JABIL

Top Reasons the Digital Economy Will Change Everything about Manufacturing

To understand how the manufacturing business must adapt to prosper in the technology tempest that forges the future, we must first grapple with understanding how technology is changing "us". Technology is literally shaping our daily habits – everything from heightening our expectations of products to how we shop and even the immediacy of the entire process.

The culmination of new ways of doing business has put in motion an incredible disruption for which we are just beginning to feel the "ripples".

THE DIGITAL ENTERPRISE

Thanks to a convergence of disruptive technologies, everything we know about business is changing ... rapidly. Artificial intelligence, cloud services, drones and Blockchain technology are just a few key innovations that ultimately deliver incredible service and value to customers. When adoption of these types of transformative technologies is complete, we'll have a dynamic new business structure that we call the digital enterprise.

On-Demand. Digitization is rapidly shaping our transportation systems… and supply chains

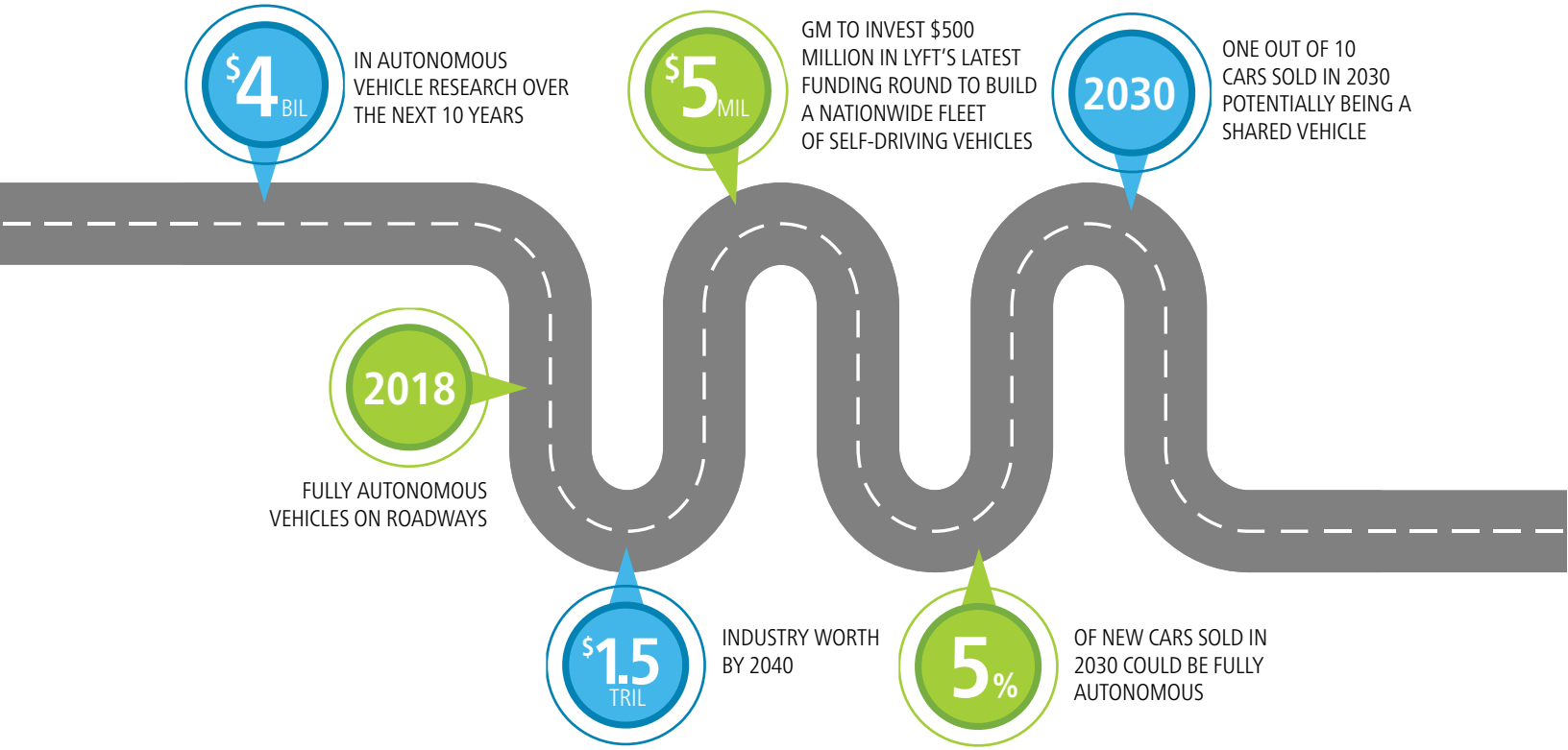
Here's one example. Right now, taxi services are in the crosshairs as on-demand transportation services like Uber and Lyft, available at the touch of a smart phone button, expand. In fact, Yellow Cab, San Francisco's largest taxi company, is filing for bankruptcy as the industry starts to change faster than almost anyone expected. However, at this point, it's more than an app that is changing the tide. Uber and Lyft focus on the customer experience, offering a growing array of services and feedback opportunities.

But in the long-term, even Uber and Lyft will be disrupted as vehicles drive themselves. Already, companies like Google and GM are working on projects to bring fleets of autonomous vehicles to cities at the push of a button. Moreover, this on-demand service model is beginning to appear across a much broader range of markets.

For example, Amazon is investing in its own fleet of trucks, planes and even drones at the same time as it pushes for same-day delivery of goods. At some point, these vehicles will be autonomous, too.

Photo: Amazon
Amazon Prime Air is a future service that will deliver packages up to five pounds in 30 minutes or less using small drones. Flying under 400 feet and weighing less than 55 pounds, Prime Air vehicles will take advantage of sophisticated "sense and avoid" technology, as well as a high degree of automation, to safely operate beyond the line of sight to distances of 10 miles or more.

Amazon isn't stopping at logistics. It is also aiming to automatically manage the supply of our home goods with its recently launched Amazon Replenishment Service, Dash. Dash is a digital service that enables connected devices to automatically order physical goods from Amazon when supplies are running low.



Autonomous vehicles will optimize industry supply chains and logistics operations through increased efficiency and flexibility. In fact, fully automated and lean supply chains will help reduce load sizes and inventory by leveraging smart distribution technologies and smaller autonomous vehicles.

So, how does transportation innovation impact manufacturing?

If Amazon continues to grow market share for online sales by reducing effort required by the consumer to place an order, while also controlling the almost-immediate delivery of goods to the doorstep, it will further fuel the trend toward on-demand services. As Amazon fuels the on-demand economy, consumers will expect immediacy in more parts of the economy. On top of speed, consumers increasingly expect more personalization options. Just browsing Pinterest and Etsy reveals the demand and fulfillment ecosystem developing around this shift in consumer behavior.

Therefore, as more of our goods pass through this model, manufacturers must rethink the build-to-inventory model in favor of a build-to-demand, dramatically reducing time-to-market in the process.

That is where **digital manufacturing** shines. With thousands of sensors monitoring every aspect of every process in real-time and communicating to self-optimized deep learning robotics, new methods of high volume and high customization will become possible. Then, as products merge into product platforms and even services, manufacturers have the opportunity to provide components and platforms used by smaller players.

> "By 2020, all products costing more than $100 should have sensors embedded in them and should offer services on top of the products."
>
> – Peter Sondergaard, Senior Vice President and head of research at Gartner

DIGITAL MANUFACTURING AT JABIL

35	275	4,200	740	270,000
YEAR HISTORY OF AUTOMATED ASSEMBLY	AUTOMATED SMT LINES	ROBOTS INSTALLED	AUTOMATION ENGINEERS	SQ. FT. OF AUTOMATION ENGINEERING SPACE

Shifting production and logistics means evolving product packaging

What about product packaging? With the direct-to-consumer model, packaging shifts from shelf-ready to shipment-ready, where packaging will be designed to minimize weight, bulk, space and rigidity to withstand direct shipping and more.

If the package is delivered via Prime Air, Amazon's proposed drone delivery service, packages will be delivered within 30 minutes of being ordered and packaging must be designed to withstand weather and perhaps even shape-optimized for drone delivery.

Additionally, packaging itself is getting smarter. Thanks to flexible electronics and miniature sensors embedded into packaging material, almost every product we can imagine will have the ability to share all sorts of data about its location, condition, logistics and inventory. This aspect of packaging is especially interesting because it can be collected in real-time all the way through the supply chain.

THE THINGS JABIL CAN DO WITH
PACKAGING

1

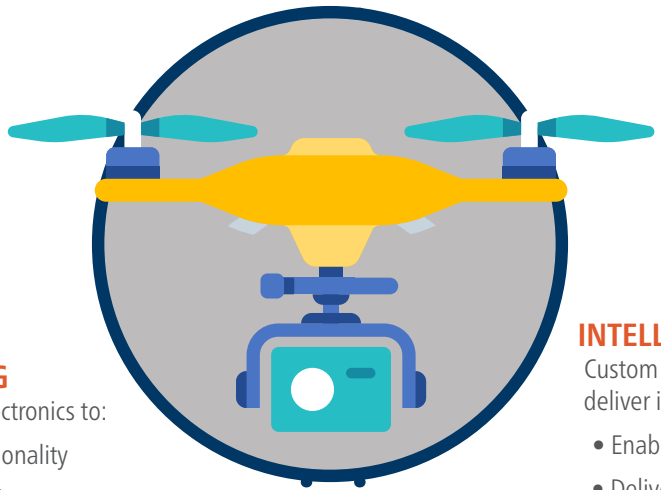
CONVENTIONAL PACKAGING
Functional design and technology such as:

- Materials
- Decoration
- Shelf-optimized design

2

HYBRID PACKAGING
Combining rigid & flexible materials that add:

- Custom function
- Value for customer
- Value for consumer



ACTIVE PACKAGING
Advanced materials & electronics to:

- Enable additional functionality
- Provide product protection
- Connect with new device platforms

INTELLIGENT PACKAGING
Custom packaging platforms that deliver immersive experiences to:

- Enable consumer engagement
- Deliver information to retailers
- Connect consumer, retailers and brand

3

4

Mass customization at the speed of digital

Innovations in additive manufacturing promise to continue carving out niches in addressing personalization.

Carbon3D, a startup that has developed the Continuous Liquid Interface Production (CLIP) , has not only created a process that is 100 times faster than traditional methods, it also eliminates defects. Furthermore, Carbon3D envisions this process eventually becoming up to 1000 times faster. So, imagine that at this speed, many types of products could eventually be completely manufactured through this new process. Because it can print anything any other 3D printer can produce and handles a wide variety of materials, it could potentially address production quality personalization. In fact, Johnson & Johnson recently announced collaboration with Carbon3D to manufacture custom medical devices using Carbon3D's CLIP process .

In manufacturing, there is a digital thread that follows the production from a CAD drawing to a prototype all the way through production. According to Joseph DeSimone, CEO of Carbon3D, the digital thread is broken at prototyping in a manufacturing process because traditional prototypes don't have the level of detail needed for final production. However, with this process, the digital thread is preserved as it produces production quality parts directly.

Then there's a new startup called BioBots, which produces a relatively inexpensive bioprinter that uses cells, bioplastics and bioinks to print living tissue. By simultaneously producing a biocompatible support scaffold and then printing the cell matrix and "curing" the structure using near UV light, BioBots printers produce tissue samples ready for drug studies and lab-on-chip applications. The company is still very young, but eventually, this technology could virtually eliminate the need for animal testing. Already BioBots is beginning to work with pharmaceutical companies. Additionally, BioBots is planning to build an online community to drive innovation and customization in materials, processes and kits. Could this way of delivering products and services be a peek into how the future of digital manufacturing might evolve?

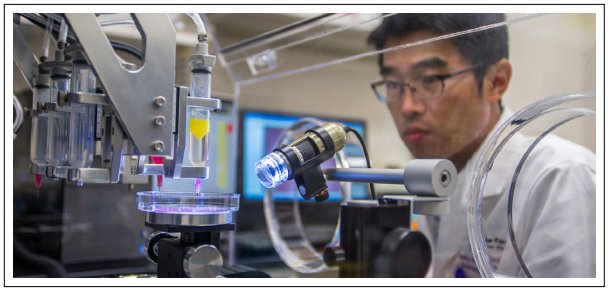


Photo: U.S. Army Material Command

TOP 5 REASONS TO EMPLOY DIGITAL PROTOTYPING AT JABIL

1. CUSTOM DESIGN
2. VALUE ANALYSIS
3. VALUE ENGINEERING
4. SUPPLY CHAIN OPTIMIZATION
5. SEAMLESS TRANSITION TO NEW PRODUCT INTRODUCTION

Digital transactions and the supply chain

The Internet has dramatically changed the way we conduct business, essentially making transaction costs and the distribution of goods free, clearing the way for new business models that provide customer-centric, on-demand access to a growing number of goods and services.

What do these trends mean for the future of how we live, shop, travel and work? What does this mean for manufacturing as companies now compete on sheer speed-to-market?

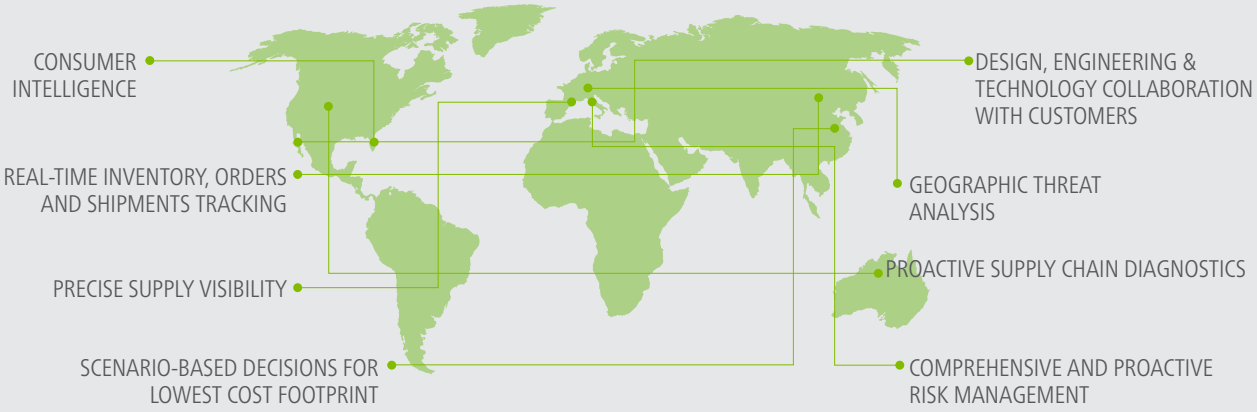
Well, there's the mighty emergence of Blockchain technology, finding its way into and beyond mainstream finance and technology companies. It has the potential to remove "friction" from online commerce by reducing time to process payments, removing transaction fees and acting as a universal payment that eliminates currency exchange problems.

Nevertheless, it is also good at securing trust within transactions, any transaction. That's because the technology has security built into its DNA. The Blockchain is designed to prevent anyone from altering the legitimacy of the information being exchanged over it, so it's an intriguing option to bring more transparency to global supply chain transactions.

In fact, in terms of the supply chain, the Blockchain can track what went into a product and who processed it. As a result, supply chain data becomes completely transparent, revealing the history of a product to everyone involved all along the product's journey – all the way to the end-user. So imagine the power of the Blockchain in the supply chain to trigger things like threshold-based payments, inventory control, supplier consolidation and more based on codified rules in a specific Blockchain.

Commanding the supply chain with Jabil's inControl

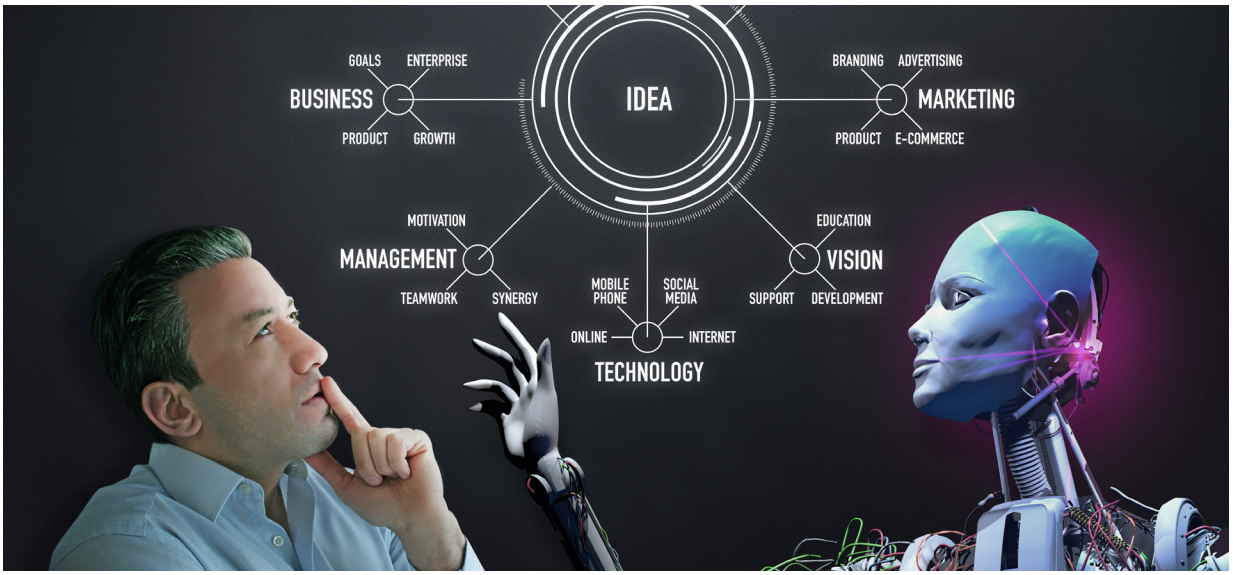
A unique supply chain intelligence tool with advanced capabilities that deliver



"Jabil has a rocket to go to Mars and we are on a bicycle."

– Multinational Appliance Company's CPO

Humans + machines



This leads to AI, the technology that promises to make our machines smarter and more collaborative, providing people with new opportunities to use our minds for much more of the work we'll be doing. At some point, manufacturing plants might be largely run by AI and robots working through the cloud. And there will be an even bigger demand for workers who understand how to deal with and analyze huge data sets and craft insights that shape everything from plant floor resources to supply chain and even customer satisfaction.

Our workforce will become even more important to an organization's success as we look to the creative capacity of people to explore and discover creative new business opportunities, partnerships or even to invent new technologies. Ultimately, people harness machines to achieve beyond what either might perform alone. We'll increasingly work across disciplines to deliver value to customers beyond anything we could have done without the help of AI. Best of all, we'll use tools that AI just isn't going to have anytime soon – creativity, empathy and wisdom.

To quote the Chronicle of Higher Education...

> "The robot age invites people to be not drones, servants, or vagabonds, but creators. Technology will free us to ask questions that have never been posed, to envision beauty never before unveiled in the mind's eye."

SMART AND DIGITAL

ARTIFICIAL INTELLIGENCE FOR ENTERPRISE APPLICATIONS TO REACH **$11.1** BILLION IN MARKET VALUE BY **2024**

BAIDU ANTICIPATES **50% OF SEARCHES** WILL BE **VOICE SEARCHES** BY **2020**

GARTNER PREDICTS BY **2020**, **SMART AGENTS** WILL FACILITATE **40 PERCENT** OF MOBILE INTERACTIONS

IN MANUFACTURING, **ROBOTICS AND ARTIFICIAL INTELLIGENCE (AI)** WILL BE THE **MOST ADOPTED TECHNOLOGIES** OVER THE NEXT 5 YEARS

BCC RESEARCH PREDICTS THE **MACHINE LEARNING MARKET** WILL REACH **$15.3** BILLION BY **2019**

Recently, the machine learning group at Google announced that it would start licensing the Myriad 2 visual processor from chip startup Movidius, maker of low-power chips using vision processing units (or VPUs). This technology promises to move intensive data processing out of the cloud and onto devices, freeing devices from having to expend undue battery energy and time to transmit and receive data constantly. Now imagine this technology bolted onto the manufacturing environment. Autonomous sensor networks will use on-board intelligence to process information quicker and more efficiently than having it transferred and processed in the cloud, allowing for lower power requirements and even more real-time insights.

"We now have a chance to really work with the leader in deep neural networks — Google — and to take it out of the cloud."

- Remi El-Ouazzane, Movidius CEO

Is your manufacturing partner thinking about the digital economy and how it will affect your business? Manufacturing is going to change. In fact, for those that can envision the future and invest in pathways to deeper value propositions for our customers, manufacturing will provide unprecedented differentiation in the rapidly evolving market.

The Value of a Jabil Partnership

1. LOWER MANUFACTURING OPERATING COSTS
2. LOWER CAPITAL INVESTMENTS
3. INCREASED MARKET SHARE
4. IMPROVED TIME-TO-MARKET
5. IMPROVED QUALITY & CONSISTENCY
6. REDUCED HUMAN CAPITAL COSTS
7. REDUCED HUMAN CAPITAL RISKS
8. REDUCED INTELLECTUAL PROPERTY RISKS

How Jabil can help

There is little doubt that the digital economy will disrupt entire industries as transactional friction is removed and speed-to-market increases. At Jabil, we're preparing for the disruption by anticipating the value we can bring to our customers now and into the future. We're reimagining manufacturing by harnessing digital ecosystems and embedding them into the heart of everything we do.

inControl

Jabil's immersive intelligent digital supply chain platform, inControl, leverages cloud technologies to surface deep insights into everything from understanding end-customer needs and demand through social sentiment all the way through tools to develop proactive supply chain risk strategies.

Digital Manufacturing

Automation is core to our business, and through digital manufacturing initiatives, we help companies reduce the cost of automation, capitalize automation investments over a longer useful life, incorporate automation best practices into the product design from the start, kick off automation engineering before the product design is even finished, and incrementally add automation as their product ramps. As a result, we reduce manufacturing operating costs and capital investments, improve time-to-market, enhance product quality and consistency, and minimize human capital and intellectual property risks. Ultimately, all of this translates to helping our customer increase market share.

About Jabil

Built on a foundation of empowered employees in over 101 plants in 28 countries, Jabil strives to be the world's leading global manufacturing solutions partner.

Jabil's unique combination of global expertise, ingenuity, analytics and financial performance has contributed to the success of the world's most well known brands.

We help companies design, build and take their products to market quickly, affordably and efficiently. But more than that, Jabil helps customers intelligently design their supply chains to be agile, economical and effective even in uncertain times.

Packaging

In a world where people are constantly on the go, performance, convenience and sustainability are table stakes for the world's national brands. It is time for market leaders to better serve customers in this increasingly competitive retail landscape. Smart Packaging from Jabil does just that. Through our smart packaging solutions, we enable customers to truly differentiate their products to drive both performance and customer value. Jabil combines smart packaging solutions with active design and development collaboration; end-to-end, vertically integrated volume production capabilities; and global supply chain operations to help our customers both change the game and improve the lives of consumers in these times of unprecedented change.

Rapid Prototyping

Jabil's Rapid Prototyping facility, headquartered in Silicon Valley, allows our customers to dramatically accelerate the hardware development process to deliver faster time-to-market, reduce uncertainty and mitigate production risks. So, whether you are testing the market, bridging to high volume manufacturing or building units for clinical test, our low-volume manufacturing capability can help.

Erich Hoch
Executive Vice President

Gina Clifford
Technology Communications Manager

JABIL

Aim Higher.

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