Human-Centered AI Interfaces in Logistics: A Scoping Review & Research Agenda

Evangelia Fotidou, PhD Candidate
Christos Katsanos, Associate Professor
Department of Informatics, Aristotle University of Thessaloniki, Thessaloniki, Greece
Contact: efotidou@csd.auth.gr | 2nd ACM SIGCHI CHIGreece-Cyprus Chapters Symposium 2026

Introduction

- **Context:** AI in logistics and Supply Chain Management (SCM) is rapidly shifting from back-end automation to interactive Decision Support Systems (DSS) embedded in operational interfaces.
- **The Problem:** Opaque AI predictions create a "black box" effect, leading to either undertrust (rejection) or overtrust (automation bias) and high cognitive workload.
- **Research goal**: How can human-centered AI (HCAI) design principles balance human control, explainability (XAI), and usability in mission-critical logistics environments?

Methodology (1/2) → Protocol & PCC Framework

- **Review Protocol:** Conducted following the standard 5-stage scoping review framework and official PRISMA-ScR guidelines.
- **PCC Operational Definition:**
  - **Population**: Logistics planners, inventory managers, warehouse operators
  - **Concept**: HCAI interfaces, UX/usability, cognitive load, XAI, human autonomy
  - **Context**: Operational logistics systems (WMS, ERP, DSS platforms)

Methodology (2/2) → Systematic Corpus Search

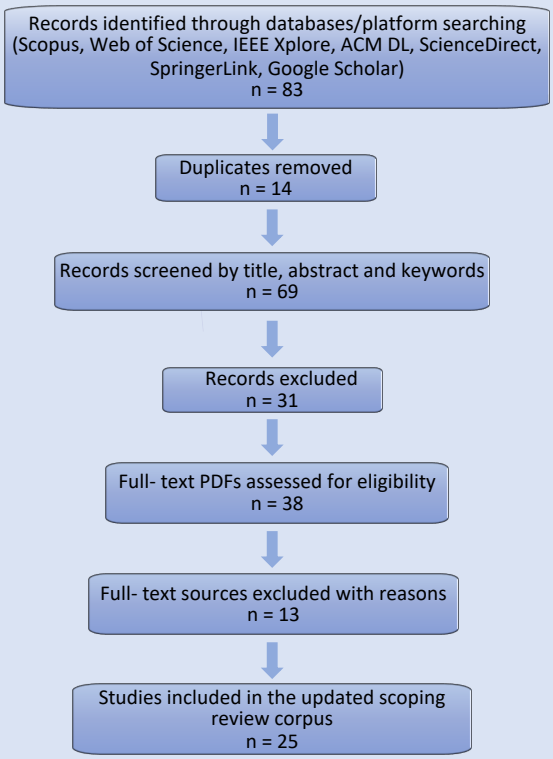
- Queried across **Scopus, Web of Science, IEEE Xplore, ACM DL, ScienceDirect, and Google Scholar**
- Search string combining: AI / GenAI / XAI **AND** User Interface / HCI / Cognitive Load / UX **AND** Logistics / Inventory / SCM
- **Selection Process:**
  - 83 initial records identified → **69 screened after deduplication**
  - 38 assessed for full-text eligibility → **25 core studies included**

Results

Thematic Synthesis (5 Core Pillars):

1. Human-AI Interaction & Guidelines (Microsoft HAX, HCAI)
2. Algorithmic Management & Worker Autonomy
3. Operational Logistics & SCM System Integration
4. Explainable AI (XAI) as an Interface Experience
5. Emerging Generative & Agentic AI Systems

PRISMA-ScR Flowchart & Key Findings



- *XAI as UX:* Explainability must be an interactive interface feature, not just a static model metric.
- *Socio-Technical Decisions:* Warehouse operators need to contextualize AI suggestions against physical constraints missing from algorithms.
- *Agentic AI Oversight:* Multi-agent LLM systems require strict Transparency, Controllability, and Accountability (TCA).

Research Gaps & Doctoral Agenda

Research Gap	Link to doctoral research
Gap 1: Limited empirical evaluation of AI interface features in real inventory management environments	Can be addressed through user testing with logistics professionals and inventory managers
Gap 2: Lack of empirical investigation into operator cognitive workload and usability in AI-assisted logistics workflows	Empirical evaluation of mental workload, usability, and task performance during inventory decision tasks
Gap 3: Explainability is often treated as model property rather than interface experience	Design and test interface-level explanations for reorder, stockout and allocation decisions
Gap 4: Few studies connect human autonomy, trust and algorithmic management with inventory workflows	Study perceived autonomy, fairness and control during AI-assisted stock decisions
Gap 5: LLM and agentic AI applications are emerging but not yet sufficiently evaluated in operational settings	Prototype or evaluate controlled LLM-assisted inventory decision scenarios