

SMART HAND TOOLS:

Preserving Skilled Workers' Jobs, Safety, & Privacy

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Introduction

The Smart Hand Tools Core Research Project is developing socio-technical approaches to use ethical AI to benefit human workers by putting AI in their hands.

As part of Good Systems, a UT Grand Challenge, researchers across disciplines are collaborating with industry, government, and other stakeholders to explore the role of ethical AI in the future of skilled trade work.

Partnerships with the City of Austin and Austin Community College enable social science researchers to gather insights directly from hand tool users which inform technical designs from engineering and computer science teams. Our combined efforts seek to present solutions that benefit workers and society.

Research Goal

The team seeks to support workers by improving their work product, their safety, and their quality of life through smart tools that contain embedded sensing, assured edge intelligence, and internet of things. The broader goal is to increase equitable access to jobs.

Methods

We are currently conducting qualitative research including observation and semi-structured interviews to gain insights from stakeholders working with hand tools at five departments in the City of Austin and welding instructors and students at Austin Community College.



- 7 Supervisor Interviews Across 5 departments
- Worker Interviews in Progress



- 12 Field Observations
- 8 Instructor Interviews
- Student Interviews in Progress

Project Overview

Our Theoretical Framework Informs Ethical AI Applications

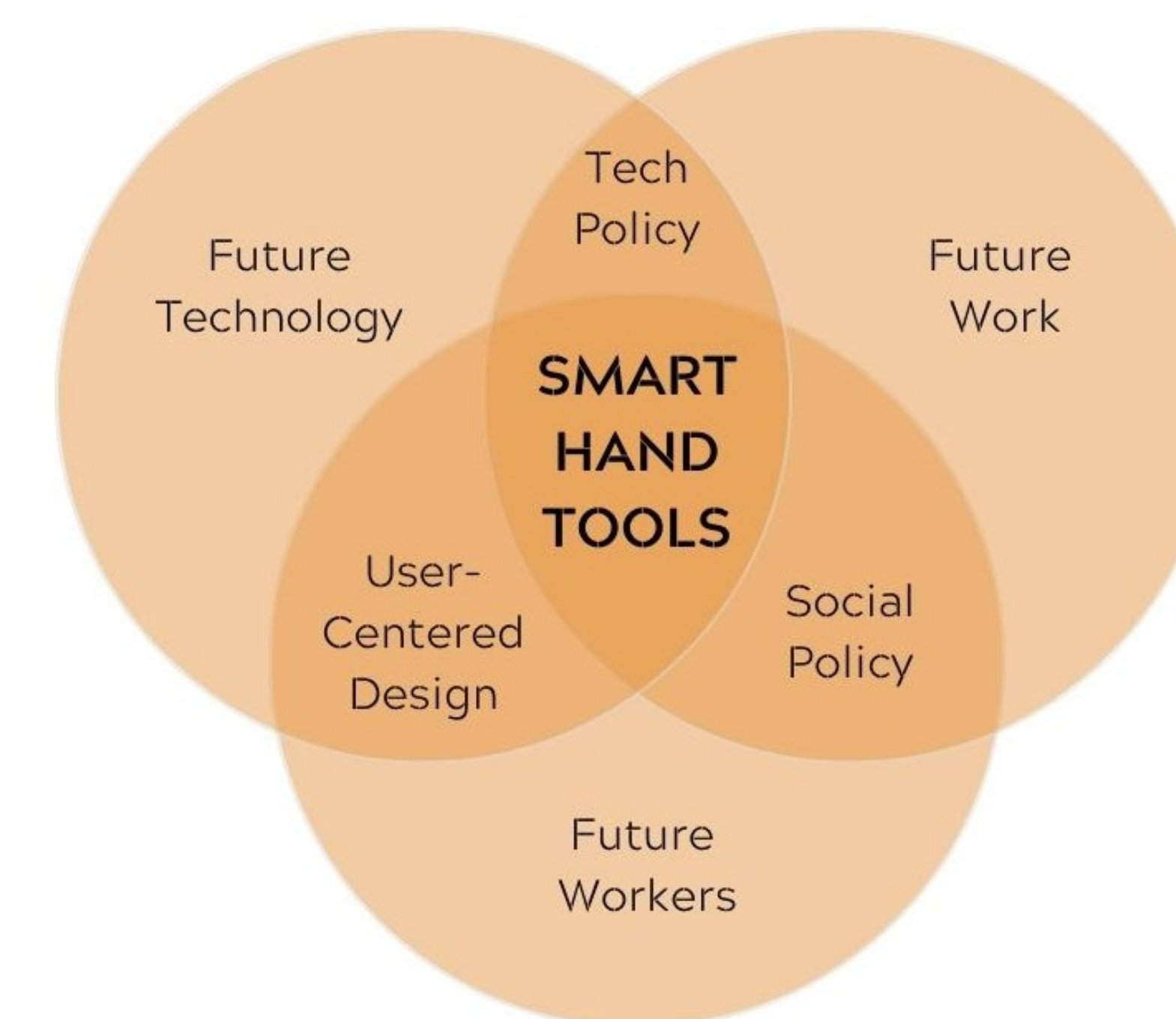


Figure 1: Theoretical Framework

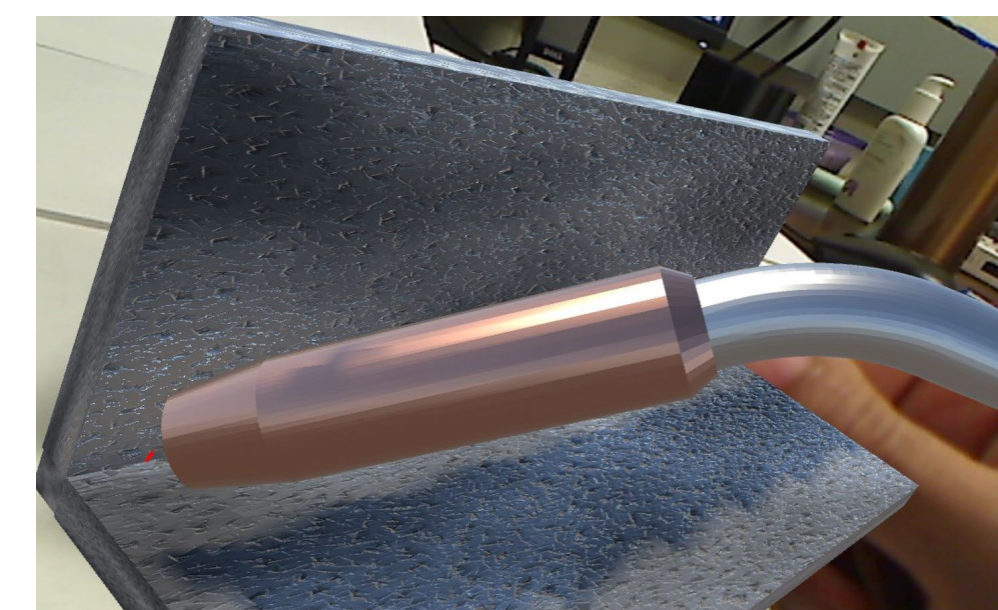


Figure 2: Simulated Welding Tool

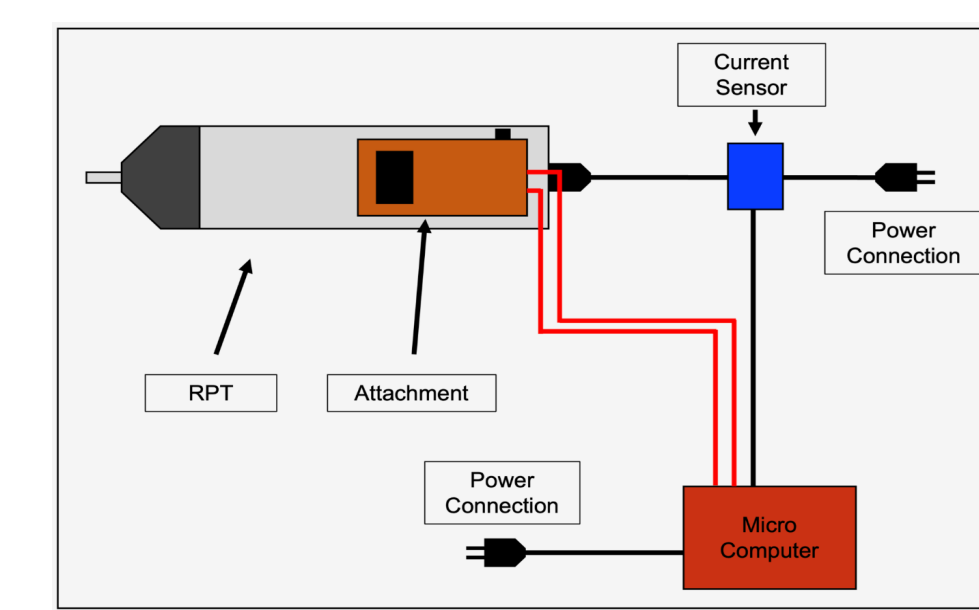


Figure 3: Smart Hand Tool Schema

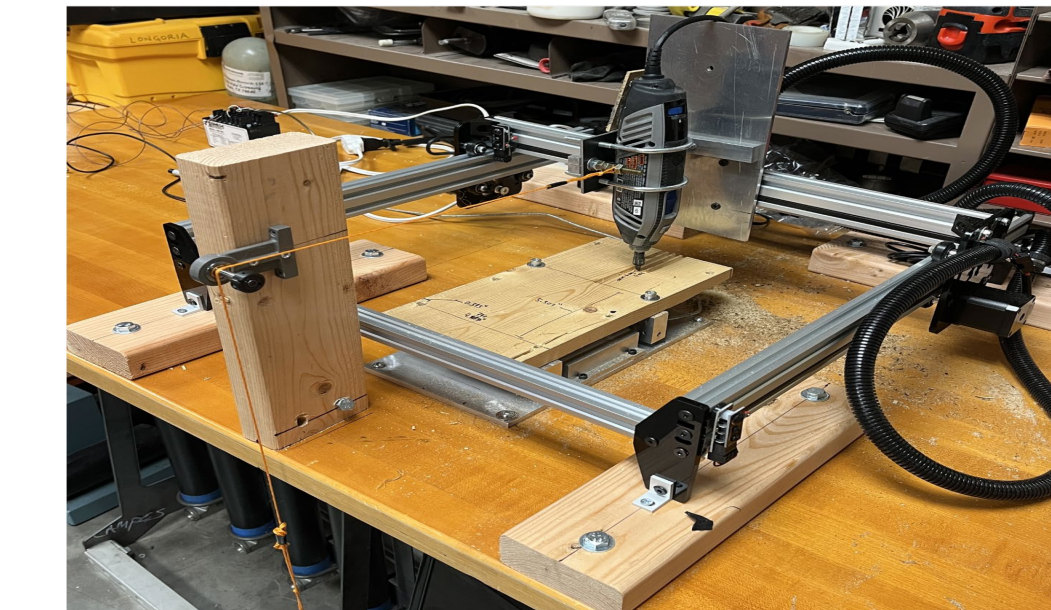


Figure 4: Force Current Test Rig

While substantial research exists regarding the future of work related to knowledge work, there is an opportunity to explore the role of emerging technologies, specifically AI, on the future of middle-skill work, also known as work in the skilled trades. Requiring a two-year degree or an industry-specific certification, workers to fill these jobs are in increasing demand but they are also currently in short supply. Due to the substantial level of training and skill required, these jobs are distinguished by high levels of danger and physical challenge. In addition, the role of AI and automation is seen as a threat to middle-skill work, instead of a force to empower workers.

Our research examines how smart hand tools can help those who work with tools do their jobs safer, easier, and faster. As a result, workers may increase their sense of autonomy and agency. In addition, these new technologies may support recruitment of new workers as well as accelerate training to increase the number and range of participants in the skilled trades.

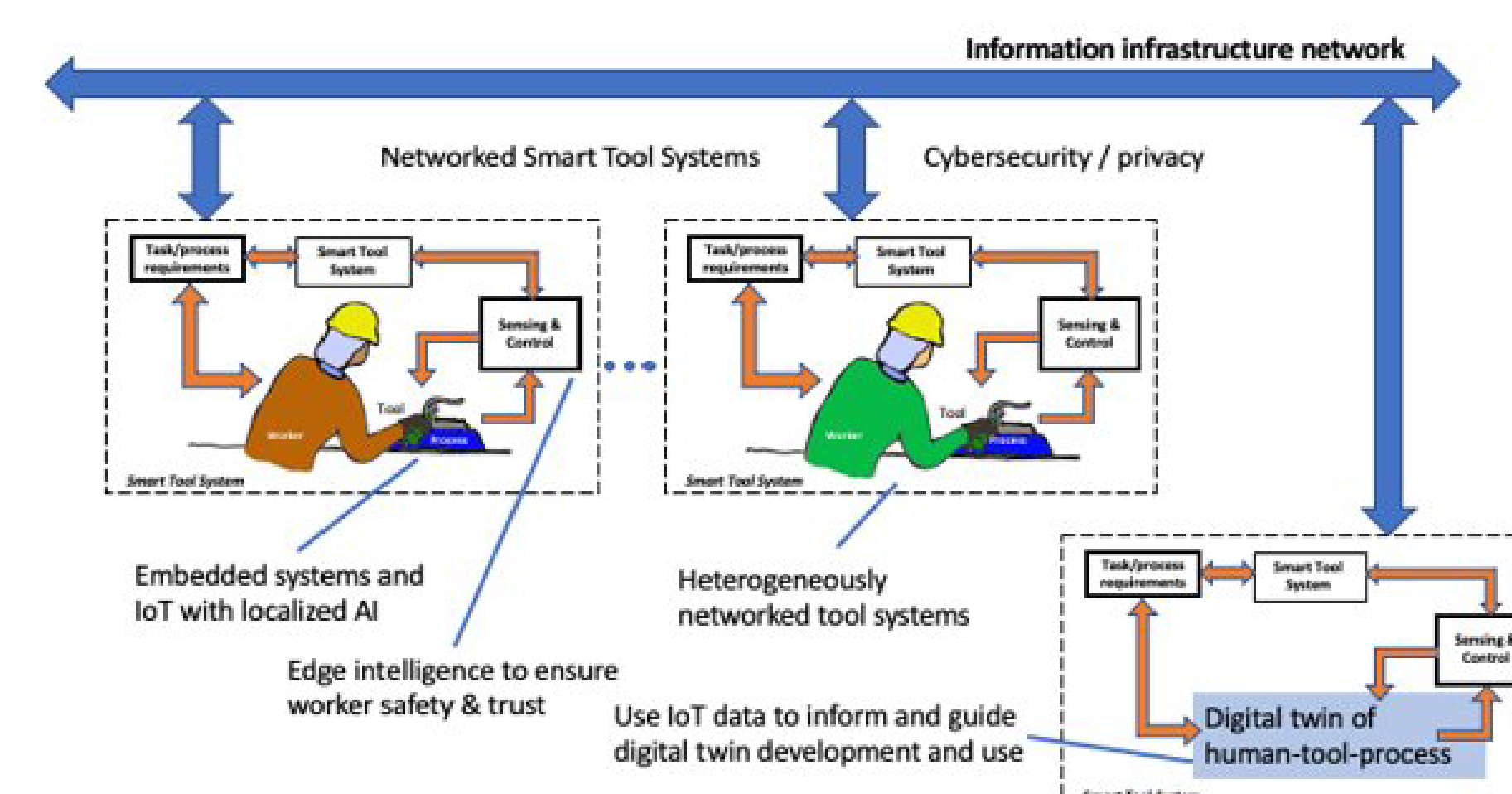


Figure 5: Smart Hand Tools Information Infrastructure Network

Expected Outputs

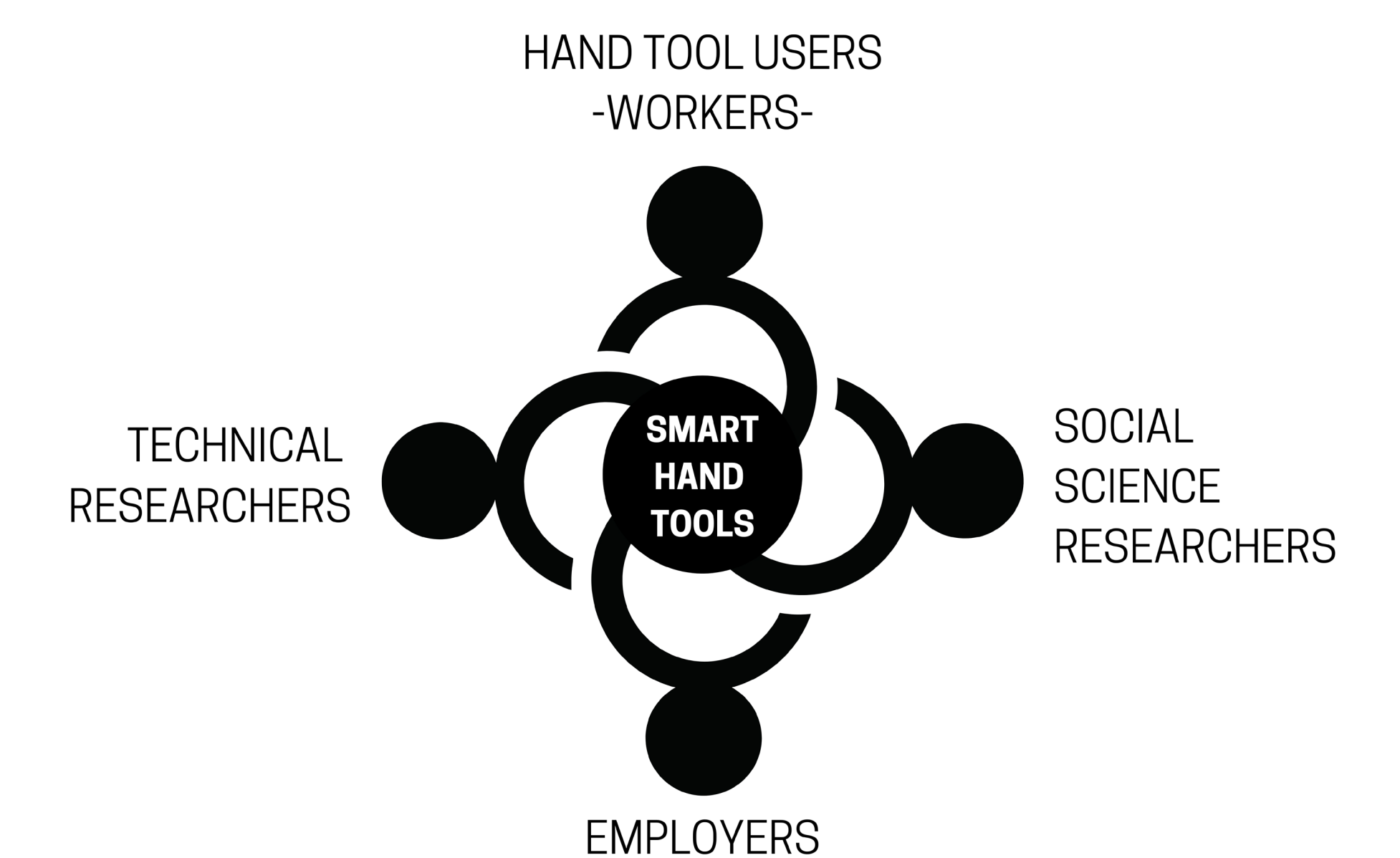


Figure 6: Ethical AI via Participatory Design

Our intention is to develop knowledge and technologies to empower workers who perform critical manual tasks by providing them with real-time and retrospective feedback to facilitate their training, avoid workplace accidents, and prevent repetitive stress-related injuries.

Acknowledgments

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Sample Publications

Hill, K., Tunis, R., Pejlatowicz, P., Fleischmann, K.R., Greenberg, S., Longoria, R., & Bendana, J. (2022). Information needs of blue-collar workers: Welding challenges and the potential of smart welding tools. *Proceedings of the 85th Annual Meeting of the Association for Information Science & Technology*. Pittsburgh, PA.

Hill, K., Kota, R., Giuntoli, R., & Fleischmann, K.R. (2023). Information needs of deaf welders: Improving the accessibility of middle-skill work. *Association for Information Science and Technology (ASIS&T) Mid-Year (MY) Meeting*. Virtual.