headsets enter enterprise deployments at scale.

Summary & Next Steps for AREA Members



- The **first neutral, published benchmark** of visual acuity, contrast sensitivity, and legibility across enterprise AR headsets — replacing *marketing specs with validated evidence*.
- A **reusable test protocol and comparative matrix** AREA members can apply to *every new headset* entering the market.
- A **Buyer's Guide and manufacturer recommendations report** giving members *task-relevant guidance* for procurement and product roadmaps.

Next steps:

- **Month 1** — protocol reviewed and approved by the AREA Research Committee.
- **Month 3** — data collection complete across all selected devices.
- **Publication** — findings reviewed by optometry / human-factors experts, then released to AREA members.