ALMA-AI: Exploring OSH Impact of Algorithmic Management and AI

Psychosocial factors for OSH based on statistical evidence in regular work

Insights from PEROSH Joint Scientific Report

Elsbeth de Korte - TNO NL – 4 December 2025

Agenda

- What is ALMA – AI?
- Project Overview & Methodology
- Key findings: Demands, Resources, OSH outcomes
- Implications for OSH
- Recommendations

The ALMA-AI project

- **2024 - ongoing**
- **16+ researchers from 8 institutes working together:**
  - INSST, Spain (PL)
  - AUVA, Austria
  - CIOP-PIB, Poland
  - FIOH, Finland
  - INAIL, Italy
  - INRS, France
  - STAMI, Norway
  - TNO, Netherlands
- **Advisors:**
  - EU-OSHA
  - JRC

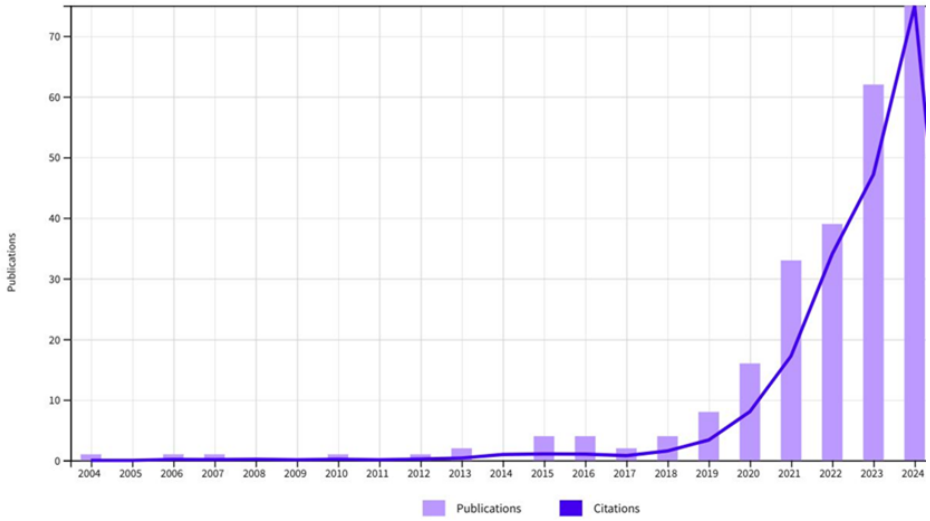
The ALMA-AI project

ALMA = ALgorithmic MAnagement

AI = Artificial Intelligence

The ALMA-AI project seeks to understand algorithmic management's essence and its implications, in terms of occupational safety and health (OSH) risks and opportunities (incl. psychosocial factors)

Why this topic matters



EU Artificial Intelligence Act

Chapter III: High-Risk AI System

Annex III: High-Risk AI Systems Referred to in Article 6(2)

4. Employment, workers management and access to self-employment:

(a) AI systems intended to be used for the recruitment or selection of natural persons, in particular to place targeted job advertisements, to analyse and filter job applications, and to evaluate candidates;

(b) AI systems intended to be used to make decisions affecting terms of work-related relationships, the promotion or termination of work-related contractual relationships, to allocate tasks based on individual behaviour or personal traits or characteristics or to monitor and evaluate the performance and behaviour of persons in such relationships.

Methodology – how did we study ALMA?

- **Comprehensive literature** review Web of Science (2022-2024)
- 641 publications screened
- Screening criteria: **ALMA and OSH focused, direct evidence**
- Final report: **39 selected** (33 scientific, 6 grey literature)
- Sectors: **logistics hospitality, office work, IT, and more**

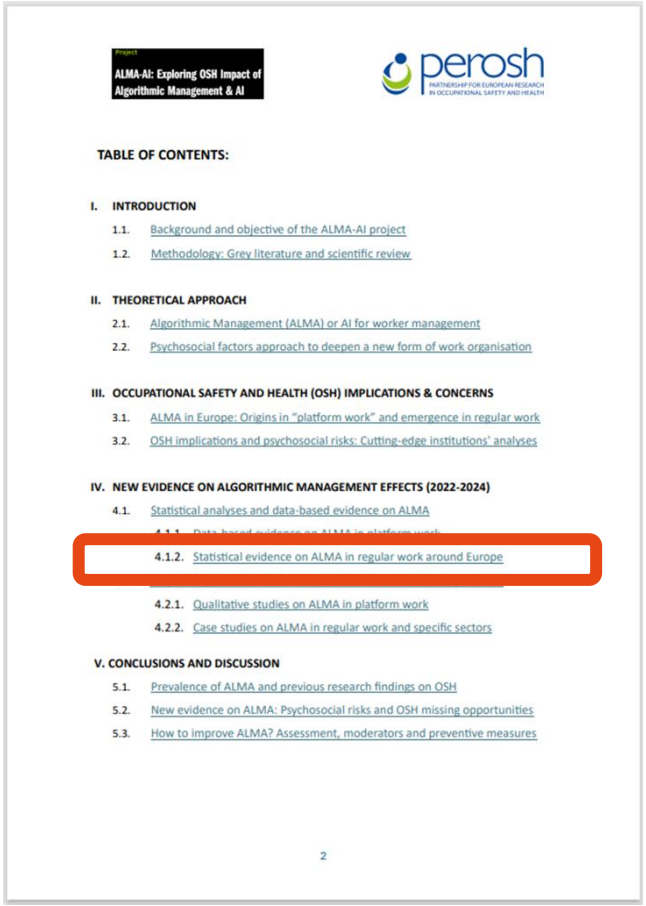
Methodology - definition

- Many definitions of ALMA
- Generally: **The use of complex digital systems or AI to manage workers**
- For this report:

- **The use of computer-programmed digital systems to (semi) automatically perform management functions that traditionally had been in performed by managers or supervisors**

Author(s)	Year	Definition
Lee, Kusbit, Metsky and Dabbish	2015	"Algorithms that assume managerial functions and surrounding institutional devices that support algorithms." (p. 1)
Möhlmann and Zalmanson	2017	"Oversight, governance, and control practices conducted by software algorithms over many remote workers [...] characterized by continuously tracking and evaluating worker behavior and performance, as well as automatic implementation of algorithmic decisions." (p. 4)
Leicht-Deobald, Busch, Schank, Weibel, Schafheitle, Wildhaber and Kasper	2019	"Algorithms designed to support and govern HR decisions." (p. 2)
Wood, Graham, Lehdonvirta and Hjorth	2019	"An extension of 'customer management' strategies." (p. 62)
Duggan, Sherman, Carbery and McDonnell	2020	"A system of control where self-learning algorithms are given the responsibility for making and executing decisions affecting labor, thereby limiting human involvement and oversight of the labor process. It replaces some of the tasks and processes that workers typically engage with by using algorithms that are developed by the very same individuals' data on the platform." (p. 119)
Gal, Jensen and Stein	2020	"Computational techniques that leverage digital data from multiple organizational areas to reflect different facets of members' behavior." (p. 1)
Cheng and Hackett	2021	"HRM algorithms are computer programs of a heuristic nature that use economical input of variables, information, or analytical resources to approximate a theoretical model, enabling an immediate recommendation of screening, selection, training, retention, and other HR functions." (p. 8)
Jarrahi, Newlands, Lee, Wolf, Kinder and Sutherland	2021	"Socio-technical process emerging from the continuous interaction of organizational members and the algorithms that mediate their work." (p. 2)
Möhlmann, Zalmanson, Henfridsson and Gregory	2021	"The large-scale collection and use of data on a platform to develop and improve learning algorithms that carry out coordination and control functions traditionally performed by managers." (p. 2001)
Newlands	2021	"An assemblage of computational processes, which automatically generate data, evaluate worker behavior and assign labor activities." (p. 723)
Meijerink and Bondarouk	2023	"System of control that relies on machine-readable data and software algorithms that support and/or automate managerial decision-making about work." (p. 3)

Methodology - focus



ALMA-AI: Exploring OSH Impact of Algorithmic Management & AI

perosh
PARTNERSHIP FOR EUROPEAN RESEARCH IN OCCUPATIONAL SAFETY AND HEALTH

TABLE OF CONTENTS:

2

4.1.2. Statistical evidence on ALMA in regular work around Europe

Methodology - focus

- **7/33 scientific articles, 2/6 grey literature**
- **Data sources:**

Grey literature reports

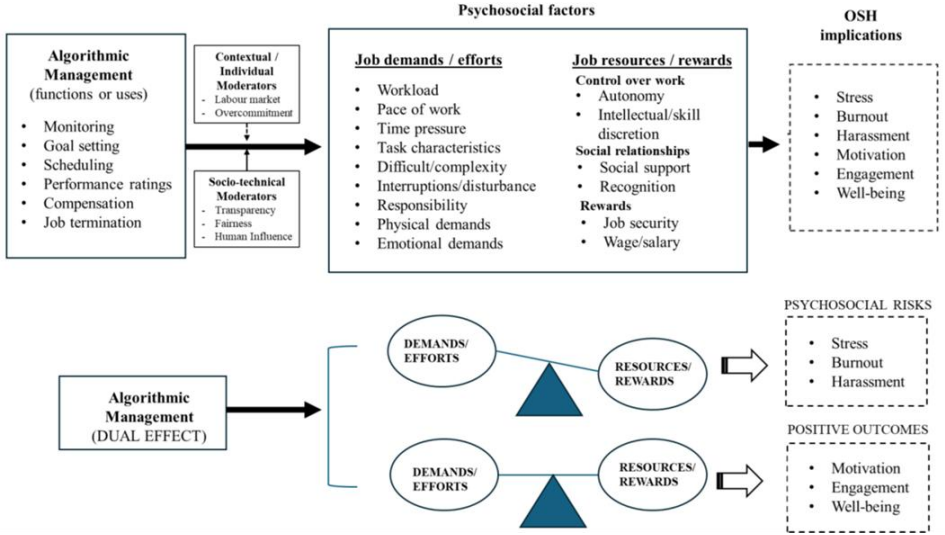
Scientific articles

- **‘Regular’ workplaces:**
  - **Transport & Logistics**
  - **Hospitality sector**
  - **Office workers – customer service, finance**

Key findings

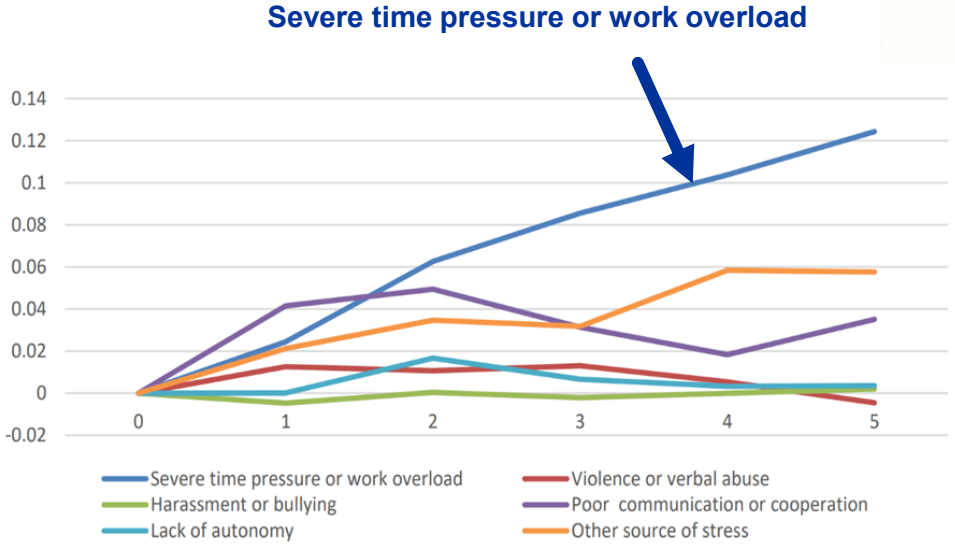
1. Job Demands & Psychosocial Pressures
2. Job Resources and Potential Benefits
3. Key Outcomes for OSH

4. Moderators of the ALMA impact on psychosocial factors and OSH implications



Key Finding 1 - Job Demands & Psychosocial Pressures

- **Overall: ALMA increases job demands: time pressure, work overload, constant monitoring.**
- Greater risks for **clerical and skilled workers** (more exposed to automation and detailed monitoring) than **professionals and administrators**
- **Remote work** reduces risks by offering more **autonomy and flexibility.**
- **Example:** OSH Pulse 2022 (Pesole, 2023) —more digital technology use correlates with higher time pressure and stress.



Psychosocial risks, factors and degree of digital technology adoption (Pesole, 2023)

Key Finding 2 - Job Resources & Potential Benefits

Instead of increasing resources…

…**ALMA reduces them**, diminishing the opportunity to boost any positive outcomes.

Regular workers (across sectors)

- Reduced **perceived trust, status and autonomy**

Transport, distribution and logistics

- Reduced **'prosocial motivation'**

Hospitality

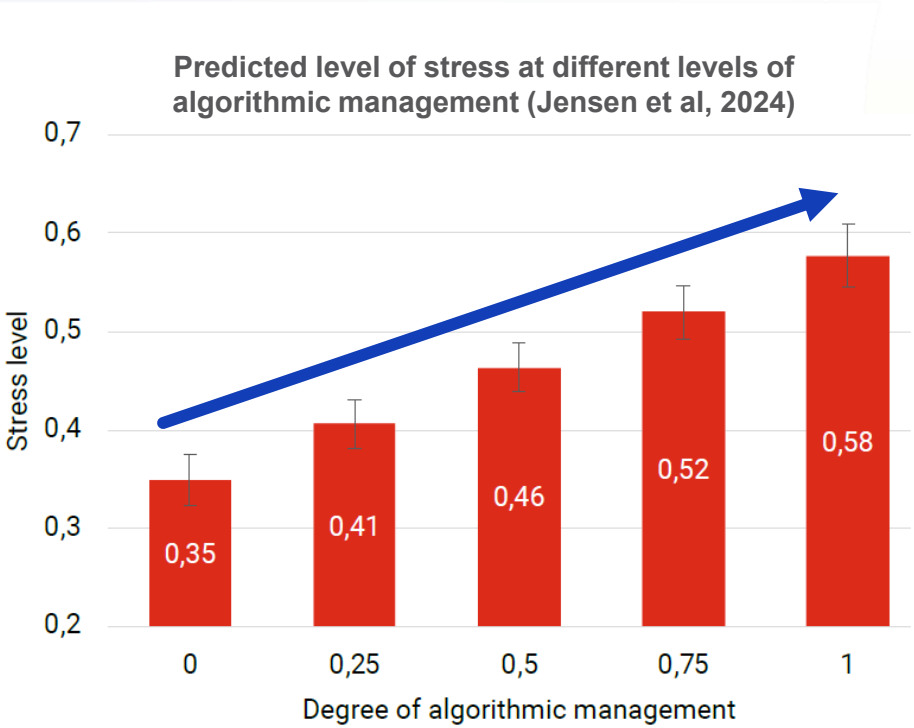
- Linked to high **employee turnover** and **discrimination**
- Led to employee feelings of: alienation, loneliness, reduced autonomy, power imbalances, job insecurity, and increased work isolation

IT service sector

- Loss of **creativity**
- Limited **knowledge combination capability**
- Hindered **goal achievement**

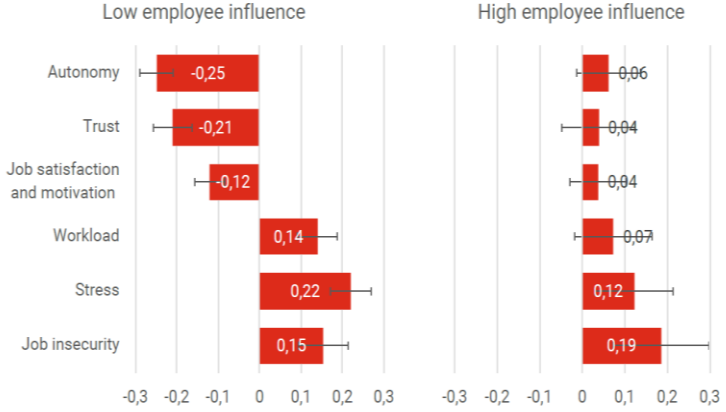
Key Finding 3 - OSH

- **ALMA influences psychosocial factors in ways that increase OSH risks:**
  - Higher stress, burnout, anxiety, and fatigue
- **OSH Pulse 2022 Each increase in ALMA intensity raises OHS problems by 16.5%**

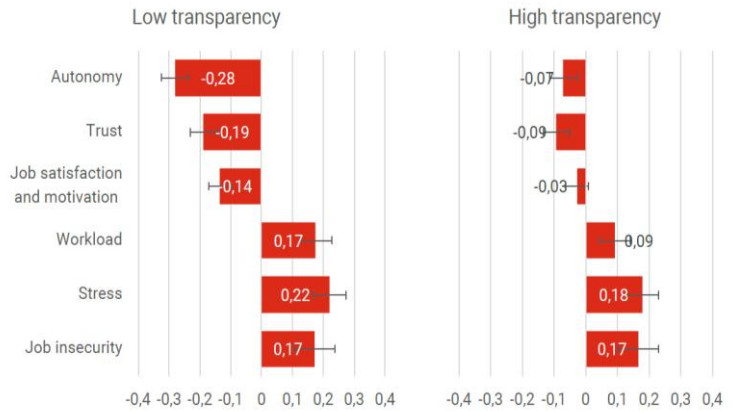


Key finding 4 – Moderators: What Can Buffer the Impact?

- **Employee Influence:** High worker participation in ALMA design and implementation halves the negative impact on stress and workload.
- **Transparency:** Clear communication about how algorithms work reduces negative effects on autonomy and trust.
- **Remote Work:** Flexibility to work outside the office can mitigate some psychosocial risks, but only if it comes with autonomy.



EMPLOYEE INFLUENCE (WORKER PARTICIPATION)



TRANSPARENCY AND SOCIO-TECHNICAL FACTORS

European Agency for Safety and Health at Work

Healthy Workplaces

Policy and Practice Recommendations

- ALMA is **reshaping regular workplaces**, often in negative ways
- Job demands ↑, job resources ↓, psychosocial risks ↑, OSH outcomes↓
- Make use of moderating factors to buffer negative effects
  - **Participation**: involve employees and their representatives in ALMA design and implementation.
  - Ensure **transparency** about algorithmic decisions and data use.
- **Monitor** and regularly assess psychosocial risks using validated tools.
- Foster **social dialogue**, **continue research** and **adapt regulation** to balance innovation, productivity and wellbeing is crucial as ALMA and AI continue to evolve.

Thank you / Q&A

- **Any questions?**

elsbeth.dekorte@tno.nl