Shortage of Microchips at General Motors

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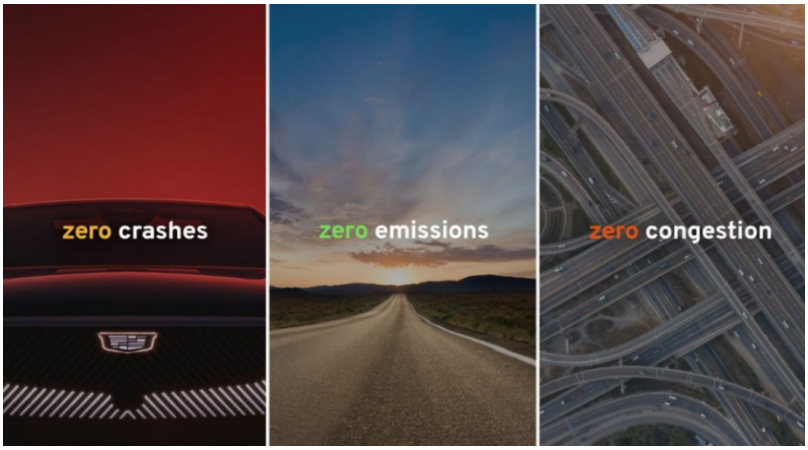
1. Introduction

General Motors is an automotive manufacturing company that builds GMC, Cadillac, Chevrolet, and Buick vehicles. GM was founded on September 16th, 1908. This business has been prosperous for 114 years! GM has operations in six continents across 22 time zones that speak 75 different languages (GM website, 2021).

(Figure1: Image courtesy of General Motors)

The headquarters of General Motors is in Detroit, Michigan. In total, GM operates 118 sites in the United States, including two engineering campuses, 19 parts distribution centers, 22 stamping, propulsion, component, battery plants, and 11 assembly plants. Additionally, GM maintains a number of offices, including call centers, IT centers, and service centers for GM Financial (GM website, 2021). Through the development of electrified, self-driving, connected vehicles, and shared mobility services that will revolutionize how people get around, General Motors is pursuing the vision of a world with zero crashes, zero emissions, and zero congestion.



(Figure 2: Image courtesy of General Motors)

With its Chevrolet line, GM caters to middle-class clients, and Cadillac line caters to the wealthy. GM developed their product with an emphasis on excellent quality, cutting-edge technology, innovative designs, and affordability. General Motors biggest competitors are Tesla, Toyota, Stellantis, Honda, and Ford Motor Company. The carmaker works with more than 70 suppliers, many of whom are essential to the creation of GM automobiles. Delphi, Yazaki, Lear Corporation, Lakeside Plastics, Johnson Controls, Grand Traverse Plastics, Dynamic Manufacturing Co. are just a few examples of their suppliers.

Since 2020, life has altered significantly all across the world. Every nation was impacted hard by the COVID 19 pandemic, forcing everyone to adjust to the new situation. Businesses all throughout the globe were impacted. The auto industry has been completely disrupted by a lack of semiconductors, the tiny but vital chips required to calibrate fuel injection, and power infotainment systems. This affected the automotive industry by delaying the delivery of parts, which finally led to a halt in production and extended lead times for automobiles. Auto production lines are slowing down, employees must adjust to the new work environment, and dealerships around the world have empty parking lots. The topics discussed in this paper will relate to Chapter 10, Sourcing and Supply Management and Chapter 12, Demand Planning: Forecasting and Demand Management to help explore solutions that can help GM succeed.

1.2 Additional information of shortage:

Due to a shortage of chips, a General Motors plant in Kansas City closed in February and has not yet restarted. GMs competitor, Mercedes-Benz is temporarily closing plants that create the less expensive C-Class sedans to reserve its chips for pricey versions. Due to a shortage of a chip used to monitor tire pressure, GMs other competitor, Porsche, advised dealers in the US that buyers would need to wait an additional 12 weeks to receive their vehicles (Ewing and Boudette, 2021).

The interruption couldn't have happened at a worse time. Since the pandemic slump, demand for vehicles has recovered significantly, with people keen to spend the money they had saved over the previous year. The availability of semiconductors denies the automobile industry an opportunity to recover from the loss of sales. In certain situations, General Motors has been making cars without electrical components and parking them until the parts are available. Since the beginning of the year, the company has had to temporarily suspend production at half a dozen sites.

Reasons for semiconductor shortage:

- Since producers of smartphones, video game consoles, and other consumer gadgets tend to be more profitable clients for semiconductor manufacturers, they have received precedence, which is a major factor in why automakers can't locate enough chips (Ewing and Boudette, 2021).
- COVID 19 pandemic.
- Another factor has been the weather. Early in the year, Texas storms prompted the temporary closure of three semiconductor facilities.

The last year was difficult for automakers due to a shortage of vehicle microchips brought on mostly by issues connected to the pandemic. Suppliers of vehicles were unable to meet the high demand. FactSet's survey of analysts predicts a 1% increase in GM earnings for

the entire year. They anticipate a 21% increase in sales overall in 2022. However, they expect EPS to fall by 18% in the fiscal year 2023 as revenue growth slows to 4%. Strong vehicle pricing has so far in 2022 assisted automakers like GM in balancing out reduced sales volumes. But when interest rates rise, supply constraints could give way to demand constraints. Pricing may decline in the coming year even as supply issues subside and volume growth picks up (Narayan, 2022).

1.3 Current sourcing strategy and future sourcing strategy:

One of the main issues that the automotive industry is experiencing is that these companies did not anticipate a pandemic that would cause manufacturers to shut down and not be able to ship required components to their customers. GM did not forecast this shortage. GMs current sourcing strategy was a semiconductor supplier located in Taiwan. Due to the pandemic, the manufacturing plant in Taiwan had to shut down production and was not able to allocate parts to GM. Furthermore, during the pandemic, customers began purchasing more personal devices and chip manufacturers were unable to keep up with the demand once they reopened. If GM did forecast this shortage they would have overstocked on semiconductors that would have provided them leeway during these times. However, GM is expecting this issue to continue on for another year and a half (Boudette, 2022).

In response to difficulties locating semiconductors and raw materials for the vehicles, the automaker declared it will concentrate on sourcing from North America. Mary Barra, the chairman and CEO of GM, stated that the business had been working at reduced levels owing to the scarcity of semiconductors but was now ramping up EV production (Phillips, 2022). In order to make this possible, the firm will focus its sourcing strategy on local supply chains and direct sourcing, as well as binding agreements to obtain all the raw materials needed to

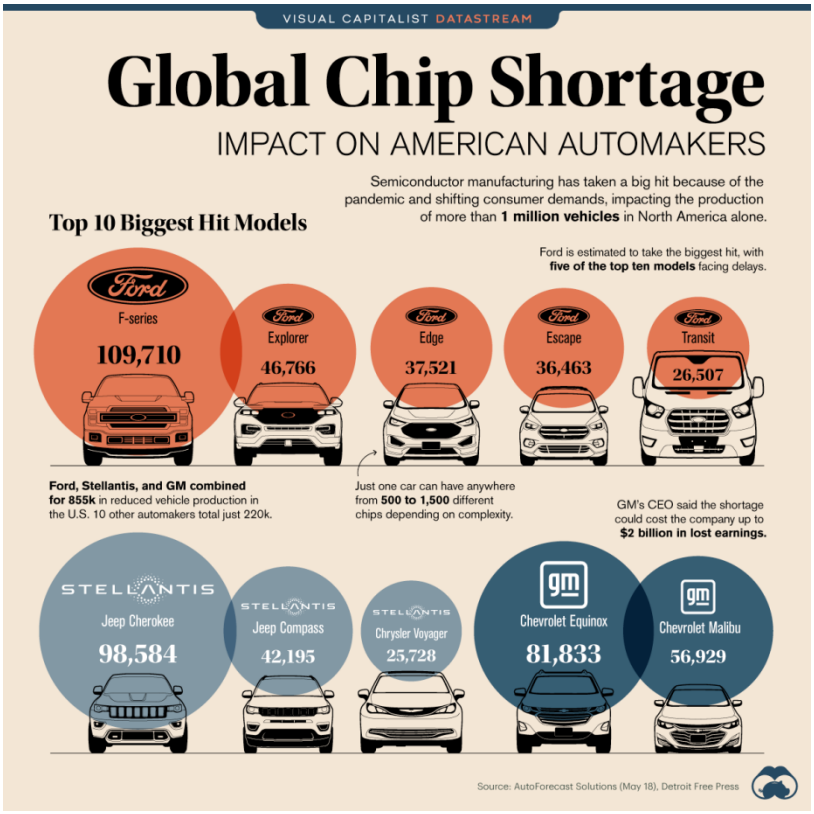
meet its 1 million unit target (Phillips, 2022). According to long-term agreements, a facility for raw materials will be built in Canada. According to a GM representative, the business has a plan to explore direct procurement of specific commodities in order to further reduce risks and promote volume growth (Phillips, 2022). In addition, to help with the shortage of parts Mark Reuss, who is GMs president, said that three new families of microcontrollers being developed by GM and its chip suppliers will reduce the number of chips in future cars by 95%. According to Reuss, GM works with the following suppliers: Qualcomm, STM, STSMC, Renaissance, On Semi, NXP, and Infineon(LaReau, 2021). GM is planning on producing their own microchips by the year 2025. With its new standardization strategy, GM will streamline the essential parts. This will deal with the requirement for numerous different chips in each car, and be able to be purchased in bulk to ensure uninterrupted supplies (Lopez, 2022).

2. Analysis:

2.1 Topic One: Sourcing and Supply Management

The shortage impacted numerous automotive companies such as Ford and Stellantis. The image shown on Figure 3, shows the top 10 biggest hits during this shortage. Ford, Stellantis, and GM together account for 855,000 of the more than 1.1 million vehicles expected to have manufacturing delays. Between 500 and 1500 microchips are used in the construction of modern automobiles. General Motors is estimating a total of $2 billow dollars in lost earrings due to the shortage (Wallach, 2021).

Although the majority of the world's leading automakers have factories in North America, it is anticipated that American-based manufacturers will be the most severely impacted shown in Figure 4.



(Figure 3: Image courtesy of visual capitalist)

Manufacturer	Estimated Volume Impact
Ford	324,616
General Motors	277,966
Stellantis	252,193
Subaru	45,272
Volkswagen	45,215
Honda	42,951
Nissan	41,928

(Figure 4: Image courtesy of visual capitalist)

Due to a limited supply of semiconductors, GM will reduce production of its two popular heavy trucks, the Chevrolet Silverado and GMC Sierra. Also, some pickup trucks will be built without the software to help fuel consumption due to shortage of chips. Additionally, GM accelerated the start date for pickup production at Oshawa Assembly, close to Toronto, from the first quarter of 2022 to the 4th quarter of 2021. Oshawa's car assembly

activities had already been phased out, but they were given a fresh start to enable GM to take advantage of a booming truck market (Iliff, 2021). But GM said it was speeding up its plans at Oshawa Assembly because of the global microprocessor shortage, which has slowed down the production of new cars everywhere, and partly because of the persistent pickup market in North America.

Since Covid 19 initially appeared at the start of 2020, the supply chain issues have gotten worse. There could be 200 distinct global supply chain interruptions every week, and there are no indicators that this will change anytime soon at GM. The global Coronavirus epidemic sparked a trend which enabled working from home. This boosted chip demand last year and helped push global sales up 6.3% to just below $640 billion. As countries emerge from the pandemic's grasp and the government encourages investment in green technologies, that demand appears certain to persist long into this year and the following one as well.

Even though GM has used unorthodox strategies for the CAMI and Oshawa investments, the projects' advanced deadlines demonstrate the automaker's dedication to them. Regarding the CAMI investment, no one has really gotten into the commercial sector for electric vehicles yet, and GM wants to be the first. It would be wise for GM to take the initiative and demonstrate to the market that they are aware of how the industry is changing. However, there are longer-term concerns about CAMI, such as how many buyers GM can find for the EV600 and how it can compete in the future against businesses like Ford and Rivian that are also interested in producing electric commercial vans.

2.2 Topic Two: Demand Planning

By assisting companies in finding the ideal balance between adequate inventory levels and consumer demand, effective demand planning generates profit and increases customer

happiness (Iliff, 2021). That's not a simple objective, especially given that it calls for cooperation throughout an entire firm. However, the effects on business are important. Excess inventory restricts working capital, raises inventory carrying costs, and increases your risk of being trapped with low-quality or outdated stock. In contrast, inadequate planning can cause needless supply chain disruptions and leave a business short on inventory, leading to backorders, stockouts, or expensive rushes for raw materials. These problems can all cause delays, which make customers unhappy.

The same is observed when GM tries to find common ground for them and their clientele in this microchip crisis. GM is short of microchips which are a key component to most features endowed by their many clients. The dilemma lies in whether the company should prolong their halt on producing their many luxurious brands or downsizing the features that come with the lack of supply of microchips. General Motors advanced the timelines for billion-dollar improvements at two Canadian assembling factories, CAMI Manufacturing and Oshawa Assembly, in an effort to get significant products to market more quickly (Irwin, 2021). Oshawa's car assembly activities had already been phased out, but they were given a fresh start to enable GM to take advantage of a booming truck market. In reaction to the global microprocessor shortage, which has slowed new-vehicle production globally, and in part in response to the persistent truck market in North America.

3. Recommendations:

3.1 Topic One: Sourcing and Supply Management

Executive compensation should be based on organizational and supplier-based sustainability outcomes to guarantee that they take longevity seriously and manage to integrate it all over the company in both short- and long-term ways. With this strategy, GM

should host webinars to enable supplier external training. This will increase safety, longevity, and quality while ensuring supplier conformity to the law. Put in place training practices that promote supplier code of conduct compliance across the entire organization. By doing this, it is more probable that all suppliers, not just Tier 1 ones, will abide by the code (Illif, 2021). This will help obtain more detailed data on the steps taken to achieve sustainability.

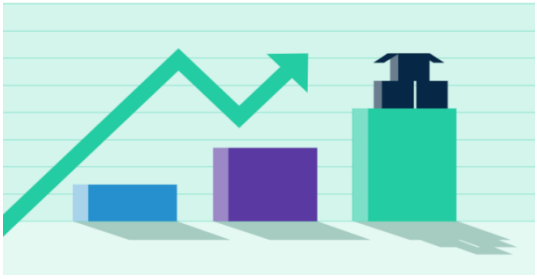
Understanding their growth is being tracked will naturally drive supplier accountability. When progress is insufficient, this strategy will identify when, where, and how to increase responsible sourcing on an innate basis. The long-term sustainable development strategy should take lower-tier suppliers into account (Uzsoy et al., 2018). This will significantly improve the segment's transparency. Refrain from setting unreasonable deadlines for their vendors. Suppliers who face unrealistic demands compromise sustainability.

Supply chain can be improved by tracking the development of electric vehicles. Lack of supply chain resilience has one of the biggest effects on the effectiveness of any sourcing strategy (Scott, 2022). GM will increase the resiliency of its supply chain strategy and naturally increase its sourcing responsiveness by implementing hybrid techniques that offer various sourcing and by resuming operations depending on analytics-driven demand (Guardian, 2022). This approach could be particularly significant in enhancing the business's adaptability and success in the face of the anticipated shortage of microchips.

On rare occasions, automakers have had to delete features from cars because they or their suppliers lacked the requisite chips. Vehicles from Honda and Volkswagen have been sent without sophisticated parking sensors and standard blind-spot monitors, respectively (Boudette, 2022). In order to produce vehicles without this material and then retrofit it later,

once the necessary parts are ready, GM can take inspiration from its rivals and do similar steps.

3.2 Topic Two: Demand Planning



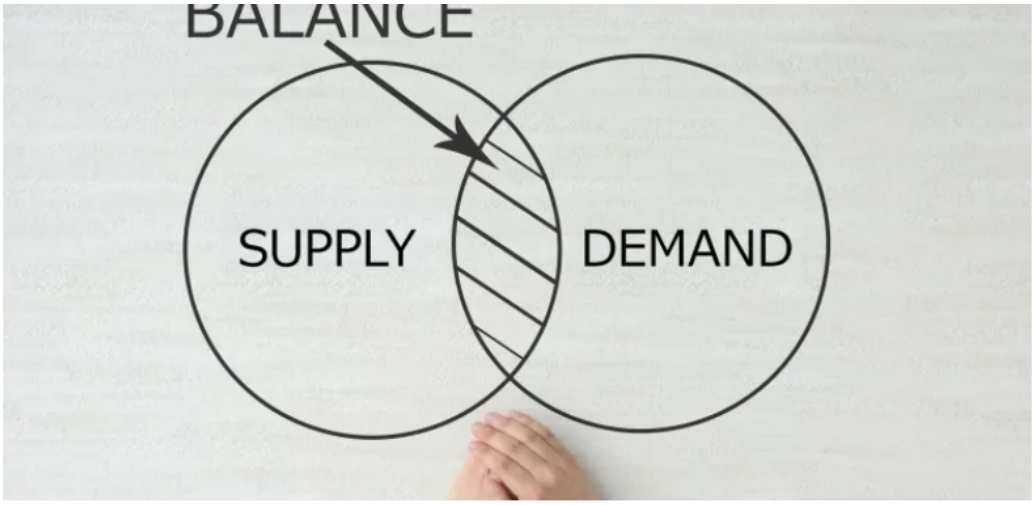
(Figure 5: Image courtesy of MSU)

As of June 30, GM had completed and dispatched around 75% of the 95,000 vehicles built without certain components. The company is experiencing better availability of microchips, as well as other parts. Dealer inventory increased to 359 million as of September 30, 2021 from 248 million at the end of the second quarter. Recent developments indicate that overall chips are improving and are definitely better than where they were a year ago (Uszoy et al., 2020). Although there have been no indications of a recession at the company, it continues to monitor the state of the economy. The company is selective in its hiring and has no intentions to lay off any employees.

Next record sales, GM intends to increase Chevrolet Bolt EV and Bolt EUV production from 44,000 vehicles this fiscal year to 70,000 vehicles the following year. The world's largest rental car company Hertz has agreed to purchase from General Motors up to 175,000 electric cars in the next five years, with the initial deliveries of the Chevy Bolt EV and EUV scheduled for the initial quarter of 2023 (Scott, 2022). It will also increase the size of its Ultium fuel cells manufacturing facility in Ohio, with a new facility scheduled to open in 2024, and another in the works. By 2025, GM will be able to increase its EV

manufacturing in North America to a capacity of more than one million units annually thanks to the successful acquisition of sufficient battery raw materials.

Forecasts should be validated, demand sources should be understood, variability should be accounted for, and inventory and customer service policies should be revised. Well Pareto Analysis of Customer Demand can help here. According to Pareto's principle, only 20% of the causes have 80% of the effects. Similarly, the top 20% of any organization's consumers account for 80% of its sales. Demand planners must closely monitor the purchasing behavior of these top clients and immediately notify any significant variations so that the sales and marketing teams may take early corrective action.The provision of long-term forecasts for budgeting, financial planning, manufacturing capex, contract manufacturing, warehousing, distribution, and 3PL is crucially dependent on demand planners.



(Figure 6: Image courtesy of MSU)

Demand forecasters should aim for good forecast accuracy of +/- 5%.

Steps to follow as a Demand Planners:

- Gather existing data and perform a preliminary forecasting.

- Integrate market intelligence.
- Taking into account sales objectives and financial data to balance bottom-up forecasts with top-down financial and sales forecasts.
- Make final forecast adjustments.
- Use real-time data to track performance.

3.3 Final Recommendations:

To sum up all the different recommendations to help GM with their part shortage, GM should:

- Produce their own semiconductors.
- Overstock on semiconductors.
- Forecast the correct amount of chips that are needed in the future.
- Keep building cars and retrofitting parts once they become available.
- Try to alternate the design to not involve as many chips.
- Give up features that are not utterly necessary for the vehicles, such as vented/heated seats/steering wheels.
- Host webinars to enable supplier external training.

4. Conclusion:

Manufacturers of a wide range of items, including medical gadgets, aircraft, ATV's, vehicles, telecommunications equipment, and energy infrastructure, continue to face major issues with semiconductor shortages brought on by the pandemic's disruptions(Boudette, 2022). Due to higher chip prices resulting from shortages, inflation is being fueled. In conclusion, the inability of businesses to maintain fully operational manufacturing is indeed weighing on the economy.

5. References

GM restarting production at plants idled by microchip shortage. (2021, May 28). *Niagara Falls Review* Retrieved from https://www.proquest.com/newspapers/gm-restarting-production-at-plants-idled/docview/2533142104/se-2

Iliff, L. (2021). CRISES CONVERGE: LACK OF MICROCHIPS, SEAT FOAM AND MORE HALTS SOME AUTO PRODUCTION. *Automotive News, 95*(6978), 1. Retrieved from https://0-www-proquest-com.wizard.umd.umich.edu/trade-journals/crises-converge/docview/2504862919/se-2

Irwin, J. (2021). GM takes rapid path to retool canadian plants: Pickup demand, chip crisis spur CAMI, oshawa plan pull-ahead. *Automotive News, 96*(7003), 11. Retrieved from https://0-www-proquest-com.wizard.umd.umich.edu/trade-journals/gm-takes-rapid-path-retool-canadian-plants/docview/2573005101/se-2

Scott, P. (2022). General motors' other franchise system: Creating an effective distribution model for frigidaire. Business History, 64(1), 183-200. https://doi.org/10.1080/00076791.2020.1714594

Uzsoy, R., Fowler, J. W., & Mönch, L. (2018). A survey of semiconductor supply chain models part II: Demand planning, inventory management, and capacity planning. International Journal of Production Research, 56(13), 4546-4564. https://doi.org/10.1080/00207543.2018.1424363

https://gmauthority.com/blog/2022/07/gm-moving-to-its-own-microchips-by-2025/

https://www.investors.com/research/ibd-stock-of-the-day/gm-stock-general-motor-strong-earnings-ev-event/?src=A00619&refcode=aflMarketWatch

https://www.cips.org/supply-management/news/2022/august/how-gms-new-procurement-strategy-aims-to-overcome-sourcing-challenges/

https://www.freep.com/story/money/cars/general-motors/2021/11/18/gm-partners-suppliers-find-chips-fix-north-america/8670518002/

https://www.nytimes.com/2022/07/01/business/general-motors-car-sales.ht

https://www.gm.com/company/usa-operations

https://www.proquest.com/docview/2694328511?parentSessionId=8fJCpxzOIXqN%2F6hZIGvx29TO1GKBI7OaTL%2Bf9Wy1%2FEg%3D&pq-origsite=summon&accountid=14578
https://0-go-gale-com.wizard.umd.umich.edu/ps/i.do?p=ITOF&u=lom_umichdearb&v=2.1&it=r&id=GALE%7CA651344973&inPS=true&linkSource=interlink&sid=bookmark-ITOF

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https://www.wsj.com/articles/auto-makers-retreat-from-50-years-of-just-in-time-manufacturing-11620051251?st=ha7fwxc1exopqby&reflink=desktopwebshare_permalink
https://www.proquest.com/docview/2694349311?accountid=14578&parentSessionId=s1emF%2BW4mXoTXiWUPW9Dha1ndXqwuopeygj2nYecG9E%3D&pq-origsite=summon

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