

# 13

## **Manufacturing Connect**

### **Teaching Advanced Manufacturing Skills to Inner-City Students**

Rick Mattoon  
Susan Longworth

The purpose of this summary is to introduce readers to the Manufacturing Connect program, its intended outcomes, and the challenges faced in achieving those outcomes. The motivation for creating this summary was driven in large part by the important question raised by the program—does manufacturing, in particular advanced manufacturing, provide sustainable career opportunities for disadvantaged youth within their communities?—with an eye toward the potential for replicability in other schools and communities. We the authors are both affiliated with the program on a volunteer basis, as a board member (Mattoon) and advisory committee member (Longworth), and those roles have informed our impressions as put forth in this chapter.

Manufacturing Connect (MC) is the flagship program of the Chicago-based Manufacturing Renaissance organization. Its creation is based in several broad economic and social trends. The first trend has been the disinvestment and job loss in predominantly African American communities in Chicago that was often accompanied by a decline in manufacturing jobs in these neighborhoods. The second trend is the increasing difficulty that existing manufacturers have had in finding skilled workers. The final trend has been a growing desire in the city to provide a career-focused high school education option that can allow non-college bound workers access to better-paying jobs. These trends motivate broader social goals to encourage manufacturing growth in urban areas and to create economic opportunity in disadvantaged communities. As such, the MC program has complex goals that go beyond the traditional training program, which often simply focuses on improving employ-

ment outcomes for the participant. To execute its strategy, Manufacturing Renaissance depends on a stakeholder network to support the program. This network includes local manufacturers, community organizations, organized labor, the Chicago city government, and the Chicago Public School system.

## **WHAT IS THE MANUFACTURING CONNECT PROGRAM?**

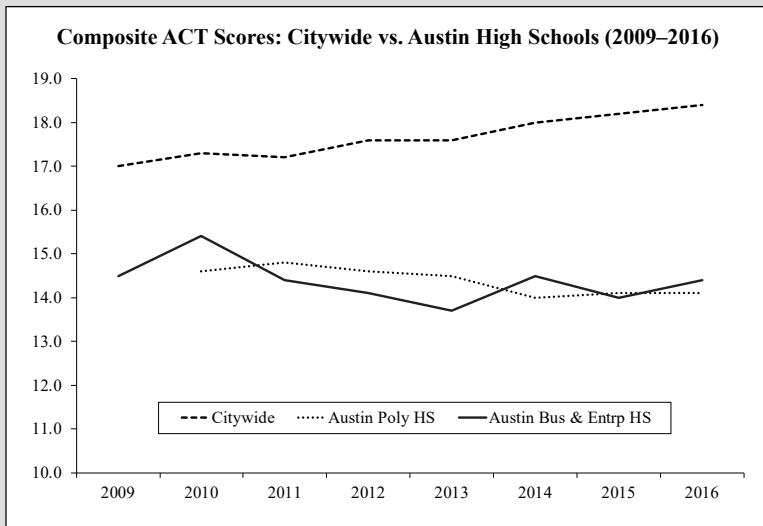
While started with primarily foundation support, Manufacturing Connect currently is funded for the most part by a four-and-a-half-year grant from the U.S. Department of Labor that supports the high school program.<sup>1</sup> Other public support funds the Young Manufacturers Association program, which focuses on young adults, ages 18–29.<sup>2</sup> The Chicago Teachers Union Foundation supports the Instructor’s Apprenticeship for Advanced Manufacturing, which provides teacher training. A fourth program focused on adult training began in February 2017 and operates under the auspices of a partner agency.

A clear challenge for the program has been issues faced by the high school in the Austin community (see Box 13.1) in which the program is embedded. Austin, located on the west side of the city, is the largest of Chicago’s 77 officially designated community areas. Austin College and Career Academy is a general-enrollment high school that has seen significant enrollment declines and has experienced academic performance issues. The school currently has just under 300 students (approximately 25 percent of its capacity). As a result, it is unable to provide and fill seats for a comprehensive general high school curriculum, making it difficult to both attract and retain students. In addition, the school has had six principals in the last 10 years.

MC is currently staffed by 11 people, with 9 assigned to the high school program and 2 to the Young Manufacturers program, which began in 2016. The variety of positions in the high school program illustrates the desire of the program to provide not only direct instruction but also supportive student services to increase the chances for success for student participants. In addition to a machining instructor, positions include a parent coordinator, an industry coordinator, a mentoring coordinator, a case manager, a tutor, and a postsecondary coach.

**Box 13.1 Understanding the Context: Chicago’s Austin Neighborhood**

The Manufacturing Connect program is currently housed within the Austin College and Career Academy, a merger of three underutilized high schools effective as of the 2015–2016 school year. The school currently has 287 students, 99 percent of whom are African American. The preexisting schools had a utilization rate of 30–35 percent in 2015, which motivated the merger. Year-end attendance rates (EOY 2016) at the three schools prior to consolidation were at least 10 percentage points below system-wide rates, although some progress had been made in recent years. Student achievement (as measured by ACT scores) also lags behind that of the district.<sup>1</sup>

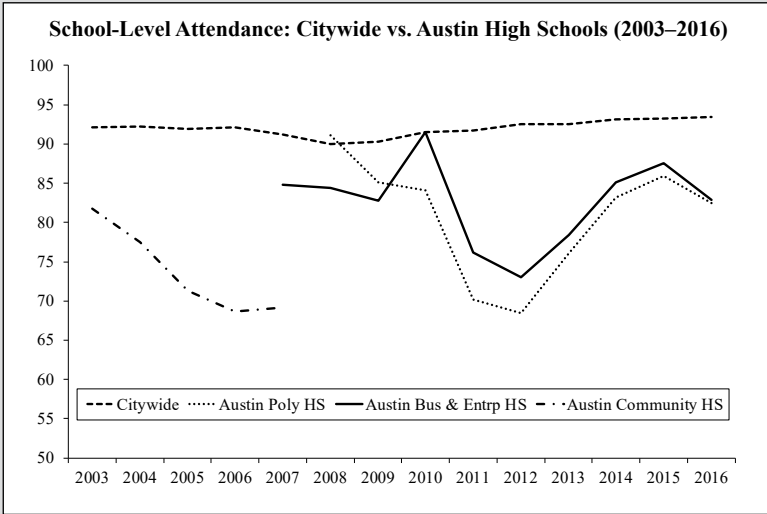


SOURCE: Authors’ compilation using data from schools (CPS 2018).

The struggling performance of the Austin high schools is evident from the two graphs, indicating that this is not a new phenomenon, nor one that is close to being solved.<sup>2</sup> This evidence reflects the broader condition of the community, which has struggled through decades of disinvestment, presenting additional challenges in meeting the student and school-based outcomes, but also greatly hindering the ability to meet community-wide objectives.

Population loss, since 1970, has been on par with the city as a whole; however, data in Box Table 1 reflect the additional challenges Austin residents have in engaging with the economy, stemming from declines in

**Box 13.1 (continued)**



SOURCE: Authors' compilation using data from schools (CPS 2018).

the labor force participation rate and significant increases in the unemployment rate. Although the percentage of the population with a bachelor's degree has increased, it has not kept pace with increases at the city level, nor has it appeared to offset a growing poverty rate. As is often reported in the news, Austin is plagued by a devastating incidence of violent crime, and advances in reducing violent crime citywide do not appear to have made significant inroads into this community. Austin is disproportionately African American, when compared to much of the rest of the city.

Researchers and practitioners alike often cite the chronic “disinvestment” that has plagued the Austin and other high-poverty, majority-minority communities across the city. To be sure, Home Mortgage Disclosure Act data point to a consistently lower level of mortgage originations in the Austin community when compared to the city.

Taken in the aggregate, these data point to a community whose residents are economically stressed and in need of opportunities that will help them provide for their families and sustain their community. Other community health indicators are even more striking, with low-birth-weight babies, infant mortality, teen pregnancy, stroke, and cancer rates among the worst in the city (City of Chicago 2018). One of the leading resources for both com-

**Box 13.1 (continued)**

munity and economic development can often be found within neighborhood educational institutions and the resources and services they provide in addition to a standard academic curriculum. However, in this case, the neighborhood high school is not in a position to play the role of community anchor.

**Box Table 1 Comparison of Austin and Chicago Demographics**

	Austin (2010)	Chicago (2010)	Austin, change since 1970 (%)	Chicago, change since 1970 (%)
Population	98,514	2,695,249	-23	-21
% of population under 18 yrs	27	23	-12	-28
Labor force participation (%)	58	66	-8	9
Unemployment rate (%)	23	13	451	200
Poverty rate (%)	30	22	212	54
% of over-25 population with bachelor's degree	11	34	83	315
% of population African American	85	2	-1	-16
Vacancy rate (%)	14	13	230	116
	Austin (2015)	Chicago (2015)	Austin, change since 2002 (%)	Chicago, change since 2002 (%)
Violent crimes	1,805	23,093	-8	-48
	Austin, per capita HMDA originations	Chicago, per capita HMDA originations		
1990	0.009	0.010		
2000	0.021	0.041		
2010	0.008	0.021		

SOURCE: American Community Survey, Home Mortgage Disclosure Act (HMDA), and authors' calculations.

**Box Notes**

1. These results are drawn from data from the three separated schools. Data for the merged school are not yet available. See also ACCA (2018).
2. The attendance graph reflects the attendance at the original Austin Community High School before it was divided into three schools, in a move that is consistent with a citywide trend toward smaller schools (CPS 2018).

The program prides itself on offering “wraparound services” to support the broad needs that often face disadvantaged high school youth.

The budget for the Manufacturing Connect program for FY 2017 is \$1,016,082, with \$892,082 (88 percent) allocated to the in-school MC program, and the remainder supporting the out-of-school Young Manufacturers Association. In the current school year, 130 students are participating in the in-school program, making the cost per pupil, per year, \$6,870. Costs are allocated between machine shop training and classroom/machine shop time (11 percent) and internships, summer jobs, work-readiness skills training, career/college coaching, engagement with partners, mentoring, and so on (89 percent). In addition, there are the costs of services borne by external organizations supporting MC students. MC refers students for support from other nonprofit community groups in Austin. These can include tutoring/math remediation, social work/case management, supports for child care, transportation, and housing.

## **DEFINING MANUFACTURING CONNECT OUTCOMES**

The program focuses on four outcome areas: 1) preparing students for employment, 2) preparing students for college, 3) increase odds of labor market success (by providing social supports), and 4) influencing community development. The most recent results are for the 2015–2016 school year.

Manufacturing Connect reports that 31 out of 32 seniors who participated in the program graduated from high school.<sup>3</sup> Of this group, 14 are attending college, with 4 studying engineering. Six of the graduates are currently working in manufacturing jobs.

The MC’s two main focal areas are to prepare students for work and to build their readiness for college.

In terms of work preparation and college readiness and exposure, 150 students (in grades 9–12) participated in some program activity in 2015–2016:

- 103 students were exposed to manufacturing jobs through job shadowing, job internships, summer jobs, and field trips, through the manufacturing partner engagement program. Through this

program, 58 manufacturers had 232 points of contact with students.

- Another aspect of the program provides students with nationally recognized industry credentials for the metal working industry. In 2015–2016, 46 students earned 67 National Institute of Metalworking Skills (NIMS) credentials.
- Finally, 67 students participated in a workshop series focusing on work transition. In the area of college readiness, 26 eleventh- and twelfth-grade students enrolled in the dual-credit Manufacturing Technology course at Daley Community College, earning at least three college credits.
- All graduating seniors applied to at least one college and completed their financial aid form (Free Application for Federal Student Aid, or FAFSA).

The final two programmatic areas concern wraparound social services and community capacity development.

Wraparound social services were extended to 33 students who were paired with a mentor, and 15 received regular academic tutoring. In community capacity development, Manufacturing Connect alumni (classes 2011–2016) have had 65 job placements, 222 career coaching sessions on topics including job placements, conflict resolution on the job, résumé writing, and job-search techniques. (Program leadership estimates that, on average, career coaches meet six times with each participant in preparation for a job placement or postsecondary education.) The program is also developing a student pipeline through middle school outreach. Some 198 eighth-graders participated in a five-week manufacturing and engineering enrichment program, with 60 expressing interest in continuing. Thirty teachers participated in 160 coaching sessions to build capacity for implementing project-based learning.

Manufacturing Connect has collected some data on outcomes since the inception of the program. As Table 13.1 indicates, there has been some volatility in both the number of students attending the high school and the number of participants in the program.

However, in terms of job tenure, of the 46 individuals placed in jobs, over 55 percent of graduates have been in their positions for more than 90 days, and over 40 percent had been with the same company for more than a year following placement.

**Table 13.1 Manufacturing Connect Outcomes per Graduating Class**

Graduating class cohort	# APA students	# of M3C participants	# of participants		# of work experiences	# placed in mfg. jobs
			w/ NIMS	# of NIMS		
2011	92	38	16	18	86	4
2012	83	53	53	87	103	18
2013	39	23	19	40	38	7
2014	60	25	25	47	59	3
2015	54	14	13	15	26	8
2016	60	32	21	28	51	6
Total	388	185	147	235	363	46

SOURCE: Manufacturing Connect.

## CHALLENGES TO THE MANUFACTURING CONNECT MODEL

### Maintaining Stakeholder Support

Intrinsic to the manufacturing connect model is the need for a broad-based “advocacy coalition” that includes stakeholders to promote and support the program. Such coalitions are by definition multifaceted and range from community-based engagement to aligned technical expertise. As a result, such coalitions can be hard to form and sustain, particularly when certain stakeholders may only be primarily interested in one aspect of the program. At its inception, Manufacturing Connect cultivated a unique alliance between industry and labor by including the Illinois Manufacturers Association and the Chicago Federation of Labor as key constituencies; however, support from key community groups was not garnered at the outset. Initial support from the Illinois Manufacturers Association has been replaced by support from individual manufacturing firms. ACT (Austin Coming Together, comprising a coalition of 50 member community organizations) initially had at best lukewarm support for the project, although since then it has been actively engaged.

ACT and MC have been working closely together to shape an economic and workforce development agenda that prioritizes manufac-



turing. This includes convening other local organizations and service providers to ensure local residents have access to manufacturing career pathways, either through the MC program at the high school or through other similar training programs. For example, ACT was responsible for bringing the Jane Addams Resource Corporation (JARC) to the table, which led to establishing an adult training program, set to open in early 2017.

MC has working relationships with several other organizations that could be further developed. Currently the structure is more of a referral relationship in that they refer participants to MC and work to supplement each other's programs. For example, MC works with Westside Health Authority, Bethel New Life, the Center for Nonviolence, Safer Foundation, Youth Guidance, Access Community Health Network, New Moms, Primo Center for Women and Children, and Banner Academy (an alternative school).

With much of the program to date funded by external sources—federal and philanthropic—MC leadership struggles to align interests and funding to sustain activities, a common problem for entities working in an environment of scarce and sometimes competing resources.

### **Is the Model Correct: Is Manufacturing the Right Target?**

As indicated by its multiple outcome measurements, the Manufacturing Connect program can be viewed through a variety of outcome lenses. However, connecting all is the presupposition that manufacturing (re)development—the retention and creation of quality manufacturing jobs and their companies—is one of the best opportunities for rebuilding distressed communities. To support this, Manufacturing Connect points to the outsized multiplier impact of manufacturing jobs on the economy. MC estimates that for each \$1 of domestic manufacturing value-added, another \$3.60 of value-added is generated across the rest of the economy. Similarly, they suggest that each manufacturing job creates five other jobs in the economy. Finally, they point to higher wages paid to manufacturing workers.<sup>4</sup>

However, there are some challenges that the program needs to address. First is the geography of manufacturing. Given possibly higher land costs, less favorable (often smaller, noncontiguous) land availability, higher taxes, safety and congestion issues, as well as eroded

infrastructure, in distressed urban areas, Manufacturing Connect needs to establish that these locations are economically viable manufacturing investments. For students who complete the program to be able to stay in the community, they must be able to find manufacturing jobs in close proximity. Otherwise, participants have to leave Austin in order to take advantage of jobs that may be available outside the city's boundaries, overcoming transportation barriers.

Second, the program must be responsive to the trend toward declining manufacturing employment and increased automation in the sector. While manufacturing output has continued to rise, employment levels continue to slump—often against a countervailing narrative of unfilled jobs and a “skills gap.” During the Great Recession, manufacturing job losses exceeded two million, and through September 2016, roughly 30 percent of those jobs had been recovered. While the existing jobs within the sector may be good, manufacturing is unlikely to add jobs as quickly as other sectors of the economy. For example, if a program was focused on accessing employment in the fast-growing education and health sector, it would pay dividends, as jobs actually increased by 689,000 in that sector during the Great Recession and have since grown by almost 3.2 million during the recovery (BLS 2018). Furthermore, given the concentration of large hospitals and universities in urban areas, access to these jobs for urban residents may be easier.

Austin is the largest of Chicago's 77 communities, both by area and population. Located on the western boundary of the city, it is positioned near transportation assets, something that has often been cited as a competitive advantage for the community. The southern portion of the community is bisected by an expressway, having access to freight rail and other intermodal services with the capacity to serve small manufacturing companies. There is a slightly higher percentage of manufacturing companies located within the Austin community limits than is reflected citywide. However, the majority of businesses in the community are service, retail, and health care or social assistance.

## **Significant Upfront Costs Yield Distant Payoffs Leading to Fear of Metrics, Given That Program Is Expensive and Payoffs Will Be Long-Term**

### **Upfront costs**

Programs that are designed to serve disadvantaged populations often are more costly in order to address barriers to work. As Manufacturing Connect shows, many of these expenses are tangential to the academic component of the program, as students need social supports and extra tutoring to succeed. In the case of Manufacturing Connect, this can be a particularly high hurdle, since the curriculum focuses on advanced math and engineering skills for a student population that often lacks appropriate prerequisites. In an application to the John D. and Catherine T. MacArthur Foundation “100 & Change” grant competition, Manufacturing Connect estimated that, over five years, a fully scaled program could produce a maximum of 4,080 graduates at an estimated program cost of roughly \$125 million. This would put the all-in cost per graduate at roughly \$30,600.

### **Long-term returns**

Another unknown at this point is the advancement path of graduates. Given how few cohorts have graduated from the program, it is difficult to assess whether students who obtain jobs through the Manufacturing Connect model are able to receive career and wage advancement. A related aspect of this is whether the NIMS credentials that the students receive translate into recognized salary gains. In theory, credentials that establish competence should see salary benefits.

### **Measuring return on investment**

Using a business-focused metric like return on investment (ROI) can seem out of sync with the mission-driven nature of a nonprofit social enterprise. However, funders are increasingly interested in the efficiency with which funds are converted into tangible mission goals, and they often ask for explicit calculations of returns on their invested funds. As such, Manufacturing Connect needs to consider three dimensions of ROI: 1) returns to the student/program participant, 2) returns to the school system, and 3) returns to society/the community.

Quantifying returns to the student in the program is perhaps the most frequently requested outcome measurement. Understanding whether the student is better off by participating in the program can be measured along two dimensions. First, what outcomes are better for the student in Manufacturing Connect compared to a similar student who does not participate? Second, does the Manufacturing Connect student do better than similar students who participate in other career preparation programs in nonmanufacturing fields? Both dimensions require measuring wages over time for each graduating cohort. Given the relative youth of the Manufacturing Connect program, many graduates are now in college and have yet to reach full-time employment.

The second return is to the Chicago Public Schools (CPS). Given that much of the program expense for Manufacturing Connect is currently covered by philanthropic foundations and the U.S. Department of Labor, Manufacturing Connect puts little budget pressure on the financially strapped CPS. However, in order to have a sustainable program in the future, CPS will need to significantly increase its financial commitment. In fact, one model for expansion of Manufacturing Connect suggests that it use a franchise structure by which CPS would essentially pay Manufacturing Renaissance an annual franchise fee to have additional Manufacturing Connect-style programs in other CPS schools. In practice, this would mean that CPS would need to measure the educational and community benefits it receives from Manufacturing Connect against the benefits from all other programs CPS must provide. Will Manufacturing Connect be able to demonstrate that it provides a higher rate of return to CPS in comparison to other career education courses or adding additional course offerings across the entire system? Manufacturing Connect will need to establish a clear set of returns that either are currently not available to CPS or exceed the returns they are getting from existing programs. However, in order to truly measure return, the programmatic contexts must be calibrated across institutions. Currently, the MC program is housed within an underutilized school (see Box 1), undermining the ability to embed programmatic offerings within a robust general curriculum, and most likely accruing additional costs to the program.

Finally, Manufacturing Connect needs to establish the broad set of benefits that it can provide to society and the city at large. To estab-

lish the case for broad public support (beyond the CPS), Manufacturing Connect needs to show that general taxpayer support for the program will increase returns for society as a whole. These measures can include higher tax receipts (reflected by higher wages of program graduates) and more stable inner-city neighborhoods, as well as avoided costs through reductions in social service expenses. Many of these benefits will be avoided costs, so they are hard to calculate, but identifying them can help make the case that all taxpayers will receive a benefit from the program. The key to fully operating or expanding is to establish who should pay for supporting Manufacturing Connect.

## CONCLUDING OBSERVATIONS

It is still too early to judge the success of the Manufacturing Connect program in Austin. On the positive side, the program has continued to receive external funding support and has shown the ability to add resources (such as wraparound services) that are likely to help students succeed. However, it is our opinion that four aspects of the program need further development or refinement.

**1. The current project struggles to quantify explicit goals for neighborhood and economic development.** Since reversing disinvestment in urban communities is a goal for the program, it seems appropriate to establish measures for how new investment might occur and for defining what the relationship is between providing training in advanced manufacturing and attracting firms into the neighborhood. At one point, the parent (Manufacturing Renaissance) was actively involved in clearing and preparing a new industrial site in the neighborhood for redevelopment, but this effort has since stalled. During its period of involvement, it was clear that this commercial development effort drew resources and focus away from the educational program. This raises the issue of carefully examining the internal capacity of any not-for-profit and its ability to provide expanded services. If, however, community development is a goal of the program, it seems reasonable to offer some specific goals for measuring new investment and retention

of businesses, as well as specific measures of whether manufacturing activity expands within the Austin community. Partnering with an economic development agency might be an appropriate strategy.

**2. Another consideration in evaluating the program involves the structural challenges of the Austin community.** In many ways, MC is a “boutique” educational intervention designed to appeal to a specific type of student. Therefore, is it reasonable to expect broad success for a program that is placed into a high school struggling with leadership issues in a neighborhood that suffers from chronic disinvestment? The answers may become apparent if MC is expanded to larger and more stable high schools in Chicago, with an expanded capacity to implement lessons learned from the Austin experience, but as currently configured, it may be that the program is simply being asked to do too much. As such, measuring the environment for success and determining whether the complementary resources are available may be a necessary step in judging the “fit” of MC with the community. In an ideal world, one would want to develop a list of community characteristics that might be necessary to ensure success. A primary indicator would be the existence of a community-driven “quality of life” or economic development plan that would clearly articulate the need for and commitment to such a program.

**3. Defining the capacity of the not-for-profit to deliver the program.** Having a reliable revenue stream is often a challenge for not-for-profits. Foundation support can be unpredictable and is often designed to serve as “start-up” funding for a program and not for sustained support. Government grants can be equally constricting, either in scope of time or impact. This volatility in funding often causes organizations to expand and contract according to funding levels, and even shift course in response to a funding opportunity. An educational program such as MC will take many years to fully demonstrate results. As such, stable and predictable levels of funding are critical, as well as a clear focus on what MC is trying to achieve. Nonprofit organizations are often challenged to ensure that staffing and budget allocations support the core mission rather than being diverted into other areas, especially in cases where there is not a clear policy agenda driving their efforts.

**4. Commitment to evaluation.** Program evaluation is often expensive and frequently is not paid for by funders. For an innovative program such as MC, it is critical that an evaluation structure is put in place from the outset and maintained so that efforts to understand what does and does not work in the program can be identified. The current set of reported outcomes from the program fail to establish whether the results are good or bad. Since there were no *a priori* standards set for what outcomes to expect, interpreting whether the program met or exceeded goals in terms of the number of participants, graduates, or credential recipients is difficult.

In summary, while the MC program operates with the laudable intention of retaining good-quality jobs and lifting the economic prospects of its host community and its residents, many factors affect the program's ultimate success. In this case, context matters, as there are significant challenges to the program at both the community level as well as system wide. The program would benefit from increased efforts to collect both performance and "context" data, working toward documenting both short-term and long-term outcomes. Finally, within a shifting funding landscape, especially at the federal level, the MC program is in dire need of long-term, sustainable strategic support that would allow key staff to focus on developing the model and identifying opportunities for expansion and replication that would return economies of scale to management.

## Notes

1. For more information on the Manufacturing Connect program, see the chapter "Youth Job Creation and Employer Engagement in U.S. Manufacturing," by Nichola Lowe, Julianne Stern, John R. Bryson, and Rachel Mulhull, in Volume 2 of this book.
2. The Young Manufacturers Association is the programmatic umbrella used to serve two groups: 1) Manufacturing Career and College Connect program alumni and 2) other 18–29-year-old young adults interested in pursuing career-track training and employment in manufacturing.
3. For the purposes of the program, a Manufacturing Career and College Connect (MCCC) program participant is defined as a student who meets three conditions: that student 1) is enrolled in the Austin College and Career Academy (Austin Polytech), 2) is programmed into the engineering/manufacturing course sequence, and 3) has completed an MCCC application with parent signature for permission to

participate in the program. For the high-school level program, these are the only three requirements.

4. The website of the National Association of Manufacturers largely echoes these calculations. See National Association of Manufacturers (2018).

## References

- Austin College and Career Academy (ACCA). 2018. *Welcome*. Chicago, IL: Austin College and Career Academy. [accachicago.cps.edu](http://accachicago.cps.edu) (accessed August 6, 2018).
- Bureau of Labor Statistics (BLS). 2018. *Employment, Hours, and Earnings from the Current Employment Statistics Survey (National)*. Washington, DC: Bureau of Labor Statistics. <https://data.bls.gov/cgi-bin/surveymost?ce> (accessed July 25, 2018).
- Chicago Public Schools (CPS). 2018. *2018 School Data*. Chicago, IL: Chicago Public Schools. <http://cps.edu/SchoolData/Pages/SchoolData.aspx> (accessed July 25, 2018).
- City of Chicago. 2018. *Public Health Statistics: Selected Public Health Indicators by Chicago Community Area*. Chicago, IL: City of Chicago. <https://data.cityofchicago.org/Health-Human-Services/Public-Health-Statistics-Selected-public-health-in/iqnk-2tcu/data> (accessed September 4, 2018).
- National Association of Manufacturers. 2018. *Top 20 Facts about Manufacturing*. Washington, DC: National Association of Manufacturers. <http://www.nam.org/Newsroom/Top-20-Facts-About-Manufacturing/> (accessed July 25, 2018).