

## IBM Institute for Business Value

# The new software-defined supply chain

## *Preparing for the disruptive transformation of Electronics design and manufacturing*



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### Overview

Adaptability is a hallmark of the Electronics industry, with its history of changes ranging from incremental to radical. Traditional manufacturing has shaped worldwide trade flows and built industry structures based on economies of scale, as well as supply chains that are both multi-tiered and global. But today, three new technology revolutions – 3D printing, intelligent robotics and open source electronics – promise unprecedented supply chain upheaval in manufacturing.

In this report, we see that these newer technologies can produce an average 23 percent unit cost benefit and reduce barriers to enter manufacturing by an astounding 90 percent. Yet half of our survey sample has no manufacturing strategy to manage the impact of digitization. To compete in this fast-approaching future, companies and governments must understand and prepare for this new software-defined supply chain.

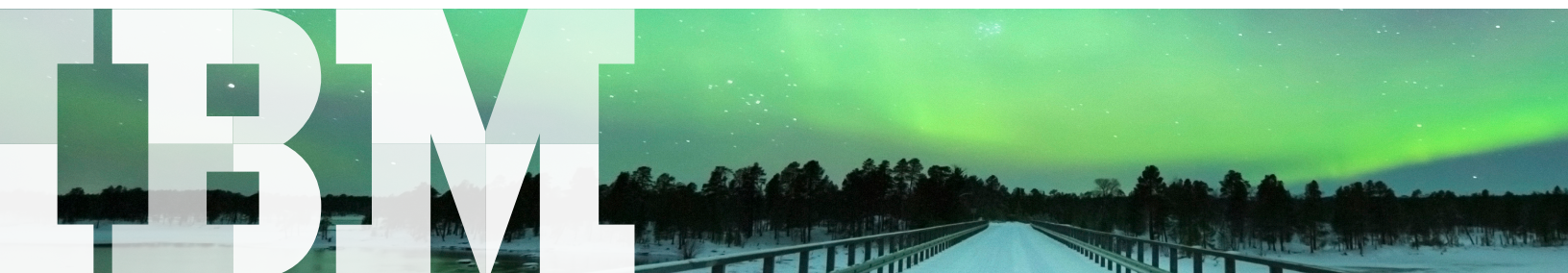
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As the twentieth century dawned, Ford Motor Company soon set the rules for modern manufacturing. Production of the Model T used interchangeable parts on an assembly line to usher in an era of standardization that has continued with refinement for more than one hundred years. By the 1920's, competitors were extending Ford's mass production model and gaining market share, thanks to the use of sub-contractors, modularization and parts commonality across models and even brands.

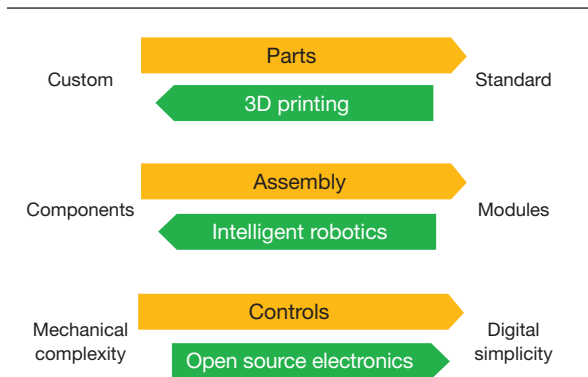
Over time, three major manufacturing and product design trends have emerged, shaped by the physical reality of the industrial supply chain: parts continue to become more standardized; assembly has continuously shifted toward modules from basic components; and complex mechanical controls continue to be replaced by simplified digital intelligence. More than a century on, these same rules still drive industry strategy, not just in Electronics but across a variety of manufacturing industries.

### Three technology revolutions

Now, the historical rules hardened by a century of experience are being overturned by three emerging technologies: 3D printing, intelligent robotics and open source electronics. Together, these new technologies are creating a manufacturing environment that can be defined and executed through managing software and data files. We describe this transformation as moving from a supply chain that is hardware-based to one that is “software-defined.”



The result: a radically reconfigured global supply chain will emerge in the coming decade. It will change manufacturing in Electronics, shifting global trade flows and altering the competitive landscape for both enterprises and government policymakers. Together, these three technologies will accelerate the digitization of manufacturing (see Figure 1).



Source: IBM Institute for Business Value Analysis

Figure 1: Independently, each of these new technologies is reaching a tipping point.

To understand how the competitive landscape of the Electronics industry will change and how these technologies will impact real-world, financially driven enterprise investment decisions, we conducted the 2013 IBM Electronics Manufacturing Study. The study is comprised of two primary research components: a face-to-face survey of 55 executives in 10 countries and a quantitative model to measure the effects of ongoing industry changes. We studied four representative test cases - tearing down products, analyzing their bills of materials and assembly, and then building a quantitative model of how they would be made and distributed using a software-defined supply chain.

Our findings reveal that based on technology roadmaps, the cost of manufacturing using a software-defined supply chain is or will be competitive with traditional manufacturing within the next decade. On average, it will be 23 percent cheaper to make products in a software-defined supply chain. Even more important than cost, however, we found that the minimum economic scale of production required to be competitive will be 90 percent lower in a software-defined supply chain. This implies that existing manufacturers could face a flood of new competitors that occupy small market niches.

And despite the enormous press coverage that technologies like 3D printing have achieved, we found that manufacturing leaders are ill-prepared for these transitions. For example, although 3D printers allow nearly unlimited customization, most supply chain executives we spoke to still plan to drive increased product and component standardization.

By changing requirements for scale, location and volume, the software-defined supply chain won't just change costs or manufacturing processes – it will effectively up-end the industry structure as we know it.

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Access the full report and model for this study in July 2013

[ibm.com/business/value/software-defined-supply-chain](http://ibm.com/business/value/software-defined-supply-chain)

To learn more about this IBM Institute for Business Value study, please contact us at [iibv@us.ibm.com](mailto:iibv@us.ibm.com). For a full catalog of our research, visit: [ibm.com/iibv](http://ibm.com/iibv)

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## Prosper amid supply chain disruption

Analysis of our product test cases found that the combination of new technologies will disrupt different segments of the Electronics industry at different rates. The consumer electronics, white goods and medical device segments will lead the transformation, with manufacturing of these products becoming “democratized” over the next decade. For Electronics enterprises, navigating the transition to a software-defined supply chain requires an understanding of its far-reaching implications:

- Product design and retailing will be influenced greatly by interactions with customers
- Competitive dynamics will change radically
- Supply chains will become more simple, flexible and localized.

For government policy makers, there are implications on labor arbitrage, infrastructure requirements, skills development, taxation and intellectual property. One particularly interesting finding from our research: a software-defined supply chain is not always a “greener” supply chain.

Enterprises that want to stay competitive will need to identify new sources of profit and customize their offerings to new and changing target markets. The reduced scale of production to be competitive will require understanding the new industry structure and rethinking optimal choice of manufacturing locations. Companies will need to evaluate their value positions in the new software-defined supply chain as it hollows out, moving toward the technology innovation or customer intimacy ends of the supply chain.

And in this rapidly-changing Electronics industry environment, companies seeking success during this transition will need to change product design and retail strategies; prepare to compete in a new market landscape; and build extraordinary flexibility into their own supply chains.

## How can IBM help?

For more than a century, IBM has led technology transformations that have defined the future as we manage our own complex transitions, transform our own operations, and build new capabilities to serve clients. IBM’s supply chain has been repeatedly recognized as one of the world’s most sophisticated and high performing. With the combination of technology leadership, deep industry expertise, supply chain excellence, and strategy and transformation capabilities, IBM is uniquely positioned to deliver next-generation solutions.

The software-defined supply chain will require an entirely new level of integration among strategy, design and execution, and it will redefine how companies manage and measure their operations, work with partners and serve clients. IBM looks forward to helping enterprises plan and manage this transformation.



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