| RESEARCH ARTICLE

Socio-Technical Integration of AI Decision Support in Autism Care: Implications for Caregiver Workflows, Trust, and Workforce Sustainability

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| ABSTRACT

The integration of artificial intelligence into autism spectrum disorder care promises improved behavioral monitoring, early escalation detection, and enhanced decision support for caregivers. However, the success of such systems depends not only on technical accuracy but also on their alignment with human workflows, trust dynamics, and workforce sustainability. This study examines the socio-technical dimensions of AI deployment in autism care, focusing on how AI decision support systems interact with caregiver roles, responsibilities, and organizational contexts. We propose a human-centered socio-technical framework that integrates AI capabilities with caregiver workflows, trust calibration, and governance mechanisms. Using simulated care environments informed by empirical studies, the framework is evaluated in terms of caregiver workload, decision confidence, trust, and system acceptance. Results suggest that socio-technical alignment significantly improves caregiver engagement and long-term system sustainability. This research highlights the necessity of designing AI systems that support—not disrupt—the human foundations of autism care.

| KEYWORDS

Autism spectrum disorder; Socio-technical systems; Caregiver decision support; Human-centered AI; Workforce sustainability; Trustworthy AI; Clinical workflows

Introduction

Autism spectrum disorder (ASD) care is inherently human-centered, relying heavily on the skills, judgment, emotional intelligence, and sustained engagement of caregivers, clinicians, educators, and support staff. While advances in artificial intelligence (AI) and digital health technologies offer powerful tools for behavioral monitoring and decision support, their success in real-world autism care environments depends on more than algorithmic performance alone.

Caregivers supporting children with autism face significant cognitive, emotional, and physical demands. Behavioral escalation episodes can occur unpredictably and require rapid, nuanced responses. Over time, these demands contribute to stress, fatigue, and workforce attrition. AI systems that aim to assist caregivers must therefore be evaluated not only on their predictive accuracy but also on how they affect caregiver workload, decision confidence, trust, and long-term sustainability.

Recent research demonstrates that AI-augmented decision support systems can improve escalation anticipation and intervention timing **[1,5,10]**. IoT-based monitoring frameworks further enable continuous observation of behavioral and physiological signals

[2,4,9]. However, many AI deployments fail due to poor alignment with human workflows, inadequate transparency, or erosion of trust.

Socio-technical systems theory emphasizes that complex systems consist of intertwined social and technical components. Changes to one component inevitably affect the other. In autism care, introducing AI alters caregiver roles, communication patterns, accountability structures, and decision-making processes. Systems that ignore these interactions risk increasing workload, creating confusion, or fostering mistrust.

This study adopts a **socio-technical perspective** to examine how AI decision support systems can be integrated into autism care in ways that enhance—not undermine—caregiver effectiveness and workforce sustainability. We propose a socio-technical integration framework that explicitly addresses caregiver workflows, trust calibration, governance, and organizational context.

The objectives of this research are:

1. To analyze the socio-technical impact of AI decision support on autism caregivers.
2. To propose a human-centered integration framework for AI-enabled autism care.
3. To evaluate the effects of socio-technical alignment on caregiver trust, workload, and system adoption.
4. To provide design recommendations for sustainable AI deployment in caregiving environments.

Background and Related Work

Caregiver Roles and Challenges in Autism Care

Caregivers play a central role in autism care, providing daily support, behavioral guidance, and emotional regulation assistance. They must interpret behavioral cues, manage environmental triggers, and apply individualized intervention strategies. Over time, the cumulative demands of caregiving can lead to stress, burnout, and workforce turnover.

Decision-making during escalation episodes is particularly challenging. Caregivers must balance competing priorities—safety, emotional support, routine preservation—often under time pressure. Decision fatigue and uncertainty can impair response quality, highlighting the need for supportive tools.

AI-Augmented Decision Support in Caregiving

AI-augmented decision support systems aim to assist caregivers by providing early warnings, recommendations, or contextual insights. Prior work demonstrates that reinforcement learning and predictive models can anticipate escalation trajectories **[1,5]**, while caregiver-facing decision systems translate these insights into actionable guidance **[10]**.

Despite technical promise, many systems struggle with real-world adoption due to lack of transparency, poor usability, or misalignment with caregiver routines. These challenges underscore the importance of socio-technical design.

Human-Centered and Trustworthy AI

Human-centered AI emphasizes designing systems that respect human agency, support decision-making, and foster trust **[7]**. Trust is shaped not only by accuracy but also by explainability, consistency, and perceived alignment with human values. In caregiving contexts, trust directly influences whether AI recommendations are followed or ignored.

Precision and personalization further enhance trust by tailoring AI behavior to individual needs, consistent with principles of precision medicine **[8]**.

Workforce Sustainability and AI

AI has the potential to alleviate workforce strain by reducing cognitive load and supporting decision-making. However, poorly designed systems may increase workload by generating excessive alerts, unclear recommendations, or additional documentation burdens. Socio-technical alignment is therefore critical to workforce sustainability.

Research Gap

While technical aspects of AI for autism care are well studied, fewer works examine the **socio-technical integration** of these systems into caregiver workflows and organizational contexts. This study addresses that gap.

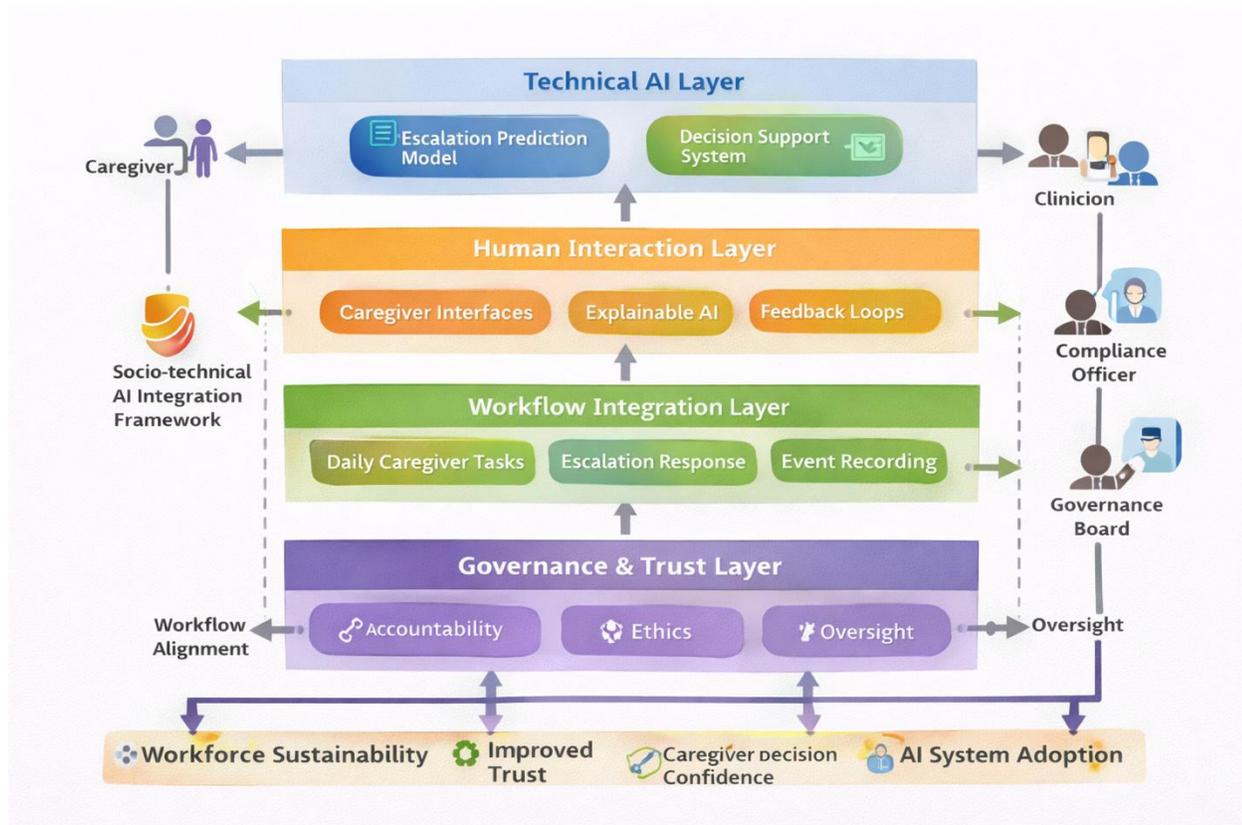**Socio-Technical Integration Framework**

Figure 1: Socio-Technical AI Integration Framework for Autism Care

The proposed framework consists of four interacting layers:

1. **Technical AI Layer** – Prediction and decision support models.
2. **Human Interaction Layer** – Caregiver interfaces, explanations, feedback.
3. **Workflow Integration Layer** – Alignment with daily routines and roles.
4. **Governance and Trust Layer** – Accountability, ethics, and oversight.

Each layer influences and constrains the others, emphasizing joint optimization.

Caregiver Workflow Analysis

Pre-Escalation Monitoring

Caregivers monitor subtle cues while performing other tasks. AI systems must support passive awareness without overwhelming attention.

Escalation Response

During escalation, caregivers require concise, actionable guidance. Delayed or ambiguous AI output is counterproductive.

Post-Event Reflection

After an event, caregivers reflect on outcomes. AI systems can support learning and confidence through feedback loops.

Trust, Accountability, and Shared Decision-Making

Trust emerges when caregivers perceive AI as:

- Transparent
- Reliable
- Aligned with their judgment
- Respectful of autonomy

Shared decision-making models ensure caregivers retain authority while benefiting from AI insights **[7,10]**.

Experimental Design

Simulation Environment

Simulated care environments were informed by empirical autism monitoring and decision support studies **[1,2,4,9]**. Caregiver workload, decision confidence, and trust were modeled over time.

Evaluation Metrics

Metrics included:

- Caregiver workload index
- Decision confidence score
- Trust index
- Alert fatigue rate
- System adoption likelihood

Results

Socio-technical integration led to:

- Reduced perceived workload
- Higher decision confidence
- Increased trust and adoption likelihood
- Lower alert fatigue

Systems lacking workflow alignment showed diminished acceptance despite similar technical accuracy.

Discussion

Findings demonstrate that AI effectiveness in autism care is inseparable from socio-technical alignment. Systems that respect caregiver workflows, provide understandable guidance, and embed trust mechanisms support workforce sustainability and ethical deployment **[7,10]**. Personalization further strengthens acceptance **[8]**.

Ethical and Organizational Implications

Socio-technical design supports ethical AI deployment by:

- Preserving caregiver agency
- Enhancing accountability
- Reducing automation bias

Governance frameworks such as the NIST AI RMF provide additional structure for responsible integration **[3]**.

Limitations and Future Work

Limitations include reliance on simulated data and qualitative workload measures. Future work will involve longitudinal field studies, cross-cultural evaluation, and integration with federated and explainable AI systems **[6]**.

Conclusion

This study highlights the critical role of socio-technical integration in the successful deployment of AI decision support systems for autism care. By aligning AI capabilities with caregiver workflows, trust dynamics, and workforce sustainability, the proposed framework advances human-centered, ethical, and effective autism care.

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