Workforce Education – Challenges and Models

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Recent background work:

- Coauthor, MIT Open Learning, *MassBridge - Advanced Manufacturing Workforce Education Benchmarking Study*, Phase One, April 12, 2022
- Bonvillian, *The Playbook – For workforce education at Manufacturing Innovation Institutes*, Jan. 11, 2022 (not yet released)
We operate in a broken workforce system -- Background on the problem:

- **Disconnect** between work and learning
- **Disinvestment** by government and employers
- **Labor Dept.** training programs don’t reach **higher technical skills, incumbent workers**
- **Education Dept.** programs focused on **college not workforce needs and not linked to the Labor Dept. programs**
- **Vocational education** in secondary schools largely **dismantled**
- **Underfunded community colleges**, lack the resources to provide advanced training in new fields and have **too low completion rates**
- Colleges and **universities disconnected from workforce education**
- **Lifelong learning is missing**
- **Underfunded advanced technical education programs** at NSF ATE and at Advanced Manufacturing Institutes
- **A broken labor market information system**
- The existing actors are in “legacy” sectors - hard to change
US Production Productivity Lags Behind Competitor Nations

Manufacturing Productivity over Time

Value Added Per Employee, Index (2010=100)

Country
- European Union (28 countries)
- Germany
- Japan
- United States

[From: Ben Armstrong, MIT 2021]
Small and Mid-Sized Production Firms Lag in Productivity:

Productivity over Time

Value Added per Employee

Year

From: Ben Armstrong, MJT 2021]
Productivity-related Capital Investments Stagnate at Small Production Firms:

From: Ben Armstrong, MIT 2021
Workforce is a rapidly rising priority for Production companies

Manufacturing Priorities Over Time

 MEP National Survey Data  [from Ben Armstrong, MIT 2/21]
We have longstanding quality job problems

• We have increasing inequality, not economic convergence – a festering problem for 15 years.
• The Barbell problem identified by economist David Autor:

  
  Technological advances, especially in IT, are putting many quality jobs out of reach for workers who didn't get the proper skills and training.
• And now a series of lower-end services hard hit by Covid-19 so new jobs require higher-end new skills
• Let’s look at workforce needs in several large sectors, over 30% of US employment -
The Wage Gap for non-Supervisory and Production Workers:

Case Study #1. Manufacturing

• Has been **middle class pathway** for men w/o college
• But **Median income is down for men** w/o HS diploma or w/HS diploma or some college
• U.S. **manufacturing employment fell** by one third, 2000 – 2010
• High overall **labor non-participation rate**
• **Coronavirus** hit some key sectors— recovery ongoing, but many left mfg. jobs
  • Need more resilient supply chains – some reshoring? Flexible mfg. means new mfg. technologies so new skills for the workforce
• 2M+ mfg. jobs will open up from **aging demographics**
• **Advanced manufacturing** will require higher skills
Case Study #2. Retail

• **2005:** US overbuilt with 6x more retail sq.ft. as any European nation; 50% more per capita than Canada

• **2008:** Economic crash led to “discount model” of dumbing down the workforce, emptying stores of staff

• **2015:** Warehousing and robotics provide further disruption

• **2020:** Coronavirus forced massive closings, online take-off

• **New Model?** Sales clerk as personal advisor
  • “Omni-channeling” – online/face-to-face entry
  • Higher skills, IT fluent, guide customer through product options

  • How to train? Train the first level managers
Case Study #3. Healthcare Delivery

• An **aging** population, higher health care demands

• New medical **technologies** creating new professions

• Results: More jobs with **higher skills needs**, so **new training** systems

• **Barriers:** Established health professions, limited entry

• Could online entry help?
Case Study #4. Construction

- **Labor productivity** in construction has declined since 1968, in contrast to rising productivity in other sectors – *calls out for change*
- 7.2 million more affordable housing units are needed for **low-income families**
- **Climate change** on the horizon - billion-dollar disasters have increased 4X in the last four decades
- 500,000+ people **homeless** each night
- Only a **small percentage of U.S. construction is industrialized** (e.g., ~3% modular).
- But a large part of the $1.4T+ U.S. construction **market can be reached with industrialized construction – panelization** - which can offer faster deployment and reduced schedule risk.
- Industrialized construction can **embed smart tech and new energy technology**
- **Will international firms take the US market?**

*Note: New Technology and Workforce improvement Are the 2 ways to productivity gain*
Each of these four major sectors is different but each has a major workforce education need:

- **Manufacturing** – stabilizing sector, but will need to replace 2 to 4 million workers in the next decade due to retirements with higher skills
- **In-Person Retail** – declining sector, but successful firms will need higher level skills
- **Health** – expanding sector, with new health technical professions being created with new skills required
- **Construction** – 3.7% annual growth projected – but low productivity – needs new technology, therefore new workforce skills
- **All** characterized by extensive tech entry requiring new skills
The Work/Learn Gap

• Jobs increasingly tend to go to **college educated**
• But growing IT, demanding new skills
  • Result: new high or middle skills jobs will require education beyond high school
  • Barrier: only 1/3 of Americans over 25 have a 4-year college degree
• Colleges/universities not engaged –
  • they own the crucial credential, the college degree, but they still think it’s a high school/community college problem
• And High Schools, Community colleges not well connected to workplaces
• Need:
  • A new **system** for workforce education
  • A new credentialling system
• **But most of all, a new connection between work and school**
Policy Implications

• New education technologies - need
development and implementation – VR/AR,
gaming, digital tutors/AI (DOD role)

• Short Courses - BUT modules that connect
to CC certificates, degrees (NSF ATE dev.
models, DOL workforce bds.)

• “Trifecta” - CC programs for CC students,
plus incumbent workers, HS students (NSF
ATE, Dept. of Ed, states)

• Apprenticeships or “Apprenticeship Light”-
youth and CC – in fields that have clear lines
for increased responsibility and wages, ‘er-
’ee agreements (DOL)
  • Need for actors to coordinate: CC’s,
employers and regional associations,
state gov’t

• CC completion rate

• Technical and Comprehensive HS’s –
state role

• Expanded employer role –
appren./training, standards

• New curriculum for advanced fields – start
with adv’d mfg. – Adv’d Mfg. Institutes/DOD
Mantech/DOE/states

• Unifying efforts at the state level – states –
across Labor/Ed

• Labor market Information system – DOL
Let’s briefly look at 4 areas --

• Employer role
• University role
• Community College role
• Online Education role
1) **Critical** Employer Role

- It’s not someone else’s problem – can’t leave it to schools and governments to fix –
  - They don’t know what co.’s need
  - Must have a better school/work transition – and co’s control work

- Requires a new level of engagement
  - It’s bigger than company HR departments

- Shortages in skilled workers - Covid may have accelerated an ongoing demographics shift – the next generation is smaller, *and* not educated in the needed skills

- Employers:
  - Must work together –
    - Single company solutions aren’t long lasting, they endure only until a shortage is filled, or there’s a downturn
    - Programs shared across companies are more lasting – pool resources – key to small co’s
    - Building shared solutions tends to reduce raiding each other’s trained employees

- **Key:** paid internships/apprenticeships; collaborations with Community Colleges, High Schools, Colleges – requires collaborations
  - Get your state and local governments to help make this happen
  - The three-way alliance: employers, schools, state/local government
2) **Univ. Role:** What can you urge your Universities to do?

*What is the University Role?*

**Roles in Different Areas:**

("notional" chart)

- Organizing Delivery Framework
- Online Platforms/Technologies
- Actual Delivery - technician level
- Actual Delivery - professional/high end technical
- Content - mid range technical
- Content - high end technical/engineering
- Lifelong Learning System
- Optimal Teaching Models/Learning Science

*Bars illustrate greater or lesser extent of Univ. role*
3) Exemplary CC programs – all link to employers:

- **Lorrain Co. CC, Ohio**
  - Ohio Assoc. of Manufacturers – industry alliance, develop curriculum, state support
  - Ohio Tech Net – independent CCs, but way to collaboration across state CCs in developing curriculum

- **Ivy Tech, Indiana – unified state CC system**
  - Curriculum developed in concert across state
  - Industry-recognized credentials imbedded into courses – building short/modular course system
  - But 1/3 of curriculum is up to specific school, so flexible, adopt to regional needs

- **Asnuntuck CC, Enfield, Conn.**
  - Equipment sharing – 4 mfg. tech centers across state – shared by groups of CCs
  - Reaches incumbent workers and HS students, as well as CC students

- **Tennessee TCATs - Tenn. Colleges of Applied Technologies**
  - 81% completion rate, 86% job placement rate in field of study
  - Integrate remedial/development courses with technical courses – relate the two

- **Trident Tech, Charleston, SC**
  - Youth apprenticeship program with 5 area HS’s
  - Created by small employers – local Chamber of Commerce key player, administrated by Tech College
  - What the apprentice’s day looks like

- **MassBridge**
  - State of Mass effort to build an advanced manufacturing curriculum and program in Mass. CC’s and HS’s
  - Collaborations: State of Mass., co’s, CC’s, univ’s, Ed, Labor & Economic Dev. agencies
4) **ONLINE:** There’s a big problem of scale – the existing system is not at the scale to meet the upskilling need --

The New Online Education Technologies can help scale -

But beware the -- *Perils of Zoom*:

• So - Covid-19 boosted online education – colleges and universities would not have survived without it
• But “zoom/teams/webex” classes didn’t take advantage of the opportunities in the online medium
  • They were a stage play, but we can do movies
  • Asynchronous can build new features, synchronous cannot
• --> if online is to scale – including into workforce education -- the learning lessons need to be absorbed
• What are the new pedagogies from online education?
4) con’t: EdTech and the new pedagogy

- **Can use New Delivery Modalities**
  - Enablers: Online Platforms with broadband access, MOOC’s, certificates, Open EdX, bootcamps
  - Online and “Solving the Access Problem”

- **Bite-sized chunks** – 10 Minute Segments and the mind-wandering problem,

- **Spaced Learning** – reiterate before you forget

- **Continuous Assessment/Feedback loops**

- **Desirable Difficulties**

- **Mind and Hand** – hands-on learning – examples:
  - Generative Learning
  - Tactile and Active Learning
  - Blended Learning
  - Enabler: VR/AR and prototyping technologies

- **New Pedagogy** through new, oncoming EdTech opportunities:
  - AI and digital tutors – personalized education
  - Digital certificates and badging (blockchain)
Recommendations: New Delivery Models backed by Industry Consortium

• Regional workforce efforts by groups of employers, w/state, CCs
• New Content – for oncoming advanced skills
• The Trifecta – reach incumbent workers, H.S., CC students in CCs
• Youth and CC level Apprenticeships to break the work/learn barrier
• improve the CC completion rate
• Short modular programs (stackable, connected to degrees, w/industry credentials)
• Integrate the stove-piped federal programs at the state level
• Lifelong learning system must be built – need lifetime skill upgrades
• New labor market information systems – industry recognized credential-base
• New education technologies – a key to the scale-up needed
• ALL REQUIRE EMPLOYER-EDUCATOR-GOV’T ENGAGEMENT
• CONSORTIUM MODEL IS KEY – work w/gov’t and education partners