

Prepare your supply chain to deal with chip shortages

Solutions for Automotive, Industrial &
Medical Equipment Manufacturers



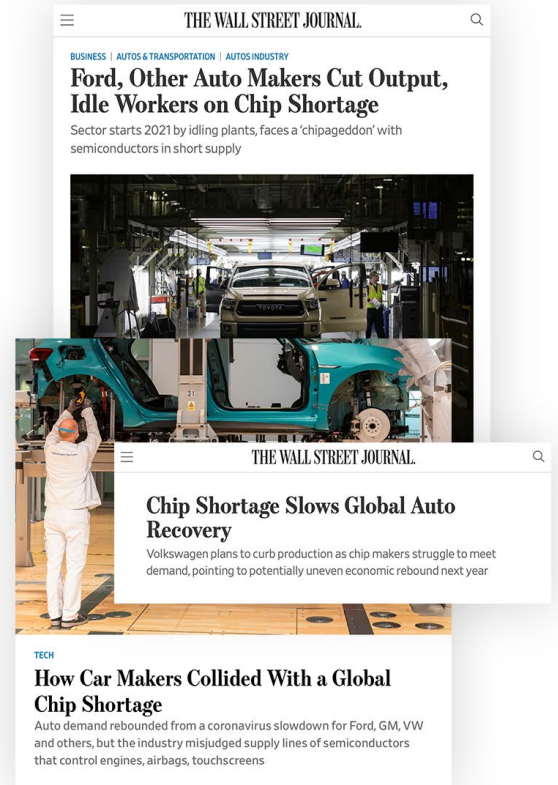
Executive summary

As more people are getting vaccinated, things feel slowly but surely getting back to normal. Many are predicting spending to increase post-Covid, which is good news for those businesses struggling due to the pandemic. However, with more spending comes new challenges for supply chain systems that must ramp up production.

Because software-driven architectures touch virtually every industry, there has been an increased need for electronic components including computer chips in every industry. In the last 12 months, multiple fires hit several chip factories. Covid has interrupted production at existing plants, and the inability to construct new plants have caused massive supply constraints. Manufacturers that don't have a direct relationship with chip factories, such as those producing automobiles, heavy industrial equipment, medical diagnostics equipment and electronics were greatly affected.

Experts now believe this chip shortage is not just a temporary aberration. It will have a long-term impact on all industries, even those that don't directly relate to the chip manufacturers.

Tada Cognitive, along with its partner CGN Global, has helped many customers with short-term and long-term planning to prepare them for supply chain shortages and procure needed electronics components in the most efficient way possible.



The Lasting Impact of Chip Shortages

The semiconductor industry is ever-changing and will continue to evolve constantly. So, while the status quo never stays the same for long, the current chip shortage crisis shows signs of having a long-term impact on all industries. Interestingly enough, those without a direct relationship with the chip manufacturers, such as automakers, medical device makers, and other industrial manufacturers, are being impacted greatly. The chip shortage has an even more considerable influence in the industrial equipment industry since a costly piece of industrial machinery may lie idle because of a few dollars' worth of electronic components.

Last year, country lockdowns forced many to stay at home, and consequently, the automotive industry saw a significant decrease in automotive sales. Now that lockdown restrictions are lifting, this industry is finding that they cannot get the chips needed to fill orders. Suppliers just did not have the parts, forcing automakers to make the difficult decision of cutting their production lines. The Wall Street Journal reported that the lack of chips from Continental, Robert Bosch GmbH, and other suppliers caused VW to stop production of bestselling brands such as Audi and its namesake VW brand at plants in Europe, China, and North America.

Honda Motor Co., Fiat Chrysler Automobiles NV and others also had to **"reduce output on everything from big pickup trucks to compact sedans."**

But beloved auto brands were not the only things let go. Employees working in the plants also suffered. Audi had to furlough **"10,000 factory workers for the first time since the spring lockdowns."**

"The company expects the supply strains to ease in the second half of the year. It just feels like it's a whack-a-mole? It's going to be another 18 months and the entire supply chain is just exhausted."

Executive at
Cummins Inc.

Business groups are now joining together to persuade the US government to get involved. According to [Reuters](#), the US Chamber of Commerce, as well as industry-specific associations representing General Motors Co, Caterpillar Inc, and Medtronic PLC, among others, sent a letter to the Biden administration asking for a deal to subsidize the construction of new US semiconductor manufacturing factories.

In the letter, they stressed the importance of setting up domestic chip production, stating, "To be competitive and strengthen the resilience of critical supply chains, we believe the US needs to incentivize the construction of new and modernized semiconductor manufacturing facilities and invest in research capabilities." Outside parties are also strategizing on how they can bring chips to US shores. In response to the chip shortages, Taiwan Semiconductor Manufacturing Company (TSMC), the world's largest semiconductor manufacturer, [has increased its capital spending budget to \\$28 billion](#) to fund a plant in Arizona to serve key American customers. While these efforts are encouraging, funding and building a new semiconductor fabrication plant is at least a five-year process indicating that this chip shortage is likely to plague the industry for many years to come.

What caused this sudden chip shortage issue?

Whether it be technical, economic, cultural, or political, many forces shaped the current chip shortage. Here we cover some of the main factors that led to the crisis we have today.



Software Defined Infrastructure

Ten years ago, the legendary entrepreneur Marc Andreessen famously said, “Software is eating the world.” He predicted that software companies would take over the economy’s future, and he wasn’t wrong. Gartner predicted that there would be more than 20 billion IoT devices deployed by the end of 2020, and many of these will be deployed for healthcare applications.

Companies realize they need to think about how to digitally transform their business if they want to stay competitive. Satya Nadella, the CEO of Microsoft, put it best when he said,

“Every company is a software company. It’s no longer just about procuring one solution and deploying one. It’s not about one simple software solution. It’s really you yourself thinking of your own future as a digital company.”

To be a software company, you must also think about the chips that run the software. In a recent CNBC interview with John Fortt, Mark Fields, ex CEO of Ford, put it aptly, “Semiconductors are the forks and knives that help you eat the software.”



Increased Use of Electronic Components

If you had a chance to replace an older car with a newer model, you would have noticed how every system in the new vehicle is driven electronically, including fuel injection, braking, and of course, entertainment systems. As more and more people start buying electric cars instead of the combustion engine automotive, the number of electronic components per car increases tremendously. In a recent article from Jabil Electronics, they put this problem into perspective,

“Think of today’s standard combustion engine car, which has somewhere between 2,000 and 3,000 capacitors. As the electric vehicle gains market share, this creates an overwhelming growth in content with as many as 22,000 multilayer ceramic capacitors required in a single car. This number will continue to grow as more functions become electrified.”

This example is merely one area where chip usage will increase exponentially. Software-driven architectures are driving an increased use of electronic components for all industries, not just automotive. As a result, the demand for chips is snowballing.



Poor Supply Chain Planning

Manufacturers use lean inventory practices to increase their profitability, but this strategy does not work when demand is upturning. A demand upturn coupled with supply constraints due to chip shortages is a logistical nightmare for automakers, medical device makers and industrial manufacturers in need of chips.

What makes matters worse for these industries is that most planners only optimize their supply chain around Tier-1 suppliers. Electronic component manufacturers are often Tier-3 and Tier-4 suppliers to industrial equipment manufacturers. Thus, many of these companies have no visibility into the tiers where chip shortages occur.



Covid's Unpredictable Influence

Never has there been an event that has plagued modern-day society, quite like Covid. It has touched every nation and reshaped business operations both locally and internationally. Among many other things, Covid has exposed issues with supply chain planning or lack thereof. Many widely held assumptions have been questioned, forcing manufacturers to rethink how they manage their supply chain.

The chip shortage became a ticking time bomb after a few unrelated supply chain disruptions at the beginning of 2020 and as recently as 2021. These events included a fire in a Japanese microdevices factory and a shortage of shipping containers and global air shipments combined with another fire in 2021 at a Renesas Electronics Corp. in Hitachinaka, northeast of Tokyo. When the pandemic caused a precipitous drop in vehicle sales in spring 2020, automakers and other equipment manufacturers cut their orders for everything, including the chips. When demand for passenger vehicles rebounded despite Covid, chip manufacturers had already committed to other suppliers.



Strained US/China Trade Relations

The relationship between the US and China is strained at best. The two countries differ on several key issues, one of which is trade laws and regulations. This tension escalated in the fall of 2020 when the Trump administration placed tariffs on Chinese imports, causing China to halt imports of all American agricultural goods. They also put restrictions on exports to Semiconductor Manufacturing International Corporation (SMIC), China's most advanced computer chips maker, a measure that deepened the technology conflict between the tech giants in both countries. Chinese companies started stockpiling chips to prepare for the ban and cut off American companies from chip sources.

Historically, most electronic components are acquired through distributors by original equipment manufacturers (OEMs), and these distributors usually reside in China. Since Chinese distributors have few existing relationships with US OEMs, they are likely to overcharge them for their inventory. This practice became even more commonplace after a Personal Protective Equipment (PPE) shortage when Covid spread globally. In 2021, many hope a new US administration will finally ease the trade tensions between the two global superpowers. But after the Biden administration's first faceoff with China in Alaska, tensions remain high, and the future is still uncertain.

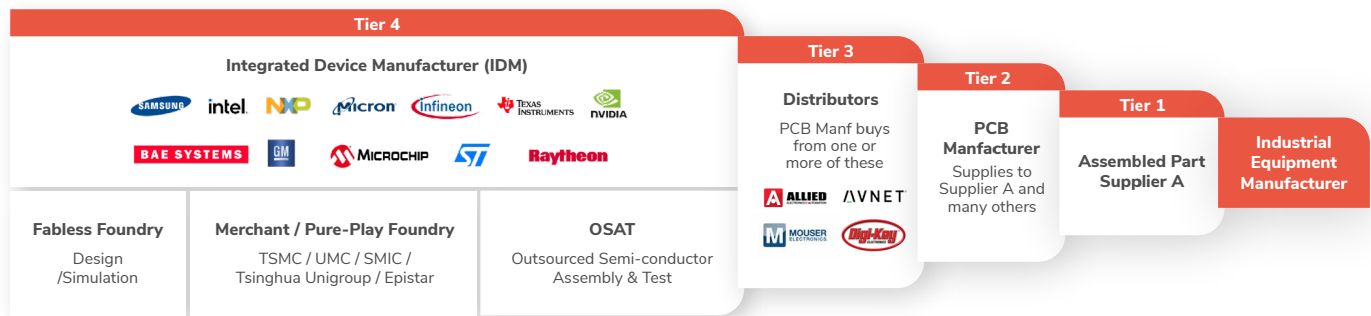
Understanding the Chip Industry

Before looking at solutions to combat chip shortages, it is worth understanding how the chip supply chain works for industrial manufacturers. Learning about the chip manufacturers' perspective can also help chip-removed industries like automotive, medical diagnostics, and industrial manufacturing remodel their supply chain strategy.

Chip Supply Chain Tiers for Manufacturers

Since most industrial equipment manufacturers order assembled components from their Tier-1 suppliers, they have no visibility or relationship with their other Tier suppliers. The following diagram is a typical example of how far removed an industrial equipment manufacturer can be from an integrated device manufacturer. But in some cases, chip suppliers may even be removed 5 to 6 degrees from the equipment manufacturer.

The current lead times for chips vary between 50 to 100 days.



Chip Manufacturer Perspective

Taking Covid out of the equation, the public demand for semiconductor chips is growing so rapidly that chip makers need 4-10 years to expand their capacity adequately. But the potential for an economic downturn in the next decade makes a chip manufacturer hesitant to expand at a pace that will meet the short-term demand.

Previously, chip distributors aggregated orders from many customers. With Holts-Winter forecasting, a chip distributor could predict with decent accuracy the general chip consumption rate and plan orders for various markets, including customers with just-in-time orders. This process is no longer feasible. Now, distributors aggregate the orders, and chip manufacturers tell them there is no way to meet demand on-time. Distributors have no choice but to prioritize real hard purchase orders (POs) over speculative forecasts, leaving companies unwilling to forecast 12-24 months in advance and placing blanket POs in a venerable position.

Many auto and heavy industrial manufacturers are simply unwilling to acknowledge this perspective or its long-term implications. It is clear that just-in-time ordering is not feasible when materials and components are in high demand. Chips are usually sold by secondary chip markets, and many automakers are not buying chips directly. Instead, they purchase their chips through a multilayer of supplier tiers, each of whom is unwilling to speculate and bear the financial risk associated with customers who refuse to order 12-24 months in advance.

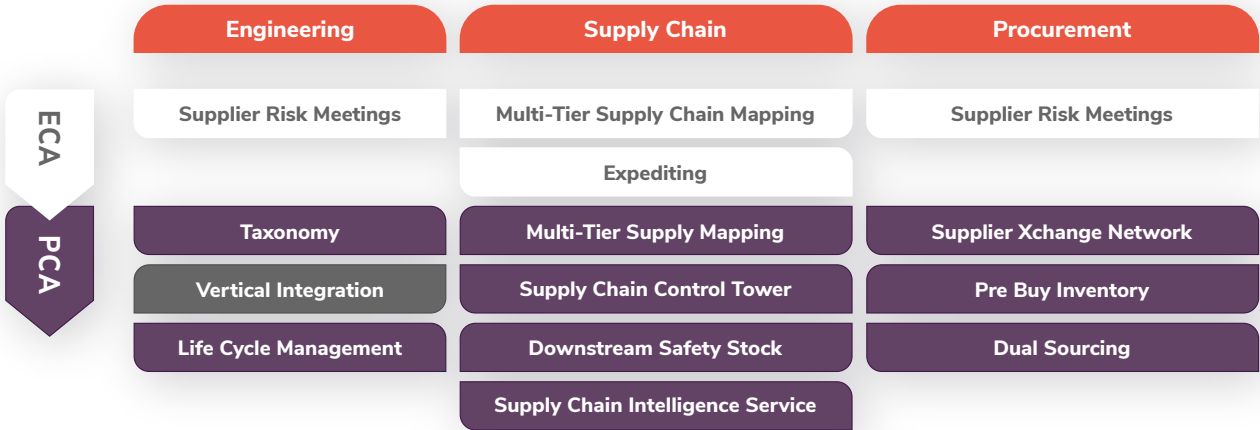
Many companies that consider themselves non-electronic need to start viewing themselves as electronic. If chips are in your products, then you are inadvertently a part of the electronics business. Therefore, you must track your chips' lead-times and place orders that will cover your business long term. Toyota predicted chip shortages would occur back in 2011 and moved away from a just-in-time methodology to a stockpile methodology called "RESCUE." Creating a master chip strategy is not a singular solution. To accomplish this, you need to completely rethink and restructure the current state of your business models.

Solution to the Chip Shortages

At Tada, we have been solving shortage-related supply chain issues for many of our customers. Here is the layout of our process that we hope will provide insight into where to start. Our plan consists of two parts:

- Emergency Corrective Action Plan (ECAP)
- Preventive Corrective Action Plan both Interim and Long Term (PCAP)

Tada's Emergency Corrective Action Plan (ECAP)



Tada's PCA includes many components detailed in the diagram above.

Merging our 25+years of experience working in the supply chain business with our engineering capabilities, we start with an Emergency CAP that includes the following steps:

1. Leverage our multi-tier framework to understand part taxonomy, critical chips, and their multi-tier suppliers
2. Understand demand flow and coverage for the next few weeks
3. Work with Tier 1 suppliers to ensure they are allocating the right capacity for the OEM
4. Find capacity availability of alternative chip revisions and alternative supply sources

After regaining stability, we start to implement our Preventive CAP.

Tada's Preventive Corrective Action Plan (PCAP)

Tada's CAP infrastructure includes many applications. Here are a few that have been used with chip shortages:

Multi-Tier Supply Chain Mapping and Collaboration

Minimizes component stores and their associated costs during normal supply conditions. Our Multi-Tier collaboration solution connects processes, companies, and partners, providing much needed visibility and collaboration to better manage risks in regular and disruptive cycles. Here is how we do it:

- Tada collects data and analytics across the ecosystem in an automated fashion, thus eliminating day to day management of excel files and manual report generation activities
- An ecosystem network map is created to provide end-to-end supply chain visibility and risk resilience at a part number level from OEM to Tier 1 to Tier n
- Proactive demand coverage analysis considering inventory, PO and ASN across all partners

Supply Chain Intelligence Services

Provides early problem detection and preventative planning that minimizes risk and cost

Taxonomy

Minimizes the expense of preventative buffer stock by using Tada's multi-tier framework to understand part taxonomy, critical chips, and their multi-tier suppliers

Downstream Safety Stock

Minimizes the cost associated with preventative and reactive buffer stock per component

Conclusion

Chip shortages will be around for some time to come, and this problem is only the tip of the iceberg as many other raw materials like steel and plastics are also going to be supply constrained for some time to come. The demand bullwhip and supply shortages are exposing shortcomings in the way supply chains have been traditionally handled. Our Multi-Tier Collaboration system has helped many customers with not only chip shortages, but also other supply chain issues.