September 1, 2023

The Honorable Gina M. Raimondo
United States Department of Commerce
1401 Constitution Avenue, N.W.
Washington, D.C. 20230

Dear Secretary Raimondo:

Thank you again for your dialogue with industry leaders in your Advisory Committee on Supply Chain Competitiveness (ACSCC). Your efforts to promote global trade and to improve the resilience of America's supply chain are critical to U.S. business competitiveness. We appreciate your leadership efforts to expand opportunities in the Indo-Pacific Economic Framework and we commend you on your recent visit to China to re-energize and reaffirm critical trade relationships with China.

By most visible signs, American supply chains are healthier today than they have been at any point over the last three years. Shelves are stocked. Auto factories are humming. Our ports are clearing freight. Even those once hard-to-find legacy computer chips are again in plentiful supply. Why does your advisory committee remain concerned?

In fact, we your advisory committee are determined now more than ever to work with you and other agencies to follow through on both recommendations made previously by the advisory committee and the newly approved recommendations offered below. A return to more "normal" business operating conditions – in part due to efforts and actions by the Department of Commerce – create a window of opportunity for planning and action. Your advisory committee recognizes that these moments of calm and "normal" business operations hold the greatest opportunity for you to lead in making constructive changes and to effectively address underlying problems, which are more difficult to resolve in times of crisis.

Today your Advisory Committee on Supply Chain Committee Competitiveness adopted five recommendations for your consideration. We urge you to consider the recommendations as consensus guidance on opportunities among industry supply chain leaders to strengthen the resilience of U.S. supply chains. We respectfully request that you direct staff to work with the advisory committee over the next 60 days to provide status updates on these and previous recommendations made by the Advisory Committee, perhaps on the agenda of the Advisory Committee's October 25 meeting.

You have an opportunity to lock in gains made and to solidify the foundation for even greater resilience in the future, and we urge you to work with the White House, with the Department of Homeland Security's Customs and Border Patrol, with the Department of Transportation, with the Federal Maritime Commission, and with other federal agencies to implement the five actions listed below.

Thank you for your steady and practical leadership in these challenging times. We look forward to continuing to collaborate on making America's supply chains the world's most robust and resilient.

Respectfully submitted,

Ursula Burns and Jeff Wilke
Co-Chairs, Advisory Committee on Supply Chain Competitiveness

CC: Stu Pann, Chair, Data, Innovation, and Technology Subcommittee, Advisory Committee on Supply Chain Competitiveness

Recommendations from Data, Innovation, and Technology Subcommittee

Advisory Committee on Supply Chain Competitiveness

Approved August 22, 2023

Recommendations

1. Design and Develop a Manufacturing Data Platform

Challenge: Manufacturers often have limited data, with little visibility on what happened in the bigger supplier network. Data is often subjected to distortions, leading to the well-known "bullwhip effect," in which distortions grow as individual organizations act in self-interest, with limited data. Hence, a small dip in demand can lead to amplified orders and reactions. During the pandemic, such distortions sometimes were observed in markets for consumer goods. A slight sign of shortages of an important product, such as sanitizers, would lead to panic buying. The increase in orders would amplify throughout the supply chain. Suppliers furthest upstream, such as semiconductors that supply multiple industries, often faced the blunt of extreme upswings or downswings. For small and medium enterprises (SMEs), the risks can threaten the continued operation of the business, as their ability to access data is even more limited and their ability to process data for production and investment needs is also highly constrained.

Recommendation: Create a blueprint for the development of Manufacturing Data Platform that provides visibility of demands and orders at multiple levels of a supply chain – from downstream to upstream.

Recognizing the need to have better supplier network visibility for manufacturers, some have formed consortiums to incentivize members in a supplier network of specific industries to share data, and to create engines to process data to come up with intelligence such as true demand and capacity needs. It is recommended that, based on their experiences, a blueprint on how critical industries can develop equivalent Manufacturing Data Platform.

- Define the minimal data elements for manufacturers and suppliers to share, including the data contracts (the legal mechanisms used to ensure protection and data security) involved in such sharing.
- Define the analytical engines used to process multi-level supply network data that would avoid the bullwhip effect to come up with industry level demand forecasts and capacity needs.
- Develop best-practice playbooks on how companies, especially SMEs, can use manufacturing visibility data for better planning and reactive actions.

Implementation Suggestions: Leverage learnings from ongoing private sector and standards efforts (e.g., the True Demand effort led by Flex) to the greatest extent possible.

2. Review Indo-Pacific Economic Framework Pillar II recommendations with the DIT Subcommittee for feedback on implementation

Challenge / Problem statement: Key details of IPEF Pillar II recommendations remain in legal review since May 2023. Since Pillar II focuses on promoting more resilient supply chains, industry advisors may valuable insights and suggestions on how best to implement Pillar II efforts. More specifically, the DIT subcommittee may have valuable input specifically on recommendations to "Increase Resiliency and Investment in Critical Sectors and Goods," to "Establish an Information-Sharing and Crisis Response Mechanism," to "Strengthen Supply Chain Logistics," and to "Improve supply chain transparency."

Recommendation summary: Engage ACSCC's Data Innovation and Technology Subcommittee as an early partner for feedback from industry and essential partners, using the DIT subcommittee for early feedback on Pillar II / Supply Chain measures and plans. Understanding what data can be easily provided by industry will help ensure that the agreement is successful.

Background: The IPEF ministerial statement was released in May 2023 (https://www.commerce.gov/sites/default/files/2022-09/Pillar-II-Ministerial-Statement.pdf). The 14 IPEF

partners represent 40 percent of global GDP and 28 percent of global goods and services trade, and IPEF offers promising incentives-based opportunities and benefits for global supply chain resilience. However, details about the respective roles of government and private sector entities, about data sharing goals and practices, and about potential pilot efforts, have not yet been made available as the framework proceeds through legal reviews.

Implementation Suggestions: Assign a Department of Commerce representative to meet with the DIT and share greater details on the IPEF Pillar II goals. This includes facilitating feedback from the DIT Subcommittee on implementation opportunities.

3. Convene a Summit on Future Best Practices in Data Sharing for Supply Chain Resilience

Challenge / Problem statement: Efforts to create forward-looking dashboards and early warning systems often struggle to reach implementation. Such efforts face common obstacles in resolving problems including data quality, data provenance, data security, data anonymization, access controls, automation, impact on timely decision-making, scope, data standards, etc.

Recommendation summary: Convene a 2024 Supply Chain Data, Innovation, and Technology Summit, focused on forward-looking data sharing strategies to improve supply chain resilience. The goals of the Summit would include (A) Highlighting new developments and future opportunities in data sharing efforts; (B) Identifying best practices to the common obstacles; (C) Showcasing both public and private sector led approaches; (D) Identifying remaining gaps, opportunities, and help needed to make progress; and (E) Reviewing the standards environment to highlight current and in-development standards efforts, and opportunities / needs for new standards and specifications.

Background: Several efforts to share data for supply chain resilience are underway. These include both government initiatives (e.g., MTDI at fmc.gov/fmc-maritime-transportation-data-initiative/, FLOW at bts.gov/flow) and private sector initiatives (e.g., the Flex-led True Demand project at https://flex.com/resources/working-towards-true-market-demand and ASTM's SCORe effort). Efforts at earlier stages of planning and development also could be shared for discussion and feedback. Bringing together project leaders focused on addressing these issues could help accelerate efforts to identify common problems and mitigations (e.g., data rights, data security, preventing misuse of data including through arbitraging, data anonymization, cost, etc.).

Implementation Suggestions: The summit should avoid duplicating efforts by FMC in creating the April 2023 MTDI report. Modeled on prior Commerce summits, this summit can provide opportunities for practitioners to see what is working in efforts including FLOW, MTDI, and private sector efforts, to compare notes on shared obstacles and promising solutions, and generally to draw attention to the urgency of the opportunity.

4. Twenty Days by Ocean: Initiate a study on investments and measures needed to achieve twenty day door to door throughput time from Asia to the U.S.

Challenge / Problem statement: Before the pandemic, throughput times from Asia to the U.S. were in the range of about 35 days, but this time approached 100 days during the pandemic. Although the pandemic is over, throughput times have not fully recovered.

Recommendation summary: Together with other appropriate agencies, conduct an assessment of what it would take to achieve a twenty day door to door throughput time for shipping via ocean. The effort should

be structured to identify what possible measures could be taken to reduce throughput times, and evaluate the merits or problems with proposed measures. For example, the effort might explore whether additional funding should be appropriated and allocated to CBP cargo processing and trade facilitation capabilities (e.g., advanced technologies like Artificial Intelligence/Machine Learning and advanced robotic facilities; advanced Nonintrusive Imaging technologies; etc).

Implementation Suggestions: Partner with key stakeholders from business, labor, and trade partners early on to shape the study and to ensure ideas are feasible. Some suggest it would be helpful to prioritize potential improvements at U.S. ports and the inland transportation system, where the U.S. officials and stakeholders have greater opportunity to influence changes.

5. Identify opportunities to enhance supply chain resilience and to incentivize returning more manufacturing to U.S. shores through accelerating trade modernization efforts, rules-of-origin, tariff programs, measurement of value add at different stages.

Challenge / Problem statement: As supply chains adapted to meet global demand over recent decades, companies shifted some manufacturing and other operations outside of the U.S. for business reasons (e.g., to reduce costs, to be closer to consumption markets, to prevent single points of failure, at the encouragement of the U.S. government, or for other reasons). However, the result has been a concentration of manufacturing, for example in Asia COVID-era shortages highlighted the need for rebalancing some manufacturing and supply lines, but companies face real challenges in rebalancing, including trade policies and practices optimized for the previous era, including how the U.S. government handles country of origin and tariff programs that do not align to policy goals that support supply chain resilience. Rather than move portions of the process back to the U.S., businesses choose to keep their processes overseas, often at lower costs or easier access to supply lines. Accelerating trade modernization efforts could also be helpful, as government agency entry and customs submissions require paper forms too often, given the current state of information management systems. This can create confusion and delays in tracking goods through the international supply chain process. The issue is compounded as each company utilizes different computer systems, and many countries require different information.

Recommendation summary: Initiate a study (potentially led by the Data, Innovation, and Technology subcommittee) to identify the most immediate and impactful actions for Department of Commerce and other government agencies to re-evaluate current rules governing country of origin to account for the totality of the manufacturing process and the various stages from development to end products, and to accelerate initiatives around trade modernization (e.g., digitization of entry processes, adoption of electronic Bills of Lading, modernizing to BIC Global standards). A detailed review of how digitization in all areas of the supply chain could speed up and strengthen supply chain resilience. This study should be provided to Congress to help with customs modernization legislation.

Background: Currently, country of origin and tariff designations come from one step of a manufacturing process, typically assembly, which can account for the lowest value of the process. However, these designations do not factor in the other portions of the manufacturing that occur before these last steps, ignoring the jobs and GDP growth resulting from the beginning steps. A world class supply chain requires a foundation in world class information management systems. Several efforts -- including trade agreements and frameworks (e.g., USMCA Chapter 7, IPEF) as well as U.S. Customs and Border Protection's (CBP's) 21st Century Customs Framework (21CCF) -- have identified problems and specific improvement opportunities. However, progress has been slow, and the process has not received the full

attention required. Both public and private sector organizations need clear guidance on how to implement digitization of trade to plan their future investments in technology, data management and security.

Implementation Suggestions: The trade community has shifted its focus to Congress on completing work on comprehensive customs modernization legislative proposals, and so it will be important to monitor developments on the legislative front. It is important to work with industry and other countries to streamline the process and ensure that systems align. In determining the value of a component, determinations could consider the value added in each step of the manufacturing process as well as considering intangible sources of value such as research and development and intellectual property. Such changes could incentivize companies to re-shore functions if they were able to claim credit towards U.S. production.

Annex

2022 Update from Data, Innovation, and Technology Subcommittee

Advisory Committee on Supply Chain Competitiveness

June 2022

1. Data Gaps in Supply Chains

The current challenges in global supply chain require multi-prone approach to address. One of the crucial problems raised by executives of supply chain companies was the lack of data. The data problems can be described as follows:

- Companies have limited data, and have to make decisions with such limited data. Companies could not see data at other sites or paths at different parts of the supply chain. The result is that they could not be proactive to identify where potential bottlenecks lie, find the best solution when confronted with unexpected situations such as disruptions, or that their planning decisions for replenishments, transportation routing, or capacity investments might be myopic or even a result of over-reactions.

- Data is often subjected to distortions, leading to the well-known "bullwhip effect." The distortions were a result of every company acting on its self-interest with limited data. Hence, a small dip in demand could lead to amplified orders and reactions. During the pandemic, we have seen such distortions starting with consumers. A slight sign of shortages of an important product such as sanitizers would lead to panic buying. The increase in orders would amplify throughout the supply chain. The most upstream suppliers, such as semiconductors that supply multiple industries, often faced the blunt of extreme upswings or downswings.

- Even when data is available, there are errors stemming from the input or transmission processes.

- Data may not be timely. By the time data reach the hands of the decision makers, they can be outdated, and therefore not as useful.

- Historical data can be useful for review, but they are often incomplete or insufficient. Plus, due to the limited nature of data, the historical data only allow for simple trend identification without the ability to explore causal relationships that could be more useful.

- With limited data, projections are at best ad hoc. Companies have to make projections based on its own data, missing out the potential interactions that could impact their business by others in different sectors. Limited data also makes it difficult to conduct meaningful "what-if" scenario analysis.

The following table summarizes the data problems described above:

Data Gaps in Managing Supply Chains

Data types	*Visibility*	*Analysis*
Historic data	Limited records, incomplete, error-prone	Separate historical analysis resulted in trend identification but not enough data to explore causal relationships
Current status	Limited but not end-to-end view, delayed	Inability to see where bottlenecks lie, and what alternatives or resolutions could be activated if disruptions occur
Future status	Projection based on limited data	Incomplete "what-if" analysis; no macro-view to see how interactions of different sectors could create problems or opportunities

In our interviews with industry leaders on this data problems, the needs and desires on data emerge in multiple ways. Sure, at a high level, everyone wants to have "more" data – data that is more than within its own boundary. More data would imply finding ways to increase more data sharing in some effective form. But it is more than as simple as just asking for more data. How could the data be turned into meaning, relevant and useful information that allows companies to make smarter decisions, which in turn would strengthen the supply chain's responsiveness and resilience? Our subcommittee, therefore focuses our efforts to explore what kind of data should be shared, in what ways should they be shared, and beyond just sharing data, what processing of the data could turn data into insights and intelligence?

2. A Framework of Data Needs for Supply Chains

When supply chain leaders expressed their desire to have "more" data, their goal is to have more visibility into the supply chain that could enable them to gain better control. Our advisory committee has two other subcommittees, one dealing with transportation and logistics, and one dealing with manufacturing. Data needs can therefore be also broadly classified as data for logistics, and data for manufacturing.

Data used for visibility of the supply chain can further be classified at the micro and the macro level. Micro-level refers to data at transaction or status level, broken down to the individual units. Macro-level refers to data aggregated at regional or national levels.

In logistics, the units could be the status at choke points such as sea ports, rail stations, or airports. They can include hubs such as warehouses or transshipment hubs. They can be further disaggregated by terminals or berths. The units could also be status of the individual conveyances – ships, containers, trucks, rail cars, and airplanes.

In manufacturing, the units could be inventory or production capacity of products, components, subassemblies, or materials.

Micro-level data would be useful for companies to respond to potential bottlenecks, disruptions, or, in some cases, opportunities. In logistics, having more extensive data would be useful for the private enterprises to seek actions such as alternative modes, routes, other means of expeditions, or deployment of inventory reserves at different locations. Today, micro-level data in logistics reside with individual

logistics companies. For example, in our discussions with companies such as CH Robinson, Flexport, Blue Ocean and Project44, all have shown various degrees of extensiveness of data captured. Some public, non-profit agencies such as ATRI have also collected extensive data on some transportation modes. The key is to encourage, enable more data sharing, as well as to establish a third-party agency to be the collator and integrator of such data. This point will be discussed more later.

In our exploration, we discovered that, sometimes, private enterprises would seek help from public agencies to intervene due to the magnitude of the disruptions. It was not clear, however, which agency to be contacted, and what course of actions is necessary for such interventions. This is an area in which the subcommittee found necessary. In short, for micro-data in logistics, we need to work on (1) more extensive data sharing and integration beyond what the FLOW project is working on, and (2) defining guidelines as on the trigger points as well as the processes in which public agencies could be contacted to support with interventions.

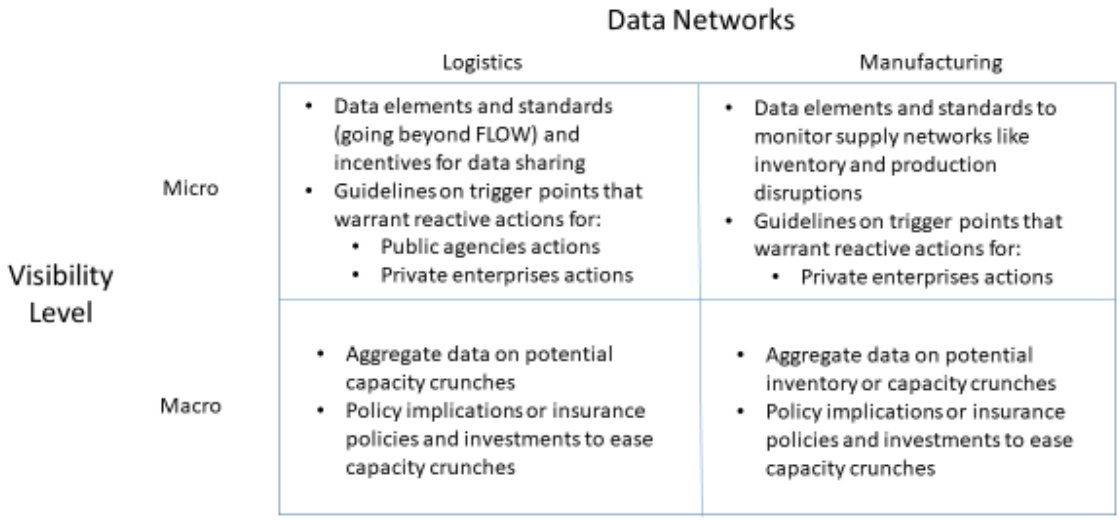
In the case of micro-level data for manufacturing, most manufacturers have their own data systems to monitor their supply networks. However, most have limited visibility into the supply networks. Some have limited view of their first tier suppliers, and even fewer have visibility into the second tier and beyond. There have been many publicly available sources that documented the limitedness of such visibility. Just to quote, according to https://www.zippia.com/advice/supply-chain-statistics/, only 6% of the companies reported having full visibility of their supply networks. The result is what we observed during the disruptions of factory lockdowns due to the pandemic, the closure of Suez Canal, or even the conflicts resulted from the Ukraine-Russia war. There was insufficient knowledge by companies on how these disruptions could affect the material, component, subassembly or even final assembly factories that they were faced with. Similarly, with the capacity crunch of semiconductor that started in the beginning of 2021, manufacturers learnt about the eventual impact of shortages to their products late in the game, leading to little lead time for responsive actions. Unfortunately, data on their respective supply networks are often very proprietary in nature, and it would therefore be much harder for companies to share the micro-level data on their supply networks, other than the advisory committee publishing best-practice guidelines on how leading companies were able to build more extensive data networks to gain visibility, and how they were able to use such visibility to make better preemptive decision making when disruptions occurred.

At the macro-level of logistics, once the micro-level data from multiple sources can be aggregated, bottlenecks or congestions can be identified. The aggregate data can able be used to develop trends and projections, which can also be used to guide investments on places where capacity crunches are found. Capacity crunches can be at the choke points such as port capacity, or at the conveyance level such as trucks and drivers.

For manufacturing, macro-level data could be used to project mid-range or long term demand or capacity projections. This would enable identification of potential future supply chain problems, so that both private enterprises can explore inventory, capacity investment or insurance decisions to plan for them. For the government, this would help to guide policies that could subsidize or incentivize proper investments.

We summarize the framework discussed above as follows.

A Framework of Data Needs for Supply Chains



3. Logistics Data Networks

This section expands the needs for the development of logistics data networks. Data is useful to companies for execution and for planning purposes. What kind of data is necessary if FLOW or a similar data network would be of use? Based on the interviews with logistics providers, the following data needs can be described.

For execution, the data needs can be described as follows:

- ***How many***. This data element looks at a choke point, and measures the conveyances at the choke point. It is a quantity measure. For example, it can be about how many ships are at berths, how many are waiting at ports within a certain radius, how many trucks are waiting outside the port, etc.
- ***Where***. This data element looks at a conveyance, and measures where the conveyance is. It is a location-specific measure. For example, focusing on a ship, the location of the ship can be specified.
- ***When***. This data element is a time measure, which can be about a choke point (e.g., the estimated time when a berth is open or a congestion can be cleared), or about a conveyance (e.g., the estimated arrival time of a truck to a destination).
- ***Who***. This data element goes deeper in the responsible party of the conveyance, such as the carrier of a ship or a truck.
- ***What.*** This data element would go one step further into the content of the conveyance, e.g., what products were in a container, or in a truck.
- ***Whose***. Following the data element of *What*, this data element could describe the owner of the products, i.e., the shipper.

The above list is very comprehensive and it may not be feasible to expect an integrated data network to be achievable in a short time. Such data can be valuable for companies to be alerted if potential out of control conditions occur, so that contingency actions can be activated. As we indicated earlier, this would also enable alerts to the proper government agencies to take proper intervention actions.

In planning, the above data elements together could provide past as well as predictive statistics such as:

- Dwell time to go through a choke point, or the waiting time to receive service, or the dwell time to travel from one choke point to another.
- Congestion levels at choke points.
- Utilization levels of capacities at choke points, or utilization of conveyances.

These statistics could inform where bottlenecks are, enabling planners to change operational plans such as changing sourcing or production plans to avoid bottlenecks, or transportation plans such as changing mode, route, or carrier choice. With the statistics, simulations to perform "what-if" or scenario analysis can be done to support capacity investments or investigate contingency plans. At a macro-level, the overall pattern in transportations linked to imports and exports can be useful as inferences on macro-economic trends.

4. Implications for Actions in Logistics Data Networks

The above discussion points to several gaps in today's status of logistics data networks. First, data sets exist in different organizations, and few are shared. Logistics providers have their respective data networks based on the logistics works that they do with their customers. Some public agencies have made more progress in having more integrated data, such as ATRI, and some originally academic agency has migrated to be commercial entity, such as Marinetraffic.com, that have some degree of data integration. In our interviews, most expressed a strong desire to share some degree of data, but there is a need to have a central agency to be the keeper and integrator of the data on a continual basis.

Second, data at a raw level is only the beginning part. Logistics providers have developed various levels of expertise in processing the data into useful statistics. It is the statistics that is useful for management actions and decision making. Some used the term "actionable visibility" to describe data that has been properly processed and analyzed to enable intelligent and smart decisions or actions. Today, individual companies have to do such analysis on their own, and for SMEs, this is a big challenge. When data has been aggregated and integrated, this job becomes even more daunting. Hence, to increase the value of a centralized data set, it is important to go beyond just aggregating and integrating the data, but to also perform the necessary statistical analysis to turn data to useful statistics for insights.

Finally, the data should be aggregated over time at the appropriate aggregate level, so as to provide longer term and holistic view of the logistics performance of the supply chain. This would enable longer term capacity investment actions to be properly made.

In summary, the subcommittee advocates the strengthening of "sense and response" in logistics.

Sense refers to building a logistics monitor as the followings:

1. *Create a central organization to be the "Logistics Monitor", with the job of developing the basic data elements, standards and means (such as appropriate APIs) for data sharing and integration. The Monitor is to exist on a continual basis.*
2. *The Monitor is also responsible to process the data into useful statistics. The kind of statistics are ones that would be most useful to enterprises and to the government for oversight and monitoring.*

3. *The Monitor will also aggregate data over time and perform projection analysis. It will publish reports to inform stakeholders of trends and long term needs.*

Respond refers to building the capability to respond to potential problems and issues:

4. *Create a guideline for what the trigger points are and the appropriate paths for public agency responses for intervention.*
5. *Using the aggregate macro-data on projections, convene government and private enterprise coordination to invest in the right capacities of both the choke points (like ports) or conveyances (like Class 9 trucks)..*
6. *Develop best-practice playbooks to help SMEs to use the Logistics Monitor for better planning and reactive actions.*

5. Manufacturing Data Networks

Similar to logistics data, manufacturing data can also be described as:

- ***What.*** This data element is about the basic characteristics of the transformation process, such as demand forecasts, the bill of materials, the condition of the product (which can include characteristics such as damaged or the age of the product), and sustainability performance.
- ***Where***. The location of the supply network. Note that some supply chain professional called locating all the members of the multi-tier supply network as "supply chain mapping."
- ***Who***. In addition to the location of the supply network, the ownership of the provider (suppliers, contract manufacturers, joint ventures, strategic alliances, self, etc.) is part of the manufacturing data networks.
- ***Whose***. The ownership or liability of the inventory at the different locations, often based on the terms of trade.
- ***How many***. This data element is a quantity measure on products (or components, subassemblies, etc.) that are at a factory as inventory or work-in-process, or in a logistics network as in-transit inventory.
- ***When***. This data element is a time measure, such as lead times or forecast horizons.

Leading companies have very comprehensive data networks that combine the above data elements to the risk and disruption events (e.g., natural and man-made disasters, such as earthquakes, fire, floods strikes, riots, blockages, and wars, etc.) to gain full visibility. The comprehensive visibility is coupled with the company's smart analysis of the actions to be invoked, preparation of contingency plans, appropriate inventory and capacity plans, and design of product and process flexibilities to respond to risks and uncertainties. The extensive data networks also allow these companies to be able to perform extensive simulation-based "what-if" and scenario analysis to prepare proactively for disruptions or unexpected events.

Here is a summary of the kind of manufacturing visibility that leading manufactures have pursued:

Example in Manufacturing Visibility

- Mostly developed by private, global enterprises
- End-to-end visibility:
  - Supply chain mapping, "who" are the existing and potential suppliers and customers at multi-tiers.
  - Events of disruptions

Stock Data	Flow Data	Disruption Events
• Capacity at different nodes of supply network. • Inventory (quantity and condition) at different nodes and in transit throughout the supply network. • Orders and backlogs	• Production lead times. • Logistics lead times. • Supplier yield and reliability. • Customer order lead times. • Trade restrictions.	• Natural disasters. • Human disruptions (e.g., war, strikes, blockages). • Congestion bottlenecks (e.g., ports).

6. Implications for Actions in Manufacturing Data Networks

While leading global enterprises have created very comprehensive manufacturing data networks for their visibility monitoring and to operate "sense' and "response" effectively, the ability of SMEs with such extensive data for visibility, in general, is limited. This is an area to help, but it is difficult to do it at a national level, as this is very much an individual firm's effort.

At the same time, on macro-level manufacturing data, some innovative manufacturing companies have recognized the needs to have a more macro-view of industry level demand and capacity data at different stages of their respective supply networks. Some of these companies have been burnt by the "bullwhip" effect of the past – the internet bubble of the late nineties, the economic tsunami of 2009, and the more recent COVID-19 pandemic, for example. They have suffered from the lack of overall visibility of macro-level data, so that they had to rely on their limited data for decision making – creating huge bullwhip. Some in specific industry sectors, have called for the formation of some coalition, managed by a third, neutral, party, to assemble demand data from manufacturers at multiple stages of the supply network. Such visibility would enable a company to supplement its own data with the macro-data at the different stages, and hence, would tamper the urge to amplify. For example, if a manufacturer is faced with multiple customer orders that were 20% higher than last quarter, and the industry aggregate demands at the end consumer level showed a much lower increase, then the manufacturer would not blindly invest in more inventory or capacity. It is not easy and simple to successfully implement such initiatives, since it still requires some trusts and willingness to share by key manufacturers. Another potential obstacle is that some of the producers at different stages of the supply chain could be located outside of the U.S., and convincing them to join in such an initiative would be even more challenging.

Within the US, we have seen some modest success, mostly orchestrated by the government. For example, the FDA has been able to conduct such an aggregation for some critical healthcare products, enabling the country to have a view of where potential shortages lie. The initiative was less on taming the bullwhip effect, but more on identifying possible bottlenecks and shortfalls.

Based on this observation, some possible actions advocated by the subcommittee are:

1. *For SMEs in critical industries, support their development of manufacturing visibility networks, and provide training for them to use the networks effectively.*
2. *Support some of the industry-initiated programs that form coalitions of key players in specific industry sectors to share demand and capacity plans. These coalitions would be based on third-party, neutral organizations to perform the data aggregation and analysis, similar to what FDA has done in critical healthcare products.*
3. *Based on the lessons from the above experiments, create a "Manufacturing Monitor", that would track and provide macro-demand trends and capacity needs for key and critical industries.*
4. *Develop best-practice playbooks on how companies can use manufacturing visibility data and the "Logistics Monitor" for better planning and reactive actions.*