Proposal Title: Convergence Accelerator Phase I: Rapid Dissemination of AI Microcredentials through Hands-on Industrial Robotics Education (RD-AIM-HIRE)
Institution: Carnegie-Mellon University
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The NSF Convergence Accelerator supports team-based, multidisciplinary efforts that address challenges of national importance and show potential for deliverables in the near future.

The broader impact/ potential benefit of this Convergence Accelerator Phase I project is to facilitate convergence of literature and methodologies from sociology, human-computer interaction, microcredentialing, software engineering, and improvement science to improve collaborative development and delivery processes for training robotics technicians who can meet the needs of American manufacturers both today and during the impending transition to an "Industry 4.0" paradigm in which factory floors are transformed into networked cyber-physical systems controlled by specialized artificial intelligence (AI) software. Technicians will remain critical in the installation and maintenance of advanced manufacturing systems, but they must understand such systems in order to troubleshoot them effectively. Good training is both authentic and consistently deliverable. Achieving this requires coordination between curriculum designers, subject matter experts, educational practitioners, and many other stakeholders. The endeavor has been approached alternately as a "product design" problem from the curriculum development perspective, or an "organizational coordination" problem from an organizational policy perspective. Our approach connects these two perspectives in a transdisciplinary effort to produce a technical training apparatus that can keep pace with rapid advancement in fields like machine learning and AI.

This Convergence Accelerator Phase I project takes a design research approach to fusing the organizations-inward and product-outward approaches into a single efficient enterprise. Our project employs design and improvement science methods to answer questions about (i) How to design effective and deliverable machine learning (ML) curriculum for technician trainees with little or no STEM background; and (ii) How to design productive collaborative routines around this objective, given the wide variety of stakeholders. We start with a "shovel-ready" curriculum concept and an experienced production team that uses human-centered design (HCD) techniques to design usable, pedagogically effective activities. In addition to authorial consultation with AI subject matter experts, HCD involves data collection on instructors, learners, and their extended learning contexts including administrative and social aspects. We problematize collaboration patterns of the production team with other stakeholders during this process, identifying improved routines to accelerate the collaborative's joint work. This phase of the project produces knowledge of how to accelerate curriculum design through enhanced collaborative routines, knowledge of how ML/AI can be integrated into technician training, prototype ML/AI curriculum for non-four-year audiences, and direct training impact for pilot participants.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.