

Software Eats Manufacturing (and Manufacturing Gains)

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(IW - Mark Muro, Kelly Kline and Bruce Katz: 2-9-16) It's been five years since the venture capitalist Marc Andreessen quipped that "software is eating the world," meaning that all of the digital tools and platforms needed to transform industries through software finally worked and were doing that. To prove his point, Andreessen ticked off a long list of mostly consumer-facing service industries like bookselling, music, telecom, and air travel that were being productively disrupted. Though he noted that the global economy would soon be "fully digitally wired," he didn't have as much to say about the manufacturing sector.

However, waves of digitization have been coursing through the manufacturing sector as well, creating new opportunities. Digital technologies are rapidly transforming the design, production, operation, and use of items as diverse as cars, workout clothes, and light bulbs. The changes have huge implications for industries and places, workers, and entrepreneurs.

To explore these implications, the Metro Program, in partnership with the city of Fremont, Calif., convened its second advanced industries regional workshop last week in Silicon Valley—the world focal point for the digitization of everything.

Such digitization is now so ubiquitous as to practically define the nation's critical advanced industries sector, including manufacturing.

The session brought together two dozen industry executives, entrepreneurs, investors, scholars, and economic development officials to tour an emblematic factory (Tesla Motors); discuss the latest trends in the Silicon Valley manufacturing ecosystem; and parse their implications for companies, regions, and the U.S. economy. Many, many trends were raised and assessed during the day's discussions on the campus of Seagate Technology, in the former Solyndra solar factory, but a short list of compelling conclusions with broad implications came into focus.

Here are five takeaways:

- The digitization of everything is potentially very good for U.S. manufacturing. Sure, the software genie is worldwide in scope. Shenzhen-based factories are wired too, and Germany is in every conversation. However, the fact remains that most of the IT technologies revolutionizing manufacturing and advanced industries today reflect American competencies, ranging from increasingly powerful visualization software; computer assisted design (CAD), 3-D printing, and rapid prototyping tools; and key forms of automation and machine learning to the cloud, the Internet of things (IoT), and data analytics. Most notably, the fact that software underlies all of these technologies and that eight of the largest 10 global software companies are American suggests that current trends play heavily to America's strengths. "You need to have a software culture now [to be a manufacturer] and the Valley and the U.S. have that," said Helmuth Ludwig, the chief manufacturing officer of Siemens PLM Software, "U.S. dominance in software is a huge advantage given where things are going." Added Russ Fadel, the founder of ThingWorx, an IoT firm: "The cloud makes software more central, and that opens up new production opportunities for our companies." That "the modern technology stack can be delivered instantly," as observed Dan Levin, the chief operating officer of Box, a cloud storage provider, means that "IT is ready to enable every positive trend."

- "A hardware start-up is no longer a contradiction in terms." Some of the same trends (and others) are also changing the game for entrepreneurs. Conventional wisdom has long been that software start-ups are the American way (think Microsoft, Facebook, What'sApp) but that manufacturing start-ups are too hard, given the costs and complexities of design, equipment, production, materials, and distribution. Now, though, that is changing, said multiple workshop attendees. TechShop founder Mark Hatch noted that entrepreneurs around the Midwest, as well as in the Bay Area, are "getting a feel" for how to reduce the costs of hardware start-ups using cloud-based digital tools and physical ones provided in "maker spaces" like TechShop. Likewise, Ben Einstein, the co-founder of the hardware-oriented venture capital firm Bolt, noted that "a hardware start-up is no longer a contradiction in terms," now that more VCs will provide funding, or, like Bolt, help incubate and accelerate startups at the "intersection of hardware and software." And for that matter CEO Scott Miller described how his company Dragon Innovation

functions “like a Match.com of manufacturing” that helps would-be manufacturers connect with contract factories to produce sizable production runs. Increasingly, it seems a suite of tools and supports like the ones that have fostered so many software start-ups are in place to support hardware start-ups.

- “In fact, productive new connections can now be imagined between the “maker” movement and industry. The increasing feasibility of serious hardware start-ups noted by Hatch, Einstein, and Miller also stirred up dialogue about more convergences of the smaller-scale maker community and larger-scale advanced manufacturing. Kate Sofis, executive director of the non-profit SFMade, stressed that the two communities are now bifurcated and that there’s a need to find some middle ground between hobbyist prototyping and scale. With that on the table, several speakers said they thought some of that middle-group was coming into focus. “A lot of lifestyle businesses used to not be able to get started in manufacturing, which was a pitfall for any small-scale renaissance,” said Hatch. “Now, access to tools, capital, and other supports is making manufacturable products like the [Oru] collapsible kayak possible,” continued Hatch. Coming from the industry side, CEO Nat Mani of the contract manufacturer Bestronics reported that his company is increasingly working with small start-ups as a form of “business development” and to track new technology development. In Fremont, it seemed possible to imagine a near future in which small-scale makers (empowered by cloud-based platforms and tools) become meaningful participants in regional manufacturing ecosystems.

- With all of that said, the convergence economy is bringing new challenges. Leave aside the looming land-use problems facing Silicon Valley, summarized by one executive as: “We’re running out of land!” Beyond that, the valley offers an extreme case of multiple finance, training, and network issues that are critical across the country. Einstein and Mike Abbott, a general partner at venture firm Kleiner Perkins Caufield & Byers, each acknowledged that VCs are still very much on the sidelines of hardware investment. Several voices named the limited supply of middle-skill technical workers—including ones with a feel for design and especially coding—as the biggest impediment to software-powered manufacturing growth. Brookings Trustee Antoine Van Agtmael said flatly that, “It sounds like the region is out to lunch on job training.” And Levin, for his part, was blunt about efforts to intensify the matching and linking of the region’s software/manufacturing cluster. Declared

Levin: “We do a horrible job of nurturing the networks effects that could be huge here. There is no formalization and matching of the assets here.”

- States and metropolitan areas need to focus. Ultimately, many in the group agreed that states and localities have key roles to play if U.S. metropolitan areas are going to monetize the digitization of manufacturing. With federal processes gridlocked, multiple workshop attendees agreed with City Innovate Foundation Board Chairman Peter Hirshberg that linking software and hardware and start-up and industry communities is “a distributed problem” that will be worked out city by city, ecosystem by ecosystem. In that vein, multiple attendees agreed that that states and localities are the natural leaders of bottom up initiatives to develop much better training and apprenticeship initiatives that leverage true public/private partnerships, as opposed to public systems that simply solicit input. Others stressed the need for regional maker communities and industry networks to link up more. And others stressed the need to shape urban innovation districts such as the emerging Warm Springs area in Fremont to foment collaboration.

In the end, it was clear that both Silicon Valley and other regions can benefit if their advanced industry communities can become meet ups of software and hardware competency. Given U.S. software dominance, digitization looks set to revolutionize more industries and give them a new shot at competitiveness. Shouldn't ensuring that that happens rapidly and successfully be part of U.S. and local strategies for advanced industry leadership?

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