Professional Perspective

AI & the CHIPS Act Could Reshape the Auto Supply Chain

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It's a familiar problem by now: a would-be buyer goes to a car lot or online vendor and can't find the make or model they had in mind. Or if they do, the vehicle costs substantially more than it used to. In fact, car prices have increased more than 6% year-over-year, and more than 42% since 2020. The car shortage isn't going away. However, both a new law and emerging artificial intelligence technology may offer some relief at common pressure points, or at least a slow-release valve that may avert future pinches.

Background

The "supply chain problem" refrain became nearly ubiquitous during the height of the pandemic, and its effects have lingered. Stay-at-home and "lockdown" orders governments around the globe stopped work in many places and slowed economic output. This was particularly true in China, upon which much of the rest of the world relies for crucial vehicle components, and where, until recently, Covid-19 restrictions were particularly severe. These sorts of orders around the globe contributed to a "perfect storm" of supply chain issues, which also included shifts in demand, labor shortages, and structural weaknesses.

This storm created a microchip shortage starting in 2020. Automakers and retailers cancelled orders early in the pandemic—recall the bleak economic picture in mid-2020—but, happily, those started to ramp back up by the end of the year to match a turnaround in consumer demand.

In the meantime, however, demand for additional technology to support the new work-from-home environment sapped the chip supply. This left fewer chips for automobiles—which are necessary for everything from entertainment systems to power steering—at the same time car orders were rebounding. The ongoing trend towards electric vehicles, requiring even more chips for more functions, intensified the strain. On top of this, new coronavirus variants simultaneously hampered manufacturing, particularly in the more human-based parts of the supply chain in Southeast Asia, such as chip packaging and testing. Waning Covid-19 cases and protocols in the US did not ease the chip crunch because the US accounts for only about 10% of the world's semiconductor production (compared to 75% in East Asia).

Although many automakers are doing their best to increase production and smooth out these supply chain issues, such as by investing more in expanded manufacturing operations, the shortage of chips, cars, and trucks has been stubbornly persistent.

The CHIPS & Science Act

In response to this unprecedented confluence of factors, various stakeholders and elected officials have been agitating for government intervention in this area since late 2021.

Over the summer, President Joe Biden signed into law the bipartisan CHIPS and Science Act, which was actually a conglomeration of three different bills. In addition to funding "Research and Development, Competition, and Innovation," the CHIPS Act has been touted by its sponsors for the inclusion of significant economic incentives for chip makers to invest in domestic semiconductor manufacturing. For example, the CHIPS Act provides $52.7 billion for American semiconductor research, development, manufacturing, and workforce development, including $39 billion in manufacturing incentives. Many have attributed recent multibillion-dollar investments in expanded microchip manufacturing from the likes of Micron, Qualcomm, and GlobalFoundries to the CHIPS Act's incentives.

Experts are optimistic about the ability of the CHIPS Act to create jobs in the US, increase domestic microchip manufacturing, and strengthen supply chains in this area to forestall future shortages. But the new manufacturing plants will take time to build, and production will take even longer to ramp up. While the CHIPS Act certainly seems to represent a solid investment in the long-term stability of the microchip industry and a significant way to avoid future shortages, its effects are not likely to be immediate, particularly with respect to the current vehicle shortage and supply chain cramps in the United States.

Others in the automotive industry are advancing new methods that may also spur short-term help and long-term change in domestic auto supply chains, including the increased use of artificial intelligence.

Three Major Benefits of AI in Supply Chains

Improving Transparency

AI can monitor and bring together different systems, such as assembly line repair processes. When a line part breaks, everyone isn't spending time trying to figure where and how to secure the part, and when it might arrive. These types of delays often have aggravated the large-scale supply chain issues caused by the pandemic circumstances discussed above.

When numerous stakeholders in a supply chain operate on integrated AI-based systems, all of them can get nearly real-time updates about the initial breakage, part needs, and the replacement's location and status as soon as it leaves the originating facility. This permits everyone else in the chain to plan their operations around accurate information—including any possible delays—and allows them to focus employee labor on other, more productive tasks.

Many OEMs and car manufacturers are already implementing these systems and there is significant optimism that their further use could help ward off the supply chain backups witnessed over the last couple of years.

Quicker Solutions

When problems spring up, AI allows companies to craft quicker solutions. AI technology can minimize human error and thus improve decision-making by enhancing a process that might ordinarily rely on human-sent—and human-read—communications. Suppliers can also use AI to automatically provide quotes for parts and services based on optimal shipping routes and pre-calculated tariffs. In addition, AI systems that auto-route and send finished products can save time, create efficiencies, and thus ultimately smooth out supply chain bottlenecks.

Advanced AI systems also learn from errors, so if a supposedly "preferred" shipping route encounters failures, the system can learn from that, discount that route, and learn to use others instead. Many auto part suppliers are already implementing these types of AI programs, so when a line breaks, AI-based sourcing systems can reestablish it faster than human-led procedures.

Precise Predictions

AI can predict things that people might not see because its automated systems take human error out of the equation and are best programmed to review and analyze historical data as part of generating their recommendation—or just taking action autonomously. For instance, by synthesizing utilization and upkeep data, and by assigning weight to present information against the historical performance of systems, AI can assess—often accurately—the probability of a supply chain failure, or even anticipate a transportation hiccup before it happens (e.g., based on historical traffic data and real-time data from maps and traffic systems). By turning these calculations over to AI, companies can more accurately predict the risk of weather delays, set departure schedules, analyze shipping performance, and calculate optimal transport routes.

Given that an average passenger car contains more than 30,000 parts, it's fairly obvious that human decision-making is limitedly scalable in this arena, but the potential for AI-based processes and attendant efficiencies is enormous. In other words, AI technology in the auto supply chain can eliminate human delay, error, and "instincts," creating a solidly data-driven process that is faster and more accurate.

What's Next

Owing to these various advantages of AI and the technology's growing implementation by suppliers and manufacturers, it's easy to imagine how artificial intelligence can help smooth out supply chains and may help prevent another global shortage. But the benefits might not be realized unless and until AI systems are deployed widely across supply chains to fully integrate OEMs with the rest of the links in the chain and the final product rolling onto the dealership lot.

The improved efficiencies from these systems will become all the more vital if microchip manufacturing continues to shift back state-side under the CHIPS Act and supply chains evolve to meet that need. Where we go from here depends in large part on how fast the CHIPS Act is implemented (and how many companies take advantage of its incentives), as well as individual companies' appetite and ability to implement and use AI technology on a large scale.