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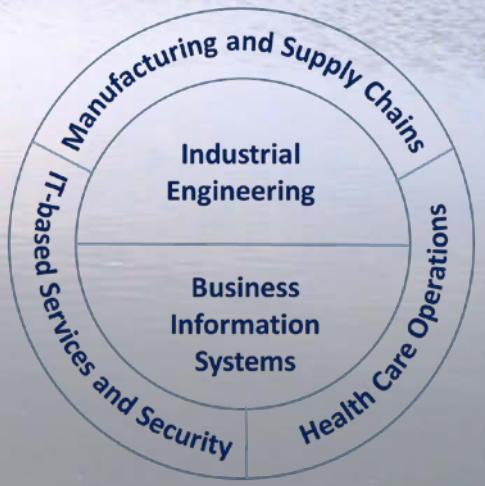
Resilient Supply Chains

Lessons from COVID-19 (and before)

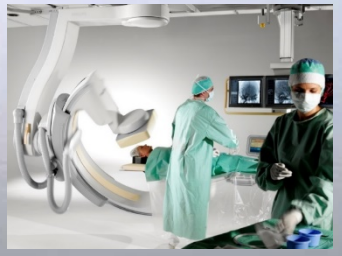
Henk Zijm



COVID-19: a problematic picture

- The COVID-19 pandemic has raised unprecedented challenges, with respect to both healthcare and economic consequences.
- Key industrial and service sectors have been severely disrupted due to lack of supplies and materials, drastic capacity limitations in certain sectors as a result of health protection measures, and severe demand drops. The impact on the logistics sector (transport, warehousing, inventory management) has been severe
- Chain effects have amplified problems, e.g. the lockdown of vital production sectors in China led to materials shortages in many industrial countries. Containment measures cut operations of many service sectors which in turn caused dramatic demand drops in e.g. related supply industries, maintenance and logistics. At the same time, some retailers (food) and ICT industries flourished.

- Capital buffers have been depleted at the level of countries, pension funds, banks and individual companies (both SME's and multinationals)
- The health care sector in particular, vital in fighting the pandemic, suffered from severe shortages in personal protection devices (PPD's), testing equipment, ventilators at intensive care departments, but also personnel.



- Tremendous efforts, combined with much creativity, and sometimes massive government support helped to continue the functioning of some vital sectors, at unprecedented costs

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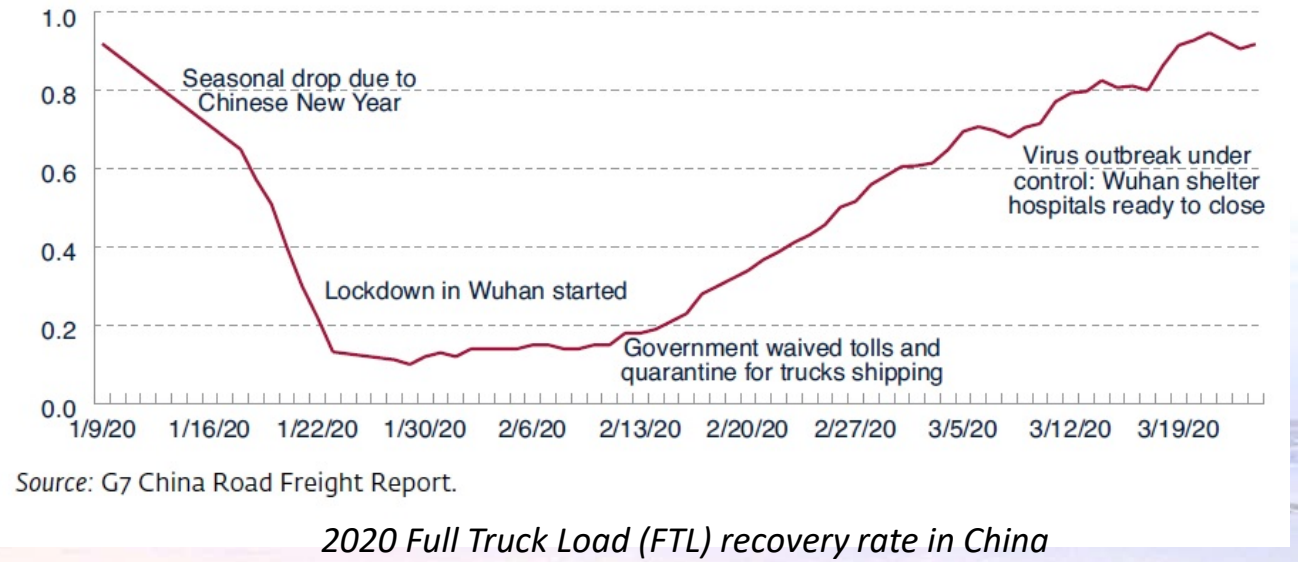
Dramatic supply disruption …. and recovery



2020 Full Truck Load (FTL) recovery rate in China

Early 2020, the pandemic and the corresponding containment measures led to a severe supply disruption.

End February, some 70% of large Chinese industry had restarted operation

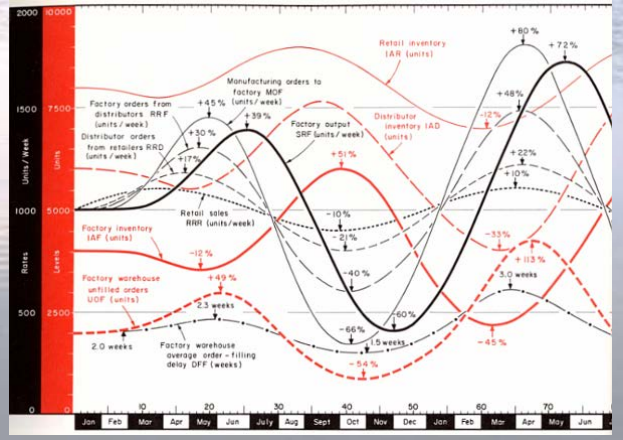
Little later, the pandemic spread to the rest of the world, leading lockdowns and border closures that restricted the movement of goods. As a result, a severe demand drop occurred in many sectors (e.g. automotive, passenger transport, tourism and cultural sectors).

But the pictures are quite diverse ….

- Piles of stock (inventories) in certain sectors, due to severe demand drops while orders already produced are still delivered.
- Dramatic shortages in other sectors (in particular in health care but also in e.g. some ICT sectors), as a result of both demand explosion and production stops (lockdowns) in supply areas.
- Closedowns or sometimes even bankruptcy of key upstream suppliers cause serious delays of even standstill of downstream industries, leading to compulsory redundancy (dismissal) of workers in sectors that might be vital during the recovery period
- Unforeseen effects in both manufacturing and service sectors due to changing priorities (with again healthcare as a notable example), also known as work substitution

In summary….

- **An extreme unbalance between demand and supply, both in terms of time and quantity, and both in and between various sectors**



How to react? Most scholars advocate to ….

- Ensure chain transparency, i.e. visibility of materials and demand along the entire supply chain. That holds for upstream suppliers, to prevent bullwhip effects (demand variations that are amplified upstream) and to ensure timely reduction or speed-up of production, and for downstream retailers/customers that need reliable pipelines. In addition: keep lead times short (local-for-local, reshoring).

(Fransoo and Udenio, 2020)

however ….

- Full chain transparency (full information) may not be in the interest of all players, for instance in situations of intense demand competition, or unique suppliers. Suppliers may seek to establish one-sided beneficial contracts with customers, or customers may wish to conceal market information, or penalize suppliers for not meeting lead-time agreements. Next to focusing on revenue optimization, include risk managing policies in contracts

(Priya and Bhiswas, 2020)

- Price manipulation disturbs such a level playing field, e.g. by concealing information about capacities and available materials, or simply as a result of a too fierce demand competition, but not necessarily a lack of capacities. Resource levels may also be adjusted due to a lack of profitability under normal prices, strong containment procedures or other mitigation measures.

(Cavalla and Kryvtsov, 2020)

- Information on future demand, as well as on supply partners, requires sound data policies, based upon monitoring both industrial behavior, customer demand and governmental policies, and their mutual impact. Smoothing demand patterns, and in that way relieving resource utilization, is crucial.

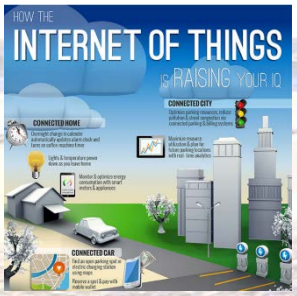
(Alessandria, Khan and Khederlarian, 2020)

Remedies, or how to restore the balance ….

- Strategic stocks at strategically chosen locations may help to address at least some immediate shortages that arise from a pandemic, in particular with respect to PPEMD's (Personal Protection Equipment and Medical Devices)

  Don't expect miracles. If demand explodes, at best *temporary* support is achieved, but it may yield some time to explore alternatives

- Invest in the design of flexible and robust production systems and supply chains, that



  - Enable fast production level adjustments (up- and downscaling)
  - Are able to quickly adopt new product ranges within their technology range
  - Use multiple sourcing
  - Are characterized by short and reliable lead times (which includes reshoring)
  - Are able to switch to servitization modes if customers face financial problems
  - Reuse materials and components of previous product models wherever possible

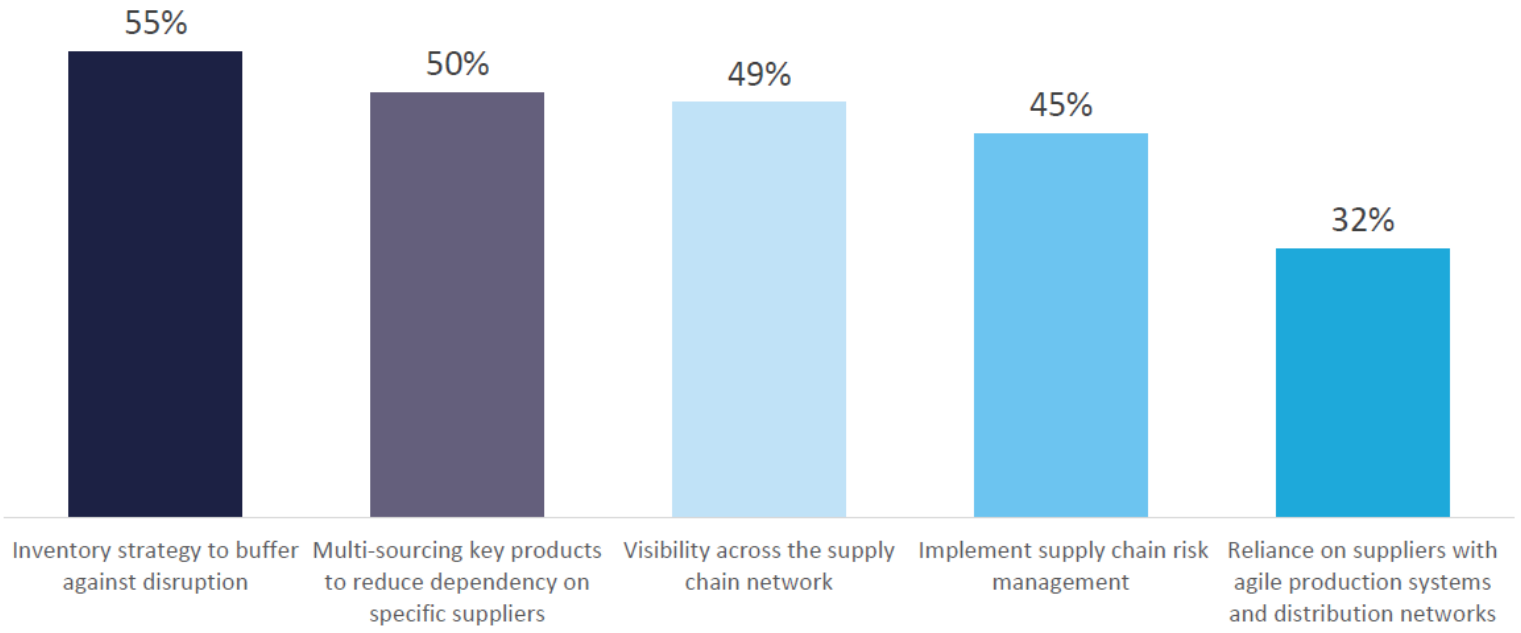
  supported by a strong digitalization (robotics, augmented reality, AI applications)

  Such anticipatory production and supply chain systems might have been vital instruments to prevent some of the dramatic consequences we have witnessed recently

- Ensure the availability of sufficient capital to maintain essential capacities, or to restore these capacities in order to prevent a temporary shortage to become a permanent one

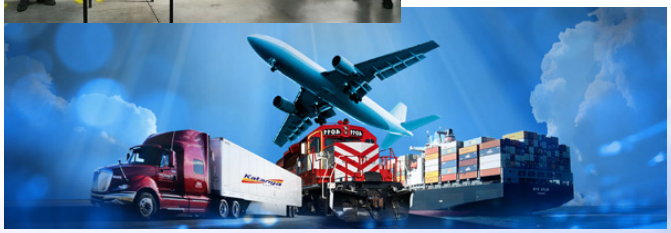
Buffer management, multi-sourcing and visibility were favored over agile production networks…

What has proven to be the most effective strategies for your supply chain when dealing with the Covid-19 situation?



Janet Godsell, InNOWvate Supply Chain Event, 2020

Response of logistics to the crisis



3PL companies have adopted a range of responses, including:

- New safety protocols
- Alternative modes of transport (synchromodatlity
- Adapting service offerings to current demand and safety protocols

In addition, short- and long-term adaptation of supply chains is considered:

- Increased dedicated air cargo capacity
- Increased cargo inspections and cross border control protocols
- Technology and e-commerce rise
- Reconfiguration of global value chains

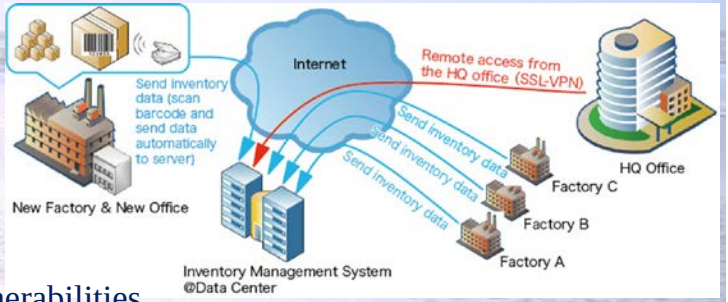
IFC (World Bank Group): The Impact of COVID-19 on Logistics

Design of resilient supply chains: some key research topics

- Data inventory and analysis of the disruption of key industrial sectors due to lack of supplies/components, resulting from pandemic-related lockdowns in supplying countries. What industrial and service sectors were hit most (automotive, machining industry, health care sector)?

- Study chain effects in supply chains that cause standstills of both industrial and service sectors, both in demand and supply. For instance: lack of testing equipment and protection means contributed to national lockdowns which in turn caused severe demand drops in consumer sectors, which in turn affected a variety of industries.

- Where and how to locate inventories of key resources and equipment, and how much? More important: how to establish production systems that are flexible, i.e. that may quickly switch to the production of these key resources (of which we observed creative examples)? Cyber risks and blockchain !?



- In which way may a local-for-local economy help to mitigate the vulnerabilities of the global supply chains we face nowadays, in particular those that have condemned themselves to single sourcing?

- What is the role of new technologies and more general the strong digitalization of production (smart manufacturing or industry 4.0 initiatives).

- How to exploit the circular economy paradigm better to fight the scarcity of materials, by re-using equipment or equipment components, in that way synchronizing sustainability goals with building more resilient supply chains?

To close with, one important advice

Instead of just focusing on materials and goods, make sure to invest in the availability of the systems needed to produce these goods (workers, equipment, tools and programs), and in particular ensure that these systems are:

- ✓ Flexible and adaptable to an extended product range
- ✓ Fast and reliable (short and stable lead times)
- ✓ Scalable and multi-sourcing (cloud manufacturing)

Note the many creative examples we observed in recent months (mouth masks, ventilators, switch from non-Corona to Corona, development of new services (counter models), co-manufacturing models)