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Project Insights Report

The Autonomous Microfactory: Skills Development Training Program

PARTNERS
Ryerson University – Creative Technology Lab @ FCAD

LOCATIONS
Ontario

INVESTMENT
$129,363

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Executive Summary

In the early stages of the COVID pandemic, many manufacturing processes had to shut down due to the lockdowns and the need for social distancing. The Creative Technology Lab at Toronto Metropolitan University (TMU)—a microfactory manufacturing model—intended to address these challenges and allow production to continue and adapt. The microfactory model could be replicated more widely, but this model requires workers with skills in agile systems for digital fabrication and technology-based manufacturing.

This project developed a two-week intensive training curriculum to introduce employers and workers to the technology, equipment and processes essential to operating the agile microfactory.

Due to supply chain disruptions, production backlogs and high turnover in the tech sector as a result of the pandemic, participating employers, who were initially enthusiastic about the two-week intensive training opportunity, were unable to support the upskilling or reskilling of their employees due to a lack of workers to cover absences. Therefore, the developed curriculum has yet to be piloted.

This project offers lessons for decision-makers to improve how they form and manage partnerships focused on collaborative training initiatives that involve both educational and training institutes and employers. This project serves as a guide for those looking to develop effective collaborations in the field of education and workforce development.

KEY INSIGHTS

1. External factors—in this case, supply chain disruptions, production backlogs and high turnover—can impact employers' willingness to participate, regardless of the quality of the training offered.

2. The ways that training and upskilling initiatives are delivered must balance employer needs with worker preferences.

3. A formal commitment from engaged employers is a critical component of training and upskilling initiatives.

The Issue

In the early stages of the COVID-19 pandemic, many manufacturing processes had to shut down due to the lockdowns and the need for social distancing. For manufacturing to continue under those circumstances, there was a need for new technologies that disrupted traditional mass-production processes and utilized contactless fabrication and robotic-driven autonomous construction.

The Creative Technology Lab at TMU was the only facility of its kind in Toronto to have the ability to prototype medical-grade equipment for local hospitals on demand, and small-scale rapid manufacturing equipment (10,000 units) during the pandemic. The microfactory proved to be both agile and invaluable in responding to the daily changes in design, prototype and production needs brought on by the pandemic. Only two technicians were required to operate the 7,600-square-metre lab at full capacity. This microfactory model could be replicated to address the challenges that shut down many other manufacturing processes during the pandemic.

To support these new processes, there is an unmet need for workers able to develop agile systems for digital fabrication and technology-based manufacturing.

What We Investigated

This project intended to test how to support employers and workers to build capacity through skills development activities—specifically in digital fabrication, automation and collaborative robotics—using new technologies for contactless fabrication and autonomous construction. The project intended to introduce the technology, equipment and processes essential to operating the agile microfactory.

The project developed seven workshops, each of which would be delivered over a two-week intensive period, to strengthen and expand skillsets in on-demand production, rapid iteration, fabrication of specialized products, and niche manufacturing to increase productivity, efficiency and innovation capabilities. The workshops were designed to impart technical skills in 3D modelling, 3D printing and scanning, laser cutting and computer numerical control milling, robotic programming, integration and cell set-up, end-of-arm tooling development and virtual reality control.

What We're Learning

While the curriculum guiding the workshops was developed successfully, the project was not able to assess its success on employers or workers.

Unfortunately, due to supply chain disruptions, production backlogs and high turnover in the tech sector as a result of the pandemic, participating employers, who were initially enthusiastic about the two-week intensive training opportunity, were unable to support the upskilling or reskilling of their employees due to a lack of workers to cover absences.

To address these recruitment challenges, project partners suggested (1) securing a formal commitment from interested companies prior to the development of skills-training curriculum, and (2) recruiting students who will be entering the workforce within a year of graduation, rather than workers already employed.

Why It Matters

Developing training materials and curricula for new industrial and technology-driven processes is time and resource intensive. This project demonstrates that this process involves not only developing technical instruction but spending significant time up front assessing the needs of employers and workers in this space, and securing a formal commitment to implementing the training once the curriculum is developed.

Without employers formally committed to collaborative training efforts, projects risk having no one to use the training, no matter how effective it may be.

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What's Next

As a result of the recruitment challenges, the Design + Technology Lab (formerly the Creative Technology Lab) at TMU has expanded the workshops to cater to a large student body. The Lab plans to offer a series of workshops in May/June of 2023 to faculty across the Creative School at TMU in an effort to ensure technology is being integrated into course materials in a range of disciplines, including interior design, graphic communications management, performance, fashion and image arts.

The Lab is also in conversation with the Chang School of Continuing Education and the Creative School at TMU about developing a certificate program or micro-credential based around the curriculum developed during this research project.

Have questions about our work? Do you need access to a report in English or French? Please contact communications@fsc-ccf.ca.

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