

Reclaiming Digital Infrastructure for Workforce Readiness



The Challenge: Scaling Evidence-Based Education

Clemson University's Center for Workforce Development (CUCWD) faced a fundamental tension: while the Center was successfully developing high-impact, evidence-based technical curricula, it needed the digital infrastructure to disseminate those resources at scale. This need became clear through initiatives such as ATEC's Choose Aerospace program, which adopted CUCWD-developed curriculum and the learning platform they built to help high school students explore aerospace careers, complete credential-aligned coursework, and prepare for their first AMT certification.

Supporting efforts like this required a flexible and reliable platform capable of serving thousands of learners across diverse institutional settings.

Scale

The scale of the CUCWD Open edX project is significant, currently serving a population of approximately **20,000 to 25,000 learners** across a diverse nationwide network.



Initially, the installation was completed at Clemson, and we hosted the entire platform on Clemson servers. As the program grew, supporting that scale across many institutions became increasingly challenging within our local server environment.

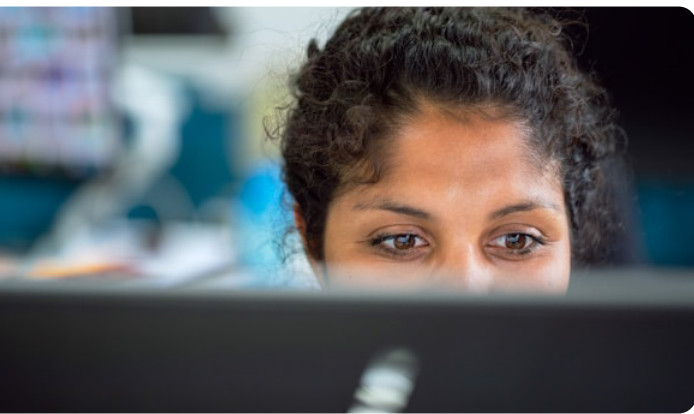
Kapil Chalil Madathil | Wilfred P. Tiencken Endowed Professor of Industrial Engineering at Clemson University

Impact

The platform's impact is distributed across several key tiers of education and workforce development:

High School & CTE (Career and Technical Education)

- **Choose Aerospace:** This flagship program, run in partnership with the Aviation Technician Education Council (ATEC), serves **1,800 high school students** over the last two years. It provides these students with the content needed to achieve their first FAA certification, creating a direct pipeline into aviation maintenance careers.
- **CTE Programs:** Over 200 high school students are currently learning about EV Maintenance through the SkillRedi platform. These students will be able to take the Automotive Service Excellence (ASE) certification exam and SAE Electric Vehicle Manufacturing Fundamentals microcredentialing exam after completing the course, as the curriculum aligns to the exam.



Specialized Technical Training

- **Mobility, Water, & Photonics:** The platform hosts a variety of virtual reality modules and digital tools focused on high-demand technical fields. These programs collectively reach **3,000 to 4,000 students**.
- **Manufacturing Partnerships:** Active engagements include training for incumbent workers in partnership with workforce development agencies such as Alabama Industrial Development Training (AIDT), which provides training for major automotive manufacturers, including Mercedes-Benz and Hyundai, with a specific focus on electric vehicle manufacturing.

State & National Infrastructure

The project operates as a "three-tier" system, where SkillRedi acts as the content provider, supporting middle-tier organizations (such as state workforce development agencies) that in turn distribute the curriculum to local school districts and institutions.

- **South Carolina:** A major state-wide effort currently integrates the content into numerous CTE centers and workforce development agencies.
- **Alabama:** A key partnership provides direct access to incumbent worker training for manufacturing sectors.

This scalable, cloud-native architecture (supported by Kubernetes and AWS) allows the team to maintain this large-scale distribution while white-labeling the experience for different institutions and keeping data structures separate to meet strict requirements like FERPA compliance.



Kapil Chalil Madathil reflects on why the team chose this architecture over other available learning management systems:



"From an architectural standpoint, we needed a platform that could truly scale. Open edX stood out as one of the solutions because it offered the flexibility and infrastructure needed to support a large and diverse user base. Many of the other options were traditional learning management systems, but they did not provide the same level of scalability. That was one of the key reasons we moved forward with the Open edX platform."

Kapil Chalil Madathil | Wilfred P. Tiencken Endowed Professor of Industrial Engineering at Clemson University



The Solution: A Pivot to Open Infrastructure

The team needed a platform that prioritized pedagogical soundness while supporting massive scale. They selected the Open edX platform as their foundation, eventually partnering with industry leads to migrate from local servers to a scalable, cloud-native architecture on AWS.

CUCWD has successfully transitioned from relying on university-hosted servers to a professionalized, cloud-native infrastructure that affords them full autonomy over their platform. By moving to a fully scalable Kubernetes deployment on Amazon Web Services (AWS), the team has mastered the ability to spin up, manage, and white-label independent Open edX instances for a diverse array of institutional partners. This strategic shift has allowed the team to move away from rigid, one-size-fits-all hosting, enabling them to meet specific customer requirements—such as data isolation and customized features—in real-time. As Trae King, Director CECAS CORE, noted this technical independence is central to their agility: "AWS has given us the flexibility to meet customers' needs and run Open edX instances independently, keep data separated, depending on the use case... while also still customizing our own features and pushing those out in real time."

By leveraging Kubernetes-based deployments, the team achieved the ability to white-label and spin up independent instances for partners like the states of Alabama and South Carolina, effectively decoupling their distribution from rigid, proprietary learning management systems.

Pedagogical Innovation and Data Sovereignty

A core component of the CUCWD strategy is the move from passive content delivery to "active" engagement. Their platform now hosts over 500 browser-based VR simulations, providing high-fidelity technical training without requiring specialized hardware.

However, the team identified a critical "analytics gap." Kapil noted, "Earlier on, there was an analytics platform that provided some of these capabilities. For our current data collection needs, we are exploring ways to integrate tools such as Qualtrics surveys through iframes. What would be especially valuable is a more detailed analytics capability that allows us to examine student engagement at a granular level, such as how long a student watched a specific video, how they interacted with the content, and how they performed across different learning activities."

To address this, the team is now moving toward an integrated analytics stack that utilizes the **Aspects** plugin to provide actionable insights. This allows them to identify at-risk learners and optimize course content—moving away from "throwing content in front of people and hoping it goes well" toward a model driven by data-informed pedagogical interventions.

Future Horizons: AI and Global Impact

Today, the partnership is looking toward the next evolution of digital learning. With the development of the SkilRedi commercial entity, the team is scaling their model internationally, with plans to integrate custom-trained AI models that act as "live instructors" for learners struggling with specific concepts.



Commitment to the Open Source Community

The team's evolution reflects a broader commitment to the open source community.



"Plan your infrastructure carefully... because that really drives your flexibility in the long run."

Trae King | Director CECAS CORE

By transitioning from consumers to potential code-level contributors, CUCWD is not just deploying a platform; they are building a sustainable model for national-scale digital infrastructure that prioritizes learner data sovereignty and pedagogical quality.

The **Organizations** that
Made this possible

