

*A modern-day revolution in manufacturing prioritizes social inclusion, education and workforce development, community development, and environmental restoration through public-private partnerships.*

# Balancing Innovation in Technology with Social Inclusion

## The Second Industrial Revolution



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### Dan Swinney

**N**ews stories describe the marvels of a hand-held device with more power than the Apollo space rocket, apps that can do almost anything, a driverless car being tested on city streets, 3D printing that creates a low-cost functional prosthetic hand, robots that perform advanced surgery, and projects that push the limits of artificial intelligence.

These new technologies suggest that a truly advanced society is achievable, and they may even give rise to utopian dreams.

Yet other stories in the media on any given day suggest that dystopia could prevail:

- Income inequality is increasing: 80 people have the combined wealth of half of the world's population.
- In the United States there are troubling signs of deepening racial polarization, with the killings and demonstrations in Ferguson, Staten Island, Baltimore, and Cleveland.
- An environmental crisis threatens daily life in very immediate ways in every section of the country, from Beverly Hills to Staten Island to New Orleans.
- Many major cities are actually two cities with the same name in the same location, one populated by those who are white and wealthy and the other by people of color who are poor.

- Increasing political polarization at every level of government hampers responses to conditions that require a unified and effective effort.

These serious concerns share a significant contributing factor: manufacturing, as shaped by the First Industrial Revolution. After sketching the history and impacts of the First Industrial Revolution, I point out the long-term costs of its values—all too evident today—to the US economy, society, environment, and manufacturing sector. Those values were principally the private accumulation of wealth. At this last stage of the First Revolution, that priority has deeply compromised the health of the US manufacturing sector and society.

Yet even at the birth of the First Industrial Revolution, there were the seeds of a Second Industrial Revolution—a revolution led by the public sector with a vision of manufacturing as the essential means to solve fundamental social, economic, and environmental problems. This “revolution” prizes a modern education system, community engagement, and environmental sustainability and restoration through public-private partnerships. These partnerships recognize the absolute necessity of a strong financial return on investment for the private sector partners.

In this article I present three regional examples of a modern-day Second Industrial Revolution that can lead the United States toward a brighter, stronger, and more prosperous future.

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*The character of US manufacturing began to fundamentally change in the late 1970s, when jobs were lost and factories closed.*

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### **The First Industrial Revolution and Its Long-Term Impacts**

The First Industrial Revolution, beginning in the late 1700s and first formed in cities such as Manchester, England, was motivated by a new private sector freeing itself of the shackles of feudal rule. The pioneers of industrial production launched a wave of development that resulted in an explosion of innovation in

technology, in the character of production, and in wealth creation—and gave rise to the modern world.

But industrial development was principally driven by a desire for private accumulation of wealth by the leading entrepreneurs and financiers, and from the beginning there were intended as well as unintended negative consequences. Grueling child labor, long days, low pay, and dangerous working conditions became commonplace. Cities were stratified into rich and poor neighborhoods. And later the contamination of the environment became evident, much of it from unregulated or unsupervised production practices and processes.

Although some governmental systems emerged or adapted to address the changing economic and social landscape, the private leadership of production remained essentially unchanged. It yielded steady progress—particularly in the developed world—and so made the costs acceptable. In the United States, the dramatic growth of production created a prosperity and a broad-based stable middle class that became the envy of the world until the early 1970s.

### **US Industry and Manufacturing: Financial and Technological Impacts**

In the early days the development and maintenance of the industrial base relied on patient capital. In the 1970s new information technologies emerged as did the modern computer. These breakthroughs not only began to revolutionize production but gave the financial community the ability, through the skillful use of new tools and products, to gather and analyze trillions of bits of information in microseconds—and with it the ability to shift capital around the world and make enormous wealth. Such wealth was often made by cannibalizing the same manufacturing companies that had been the beneficiary of investment for decades.

New technologies and capacities also allowed large companies to quickly move production offshore in the search for lower-cost labor. David Roderick, former CEO of US Steel, is reported to have said “I’m in this business to make money, not steel.” Manufacturing became deeply impacted by short-term thinking that focused on the highest financial returns in the shortest amount of time.

With these developments the character of US manufacturing began to fundamentally change by the late 1970s. Employment declined from a high of 19 million workers in 1979 to 12 million in 2014. In 2000–2010 alone, 5.7 million manufacturing jobs were lost, repre-

senting one third of the workforce. From 2000 to 2009, over 60,000 factories closed, including 40 percent of the country's largest factories that each employed over 1,000 people (Miller 2014, p. 10).

In the mid-1980s there arose a number of disputes around the country between labor and management, manufacturers, cities, and communities about plant closings. By the late 1990s low-skilled work in the United States had, in large part, moved offshore and what is now called the *skills gap* became apparent.

A powerful section of the private sector had walked away from serving as the steward of productive capacity, and with the decline in manufacturing came the acceleration of social problems such as poverty. At the same time, public education was subjected to massive cutbacks in vocational education programs, stripping the connection between education and the manufacturing sector. This loss was exacerbated as the latter embraced new technologies that required more skills for even entry-level workers because companies found that if they wanted to survive they had to shift to high-value-added work—to advanced manufacturing and technological innovation.

But with this shift American manufacturing companies discovered that they couldn't find the talent they needed for production—a problem that is becoming particularly acute with the retirement of baby boomers. The numbers were significant. In Chicago in 2001, some 10,500 jobs in manufacturing had to be filled, whereas there were, at best, only 5,600 qualified candidates for those positions (CFL and CLCR 2001, p. 88). At the same time, there were thousands of people, many in innercity communities that had been devastated by deindustrialization, desperate for jobs and careers.

What does the future hold for the US manufacturing sector and society?

### **The Early Seeds of the Second Industrial Revolution**

Even at the time of the First Industrial Revolution, some pioneers had a different vision of how industrial capacity could be developed in ways that supported greater public involvement, innovation, and productivity for broader benefit. These were the early seeds of the Second Industrial Revolution, embedded in the same soil as the First.

In 1817 Scottish industrialist Robert Owen called for his cotton mills to be guided by the principles of “eight hours labor, eight hours recreation, eight hours rest”

(Widrich 2014). By the 1840s, just outside Manchester, England, cooperative enterprises had formed under the umbrella of the Rochdale Cooperatives<sup>1</sup> and were managed democratically.

Since the 1940s another trend in manufacturing has evolved, led by visionaries driven by a desire to innovate in both manufacturing and community development. They saw manufacturing as a means to reduce poverty and build a broad-based middle class. As the world acknowledges and contends with the social and environmental impacts of the First Industrial Revolution, manufacturing can be a means to address them through new products and processes. This idea is vividly exemplified by two regional economies—Mondragón in Spain and Emilia-Romagna in Italy—that are global leaders in advanced manufacturing and that became the inspiration for an effort to rediscover, redefine, and rebuild manufacturing in an innercity Chicago community.

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### **Mondragón: Civil Leadership**

Mondragón is a town in the Basque region of Spain. Wracked by the Spanish Civil War, the region in the 1940s was very poor and undeveloped when a young priest, Father Arizmendi, was assigned to serve the area. The region had iron deposits and a few manufacturing companies, and Arizmendi understood that its recovery would be through the development of a strong manufacturing sector. As one of his leading students, Juan Leibar, commented, “We Basques have used up all our natural resources and we have to sail thousands of miles for fish. Our only resources are human so that education and technology are essential for our survival as a people” (Mathews 2009, p. 177).

<sup>1</sup> The Rochdale Cooperatives, established in a village of the same name in the mid-19th century, were based on principles such as democratic management, economic participation, education and training, and concern for community. They were the basis for the creation of the International Cooperative Alliance (ica.coop).

Arizmendi started a small polytechnical school in the 1940s with 20 students. They studied various technical components of manufacturing as well as Arizmendi's strong social values. In the 1950s five of the students purchased a small gas stove company, which they organized as a cooperative: one worker/one vote, and the highest paid didn't make more than 3 times the lowest paid. This formula for management and compensation permitted significant reinvestment of the margins, to promote both technical and workforce innovation. Despite fears to the contrary, the company was very successful.

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Today, the Mondragon Cooperative Corporation (MCC) comprises more than 250 companies, employing about 83,000 people and representing diverse businesses from manufacturing to banks and supermarkets. In 2011, the company had 94 overseas plants, including 13 in China, and \$4.41 billion of the \$6.59 billion sales in its industry division were outside Spain.

In 2013 the MCC won the prestigious ArcelorMittal Boldness in Business Award for “lo que representa en términos de una nueva propuesta real de modelo de negocio, ‘Humanity at work,’ basada en la cooperación, en el trabajo colectivo, en la solidaridad, y en la implicación de las personas en el ámbito laboral” (Europa Press 2013).<sup>2</sup> The *Financial Times*, a sponsor of the prize, noted that the corporation “remains profitable while paying 90 percent of its workers more than their peers at rival companies” (Johnson 2013).

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<sup>2</sup> Translation: “for what it represents in terms of a real proposal of new business model, ‘Humanity at work,’ based on cooperation, collective work, solidarity, and the involvement of people in the workplace.”

### **Emilia-Romagna: Political Leadership**

Emilia-Romagna (ER) is a region in Northern Italy that includes Bologna, its capital. Known for major auto companies such as Ferrari, Lamborghini, Maserati, and Ducati, it features a high standard of living, great food, and beautiful small towns. It also has more entrepreneurs per capita than any place on earth, as well as numerous small manufacturing companies, many cooperatives, and a unique history of state and political forces shaping the region based on more community-based values and performance.

ER was a backward and undeveloped region of Italy before World War II. Under Mussolini, the Italian Communist Party led the partisan guerrilla war to defeat the fascists. It also distinguished itself from the international communist movement by embracing market economics, democracy, and entrepreneurship; supporting the development of cooperative firms; and recognizing the importance of building the manufacturing sector through the development of small firms.

ER benefitted from these approaches and is now one of the wealthiest and most developed regions in Europe, with the third highest GDP per capita in Italy. It has 60,000 small companies—many in advanced manufacturing—an indicator of the entrepreneurial culture. For example, the small town of Ozzano Dell’emilia, with a population of just 11,400, has 1,400 businesses (Pfleger 2012).

Cooperatives—businesses owned and managed by their employees, consumers, clients, or suppliers—are also integral to the ER economic success. The town of Imola is fairly typical: 50 percent of its residents are members of a cooperative and 17 percent of the workforce is employed directly by cooperatives (Hancock 2007).

Complementing the strength of the cooperative movement and large number of small, privately owned companies, the region’s government is instrumental in promoting the competitiveness and development of its manufacturing sector. Since World War II the regional and local governments in ER have played a very active role in promoting innovation and competitiveness, particularly through small and medium-sized enterprises.

Leading this work over the past 35 years has been the regional consortium for innovation and technology transfer ASTER ([www.aster.it](http://www.aster.it)), formed in 1980 to implement the region’s policies to promote innovation. ASTER has organized service centers for clusters of small companies in a particular sector to increase their com-

petitiveness globally—a practice that has now evolved to creating strong linkages between universities, research centers, and small companies. Today this small region has 89 industrial research centers and enables almost 600 graduating engineers to work in small companies for three years at no cost to the company.<sup>3</sup>

ER represents key values of the modern-day revolution in industrial development in its promotion of advanced manufacturing tied to innovation and community and workforce development, reflected in its extensive cooperatives and the active engagement of the public sector.

### **Chicago: Public-Private Partnerships with Labor in the Lead**

During the labor disputes of the 1980s Chicago saw bitter and polarizing fights at Brach Candy Company, Stewart Warner, Playskool, and a number of other major manufacturers. Inspired in part by examples such as Mondragón and Emilia-Romagna, Chicago's Federation of Labor (CFL) partnered with the Manufacturing Renaissance (MR; a not-for-profit consulting and research company focused on the challenges of manufacturing) to address the emerging crisis. They had come to understand that the loss of manufacturing was not inevitable or beyond remedy; that manufacturing was essential for a sustainable and secure workforce and society; and that both the public and private sectors could intervene in a way that addressed the needs of both the private sector and society.

The CFL and MR secured a grant from the US Department of Labor to study the increasingly evident failure of the public education system to meet the needs of the manufacturing sector and of residents eager for employment. The study not only documented the problem but proposed practical reforms based on best European practice in education linked to manufacturing (CFL and CLCR 2001). The analysis and recommended reforms caught the attention of the manufacturing sector and some of its associations and led to a new partnership, the Chicago Manufacturing Renaissance Council (CMRC), committed both to advanced manufacturing as a foundation for the region and to development in the communities devastated by deindustrialization.

This fusion of the promotion of advanced manufacturing and technological innovation with workforce

and community development lies at the heart of the mission of the revolution in the development of the manufacturing sector. In Chicago this was led, in large part, by the labor movement rather than the private sector in manufacturing.

The first and most widely known project of the CMRC was the creation in 2007 of a public school in the inner city, the Austin Polytechnical Academy (APA), and a Manufacturing Connect<sup>4</sup> program linking the school to the manufacturing sector—an excellent example of the programs and partnerships representing the new revolution. Austin was one of the most challenged communities in Chicago, with high rates of poverty, unemployment, crime, and a low-performing public school system. The location was chosen to demonstrate CMRC's commitment to advanced manufacturing and community development.

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*Austin Polytechnical Academy educates the next generation in all aspects of manufacturing—not only production but also management and ownership.*

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Rather than a traditional vocational school, APA was modeled after the founding school in Mondragón, to educate the next generation of leadership in all aspects of manufacturing, including not only production but also management and ownership. It's one of three small schools housed in the Austin campus and has about 130 students. Fifty-five companies partner with the academy, principally out of self-interest in finding the talent they need to compete in the global economy. The school's WaterSaver Faucet Manufacturing Technology Center is accredited by the National Institute for Metalworking

<sup>3</sup> Paolo Bonaretti, managing director of ASTER, Emilia-Romagna Region and ASTER presentation, April 14, 2014.

<sup>4</sup> Manufacturing Connect is a program of Manufacturing Renaissance creating a partnership between Chicago Public Schools, local manufacturers, and the Austin community that provides students with college and career exposure, field trips to manufacturing companies and trade shows, job shadowing experiences, paid internships, summer jobs, industry-recognized machining credentials, and full and part-time employment after graduation.



Skills (NIMS) and, in addition to a high school diploma, students can secure nationally recognized portable NIMS credentials in metalworking and college credits.

Manufacturing Connect is recognized, after initial skepticism, as an essential program for redeveloping the community. Leaders in other states are looking to it as a model for promoting advanced manufacturing to develop challenged communities, and the program received a \$2.7 million grant from the US Department of Labor in recognition of its potential for replication in other cities.

### Conclusion

America is a society of increasing contrasts. The improvements that accompany constant technological innovation are offset by growing income inequality, marginalization of many communities, a shredding of the social safety net, and growing political polarization.

The health, management, and development of the US manufacturing sector are critical in determining whether utopia or dystopia is in America's future. The dynamic examples described here, of a modern-day second revolution in industrial development, herald new possibilities in which investment in technological innovation is matched by investment in solving social, economic, and environmental challenges. This new movement, led by a broad coalition of public and private sector leaders, suggests an optimistic future.

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