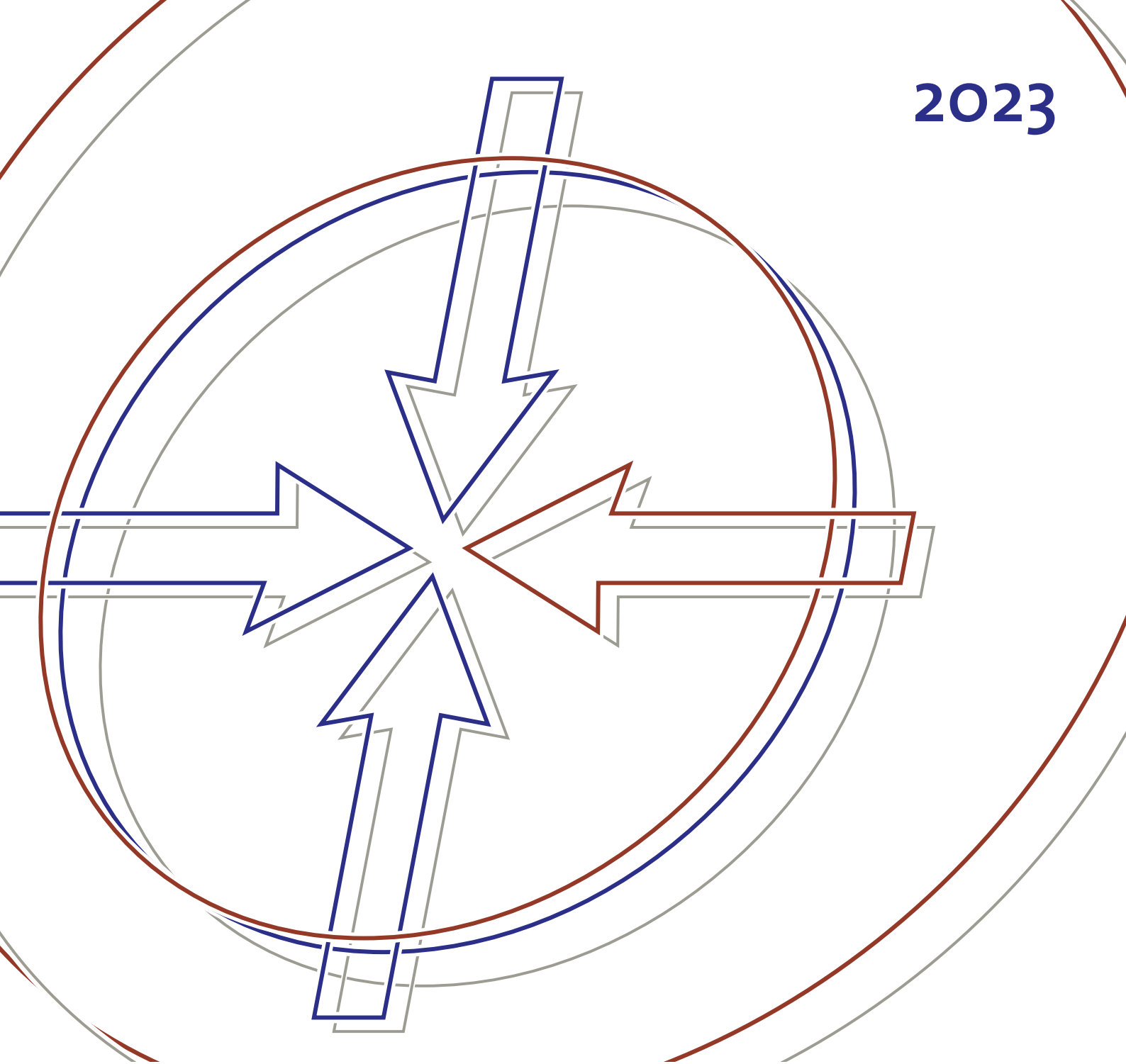


2023



**TRANSPORT LOGISTIC
MÜNCHEN**

May 9 - 12, 2023

Whitepaper –
Resilience as a new target function
of global value added chains

Artificial





Resilience as a new target function of global value added chains

Accompanying publication to the specialist forum
"The influence of geopolitics on your supply chain –
current classification and outlook"

May 9, 2023, 1 pm - 2 pm

Artificial intelligence

1.

Resilience – remedy for ruptured value added chains

Since the financial and economic crisis of 2008/9, the global economic and trading system has often been described as volatile. This volatility has made advance planning in a business context far more difficult and frequently falls under the acronym “VUCA” (volatility, uncertainty, complexity, ambiguity). This environment is also known as “BANI” (brittle, anxious, non-linear, incomprehensible).¹⁾

Irrespective of which acronym best describes the reality we find ourselves in, what we can say is that, due to the corona pandemic and the resulting supply chain disruptions, the planning of these supply chains has become more complicated. Even if corona appears to have been almost completely overcome in Central Europe and the trading indicators (in particular the price and dependability of international container transports) are returning to their normal level, the overall conditions under which supply chains operate have become considerably more volatile. In short, the notion of resilience in the design of industrial value added chains is far more important than was the case prior to corona. Then there is also geopolitics – which for a long time was only of secondary importance for the design

of value added chains and which is now a key factor in the structure of supply chains, a factor that has a concrete impact on sourcing decisions.

Until just a few years ago, value added chains were designed according to the following basic principles; major importance was attached to making them “lean”; and, where possible, quality was ensured by certification and supply capability by contract penalties. In terms of costs, the concept of a value added chain with a single central production location worldwide still appears to be the ideal arrangement,²⁾ but this kind of “single source strategy” can no longer be seen as being in tune with the times. The objective now is to create more resilient value added chains that are adapted to and can satisfy the framework conditions in a VUCA and BANI world. Planning processes must not only be aimed at minimising cost but also need to be more strongly geared towards supply capability while at the same time calculating risks along the supply chains. This renders planning more complex, and this also applies to the methods and instruments used. The concept of “total landed cost” (TLC), for example, incorporates

not only product price, freight costs, customs clearance costs and administrative costs but additionally also the risks in the procurement process occurring all the way through to actual receipt of the goods.³⁾

The issue at hand is “resilience” – in other words the “ability of a value added chain to return to the scheduled performance within an appropriate period of time following an interruption”⁴⁾. More precisely, resilience comprises three qualities: namely anticipation, coping and adaptation.

- Anticipation refers to the proactive adaptation of the value added chain to changes in the operating environment. Flexibility and redundancy must be factored into anticipation at the earliest possible stage – in the form of alternative routes or flexible production capacities, for example.
- Coping means the ability of the value added chain to largely absorb the effects of a risk and to maintain the efficiency of operational routines.
- Adaptation refers to rapid adjustments in response to the effects of risks. This quality can “effectively mitigate the effects of a risk event by containing these effects within as short a period of time as possible”.⁵⁾ The objective is to minimise production downtime and its duration throughout the entire logistics value added chain.⁶⁾

The corona pandemic, the war in Ukraine and so-called fake news are just some of the factors that result in volatile developments and make planning more difficult. This whitepaper will also outline some of the options to increase the resilience of value added chains and will look more closely at various relevant aspects in the subsections.



2.

Supply capability vs. cost minimisation in inventory management

Until a few years ago, it was standard practice to steadily reduce the level of buffer stocks stored to cushion supply failures and to maintain these stocks at the lowest possible level in order to keep the costs associated with inventories (insurance, shrinkage and loss of value due to storage, interest rate costs) to a minimum.⁷⁾

The following diagram shows the changes in stocking levels in Germany based on the monetary value of inventories. According to the available data (data comparison since 1990), there was a record increase in the third quarter of 2022. The monetary valuation method means that the values are higher due to infla-

tion. The diagram clearly shows the steady increase since 2021 and in particular since 2022. The mapped trend line supports the interpretation that stocking levels were initially greatly reduced from early 2020 (first corona lockdown in Germany in March 2020) before rising once again significantly.

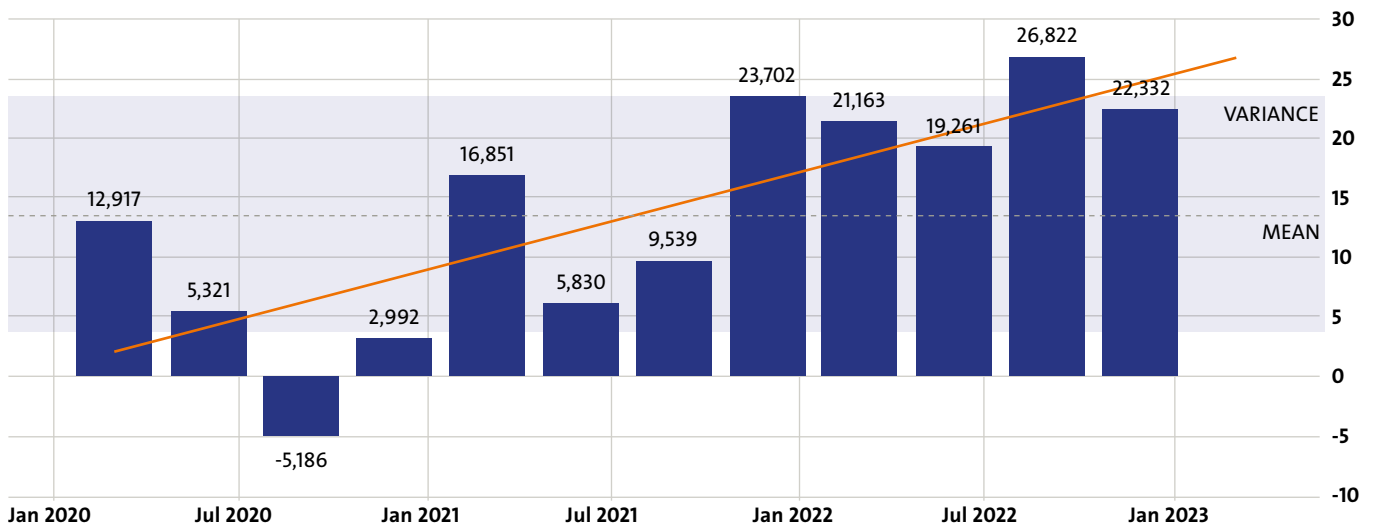


Figure 1: Germany Changes in Inventories – timeline up to 2023,

Source: <https://tradingeconomics.com/germany/changes-in-inventories>; last accessed on March 9, 2023

The extreme swings since 2021 and even more so since 2022 are not even remotely mirrored in the long timeline since 1990. The trend in these statistics is a clear indication that – in macro-economic terms – inventories were increased in order to offset the growing uncertainties in the value added chains. This means that logistics is becoming more expensive not only due to inflation but also for structural reasons.

Warehouse storage is costly as well as space-intensive and therefore also requires larger premises and more personnel. At the same time, the demand for logistics premises in Germany has risen to record levels during the past two years, but this growth in warehousing area is not an end in itself. In view of the fact that it is no longer possible to build new storage facilities without any problems on greenfield sites⁸⁾ and given that the alternative – namely the reutilisation of former industrial sites – is more expensive, any company looking to build

up its warehouse inventories has to conduct an in-depth review of the feasibility of such plans.

Increasing stocking levels in response to volatile developments is not a sufficiently differentiated strategy and such a decision should not be taken without more detailed analysis.

What is important to consider all the associated costs in a way that takes the relevant risk components into account. This in turn means that deliveries have to be categorised. As with the methodology used in conventional ABC or XYZ analyses, we can also define categories as a basis for deriving procurement and inventory management concepts. What we find is that re-procurement of different parts is subject to different risks. Based on various relevant factors, it is then possible to derive a warehousing strategy that is more differentiated than a strategy geared towards building the same stocking levels across all categories. In this pro-

cess, greater importance must be attached to risk-affected goods. To this end, the management concept should at least take account of the geographic location, the geopolitical environment, the market power and the substitutability of a product and its suppliers.

At the same time, more resilient value added chains do not mean that we have to totally turn our back on the idea of just-in-time delivery. JIT may also still be a valuable concept, provided that the risk component can be effectively managed – by means of regionalised organisation and close cooperation with potential suppliers, for example. Greater vertical integration under in-house control can also serve as a tool to promote a more resilient logistics chain without the fundamental need to significantly increase buffer stocks.

3. Regionalisation – more expensive but beneficial in terms of sustainability and resource availability

For a long time, geopolitics played only a secondary role in the design of value added chains. The result was global value added chains and utilisation of alternative supply sources all over the world. In 2018, we then saw a countertrend driven by the tariff conflict between China and the USA. The corona pandemic further incentivised the regionalisation of value added chains. With a three-week lockdown, the transport time of roughly 40 days for goods travelling between Asia and Europe can mean an increase in the re-procurement period of up to 50%. This regionalisation trend was further reinforced by the war in Ukraine.

As a result of these trends and geopolitical shifts, we can observe growing localisation and the formation of “independent blocks” (such as dedicated value added chains for the Chinese market and the EU/USA) aimed at overcoming the obstacles that trade restrictions, customs tariffs and the like are expected to create.¹⁰⁾ In addition, overall analysis of developments in the flows of goods, capital, information and people points to what is known as “slobalisation” – in other words, a

slowdown in globalisation. Global value added chains are still part of strategic planning, however, as global interconnections also help to boost resilience to large-scale shocks such as regional natural disasters. Overall, therefore, regionalisation should be viewed in a globalised context.

Although regional value added chains may make purchase prices higher, the regional design of such chains can also be seen as being more reliable and more sustainable. The move towards regionalisation should be viewed as a step-by-step process geared towards improving the functioning of the value added chain within the context of risk consideration. Whereas industrial production can be relocated at the price of higher production costs, it is more difficult to find substitute sources of raw materials. 50% of worldwide exports of sunflower seed oil originate in Ukraine, for example, and the rare earths used in semiconductor production are currently mined almost exclusively in China for cost reasons. Western countries are now trying to develop alternative rare earth deposits, but this is very costly due to the

high environmental impact of the mining process. Moreover, mining of mineral raw materials is a long-term endeavour, as it can sometimes be decades after approvals are granted before the first minerals are actually extracted from the ground.

On the transport front, regional supply concepts can reduce disruptions and ensure greater reliability thanks to shorter and more dependable transport routes. Moreover, these concepts can be expected to significantly reduce the number of special and urgent transports, thereby also reducing CO₂ footprints. What we will probably see in future is the increasing creation of smaller regional networks for certain components or part sets, with these networks still being globally interconnected with one another.

Regional value added chains also provide a solid foundation for the creation and expansion of the circular economy. In this process, long-term partnerships help to promote the creation of prototypes for the circular economy. When considering CO₂ consumption, we also need to take account of the fact that these cycles – including the necessary recycling processes – often necessitate additional transports. Regional value added chains nevertheless make it easier to maintain reduced ecological footprints despite the additional CO₂ consumption. Examples include the aluminium closed-loop model of Audi for the pressing plants in Ingolstadt and Neckarsulm.¹¹⁾ Other pilot projects based on regional loops can be found in the glass recycling sector in the cooperation between partner companies Reiling Glas Recycling, Saint-Gobain Glass and Saint-Gobain Sekurit.¹²⁾ Moreover, close and direct interaction and exchange between companies help to ensure a rapid response in the event of bottlenecks.

When building a network of regional suppliers, however, companies must also bear in mind that regional value added chains may be completely unable to perform due to local risk events such as flooding or hurricanes. One way to meet this challenge is diversification – using dual and cross-sourcing strategies, for example.



4.

Towards dual and cross-sourcing in procurement strategy

In the endeavour to identify ways of tackling the shortage of critical materials and parts, companies are torn between the options of developing multiple partnerships (multi-sourcing) and concentrating on a small number of strong and reliable delivery relationships (dual or single-sourcing). The challenge is to adapt procurement processes and to find the right balance in order to minimise risks in the supplier portfolio.

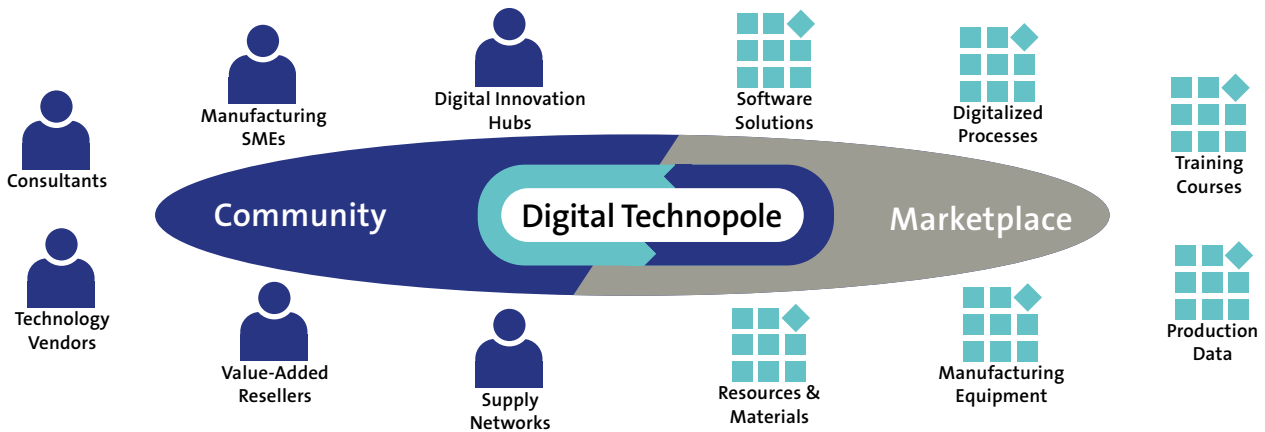
Dual or cross-sourcing is being discussed in multiple sectors as a way of increasing the resilience of value added chains. Dual-sourcing means taking on an additional supplier, while cross-sourcing is when an additional product is requested from an existing supplier in a bottleneck situation. In dual-sourcing strategies, the required part volume is split between the suppliers, often with the main supplier delivering 80% of the parts and

a secondary supplier the remaining 20%.¹³⁾ For the purpose of geographic diversification and handling regional risks such as flooding, volcanic eruptions or political instability, customer companies choose – where possible – suppliers from two independent regions. It is often the case that lower-cost parts are procured via a global main supplier, while a regional supplier provides the required flexibility in the event of bottlenecks. As a result, the increase in the regional share of the part volume is only limited.

In many cases, the search for a potential supplier can prove extremely difficult, but digital matchmaking solutions can facilitate this process.¹⁴⁾ In addition, the choice of a further supplier is frequently subject to lengthy quality and certification processes. If suitable certificates have already been issued, then this makes the changeover far easier. Sev-

eral research projects funded by the European Union are focused on this issue and have pinpointed ways of facilitating these certification processes (e.g. CO-Versatile)¹⁵⁾. Furthermore, the rapid change of supplier is limited by technical system requirements. Various IT systems are often finely aligned and interconnected for a particular product, and this complicates the integration and rapid switch of supplier.

Cross-sourcing greatly simplifies the integration of the supplier, as certain part subsets are delivered by an existing supplier. This means that both the technical interfaces and the prerequisites for quality reviews are already in place, which in turn means that the supplier base remains unchanged in a cross-sourcing strategy. This increases flexibility but does not increase the complexity of the supply chain or coordination processes with the supplier.



Co-Versatile's Digital Technopole system. (Source: Co-Versatile)

There are also other procurement strategies that help to integrate flexibility in the procurement process, and this increases resilience in the value added chain. Three issues are addressed in the following by way of example:

1. Time-based flexibility for suppliers through early approvals for material procurement
Guaranteed purchase volumes create financial security for the supplier. This reduces uncertainty for the supplier and makes for dependability and flexibility in the planning of production.

2. Time-based flexibility for the manufacturer through late approvals for the production of variant parts by the supplier
In order to keep warehouse inventories as low as possible, it is worthwhile for companies to closely coordinate the production and delivery of variant parts with the supplier. Unnecessary surplus stocks of variants can be avoided by tying the production of variant parts specifically to a customer order. It is therefore a good idea to commission versioning or variant production of parts at short notice wherever possible.

3. Use of segmentation strategies for the need-based expansion of inventories
Segmentation of inventories – based on need, for example – pave the way for selective expansion of stocking levels. This avoids excessive utilisation of warehousing capacities and the resulting wastage in the relevant processes based, for example, on resorting of inventory stocks. A segmentation strategy also makes it easier to identify the parts for which a dual and cross-sourcing or multi-sourcing approach is needed.

5. End-to-end supply chain management and deeper integration along the in-house value added chain

Holistic or end-to-end supply chain management comprises the management of value added chains from a cross-company perspective that extends beyond optimisation within the confines of a particular company and aims to achieve an integrated and optimised outcome for multiple actors. Companies can gain a better understanding of upstream and downstream steps in the value added chain by looking beyond the confines of their own operations – starting at the raw material source all the way through to the sink. Financial investment in players active along a company's own supply chain can play a key role in this process.

On example of this is the acquisition of a stake in Jade-Weser-Port by Hapag-Lloyd in

2022.¹⁶⁾ This means that the carrier now has a holding in a port and that this port may then play a greater role in future. Not only is the carrier making a potentially lucrative investment; it also seems plausible to assume that the company also aims to gain access to the corresponding infrastructure. Another example of targeted development in a company's own value added chain is the takeover of eCommerce fulfilment provider Visible SCM by Maersk in 2021. As a result, the company has underpinned its end-to-end problem-solving expertise and also – through the connected company – has its own access to data and resources along the entire value added chain practically all the way through to the end customer. Maersk also holds a significant stake in logistics start-up Forto, who act as a

digital carrier for air, sea and overland transports, and this marks the development of Maersk away from a classic sea freight carrier. This also enables the company to gain a far better overview of its own value added chain as well as that of its customers. Thanks to this increased visibility all the way into the eCommerce business and due to the fresh insights obtained through the digital forwarding system, Maersk can be described as being more crisis-resistant and more resilient than was previously the case.

Examples of this kind can also be found in other sectors. When it comes to resilience, what makes the difference is when companies have a better understanding of necessities and concerns along their own value added chain.

The Jade Weser Port in Wilhelmshaven



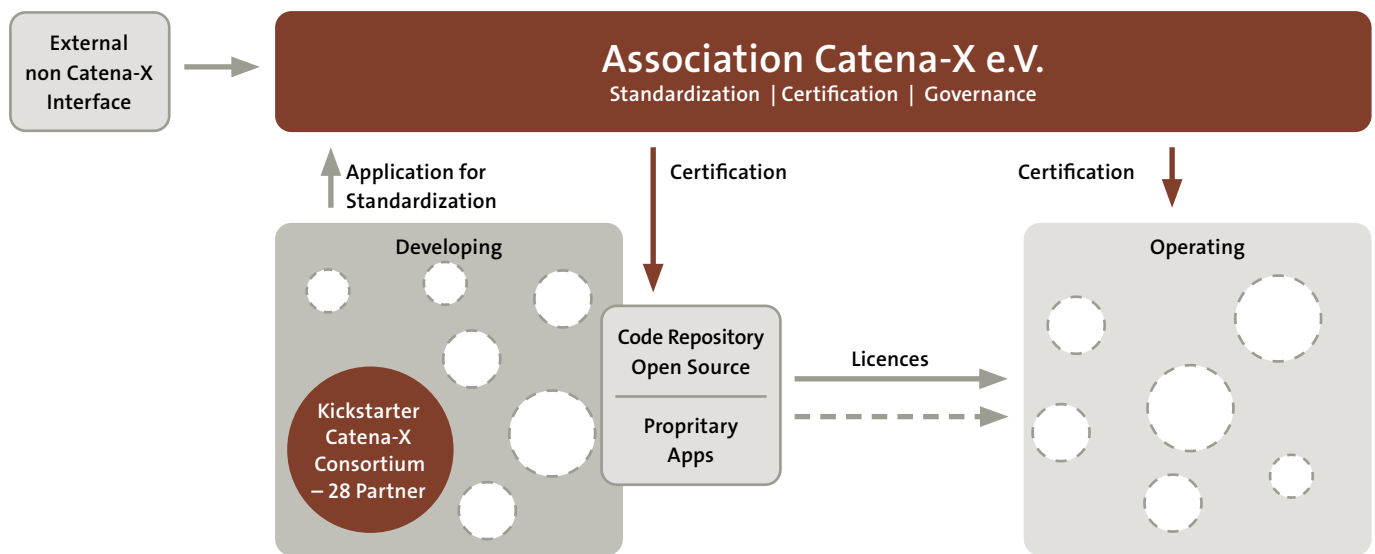
6.

Transparency as an enabler for the adaptive value added chain

The ability to make rapid adjustments in the value added chain and to respond to risks at an early stage calls for an adaptive value added chain. One prerequisite for this adaptivity is a level of data transparency between the partners in a value added chain that enables companies to see when materials will be delivered and to determine whether, for

example, additional suppliers need to be contacted to supply shortage materials or whether different delivery routes need to be chosen. The only way to achieve this is through a suitable process for the exchange of data. What became apparent above all during the pandemic is that there is room for improvement on this front. Coordination with

partners by phone is particularly time-consuming. Moreover, coordination with an individual partner provides an inadequate overview of the “big picture” in the value added chain. What is required instead are interconnected platforms that can generate a holistic overview of the relevant logistics data.¹⁷⁾



The Catena-X System Approach: © 2022 Catena-X or a Catena-X affiliate company. All rights reserved.

The goal of digital platforms is to interconnect all the actors involved in the value added chain in order to permit collaborative planning.¹⁸⁾ In the automotive industry, for example, the lighthouse “Catena-X” project funded by Germany’s Federal Ministry for Economic Affairs and Climate Action is designed to implement the idea of collaborative planning. Data can be shared by means of federated data exchange. The potential of such a platform lies in the synchronisation of procurement and production plans while ensuring data sovereignty. This type of platform permits near-realtime orchestration of the value added chain.¹⁹⁾

One of the options for an effective digital infrastructure and for cross-company data exchange comes in the form of trustworthy third parties who facilitate the anonymous exchange of confidential data with partners in the supply chain while withholding sensitive and competition-related data. This exchange

is best organised via the platform systems of a neutral and independent operator who is open to all value added partners. ERP and MES providers are already developing platform strategies, and some of the big players like Microsoft Azure are also offering their own solutions. However, none of these platforms has so far established itself as a standard. In addition, the decoupling of data creation and data utilisation supports the future use of data in a way similar to that in which apps are used on a smartphone. Each app contains a specific analytical function – such as an inventory and capacity comparison. The idea is that, when using the app, the user “fetches” the necessary data from a neutral entity, in other words the platform. In this process, access is granted only to a fraction of the available data sets and only for a specific time frame.

If we master this digitalisation challenge, we can pave the way for direct communication of milestones in the production process via a suitable platform. The customer can then be notified online that the product is still being produced, is already finished, is already en route to the rail terminal via intermodal transport, or has already loaded onto the train and will arrive at the hub at point in time “X”. At the same time, this implies successful internal communication between departments and hence the necessary interoperability between internal systems.

7. Thinking in networks promotes rapid adaptation to changing market conditions.

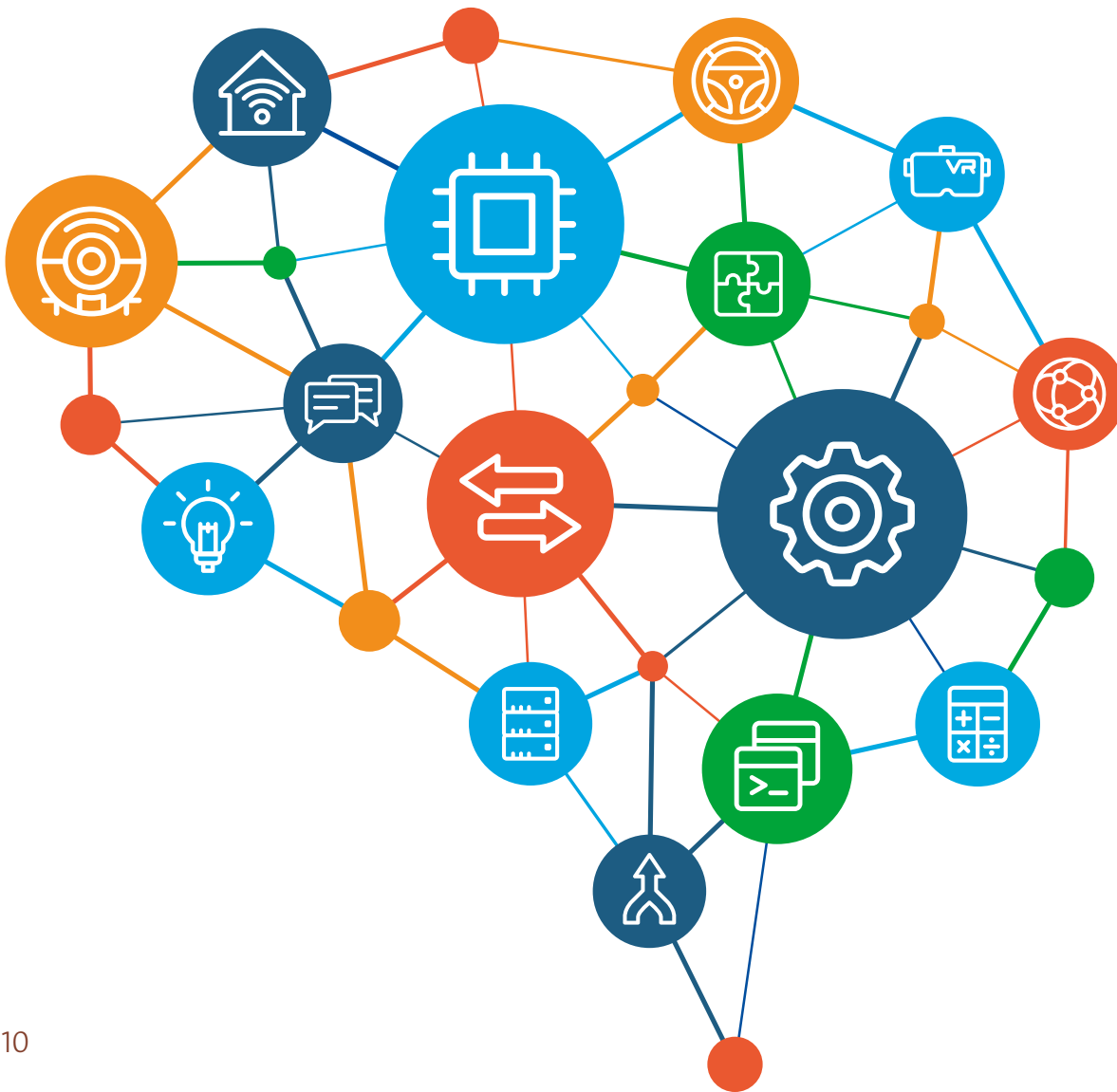
During the most recent crises, some companies have restructured parts of their value added chains and switched suppliers in order to make their chains more resilient. These restructuring measures have not only ensured the integration of further regional suppliers but have also addressed risks like the volatile development of transport prices as well as delivery delays and non-delivery in the overall costing of part supplies. In all of this, companies are not just actively trying to extend their supplier base by means of dual and cross-sourcing but are at the same time also endeavouring to realise their ethical and ecological objectives. But the integration of additional suppliers and the exchange with these suppliers are time-consuming. New plat-

form-based digitalisation models open up options for the efficient development of collaborative exchange and the near-realtime coordination of strategic measures.

Companies need to constantly observe and assess the value added chain if they want to respond effectively to changing market conditions. This requires a good database offering access options within the value added chain. New technologies are being developed for this purpose and are designed to improve collaborative exchange between the partners. If the required data and therefore the necessary transparency exist along the value added chain, then pre-planned scenarios can be directly implemented in close consultation

with the partners when risks occur. Supply chain simulations permit quantification of the scenarios and impacts of risks. Once adequate scenarios have been developed, the value added chain can be rapidly adapted and redesigned to ensure the necessary efficiency and efficacy. Close cooperation within value added chains will become a necessity in future.

Volatility in value added chains will become the new norm. The only way to make the necessary allowances for risks and to adapt to varying developments in the trading environment is through holistic end-to-end supply chain management.



The authors

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Saskia Sardesai is deputy head of the Supply Chain Engineering department at the Fraunhofer Institute for Material Flow and Logistics. She analyses the latest trends in constant exchange with practitioners and identifies improvements in creating resilience in supply chains. In her doctoral thesis, she developed an index for the assessment of robustness and resilience in global value added chains. She addresses the topic of digitalisation in

logistics as Chair of the “eLogistics and Digital Supply Chain” working group of Bitkom e.V. and discusses the technological options with participating companies. Saskia Sardesai gained international experience during her time with Kühne+Nagel India Pvt. Ltd., where she worked in the Contract Logistics department for a number of years.



References

- Blackburn R. (2018) Preface: Industry 4.0. In: Linnhoff-Popien C, Schneider R, Zaddach M, Hrsg. Digital Marketplaces Unleashed. Springer Berlin Heidelberg. S. 515–526.
- Buchen, S. (2021) Wer das Schiff hat, hat die Macht. URL: <https://www.tagesschau.de/wirtschaft/unternehmen/reeder-konkurrenz-kampf-spediteure-101.html>; last call 2023-02-09.
- Carvalho, H.; Azevedo S.G.; Cruz-Machado, V. (2014) Supply chain management resilience: a theory building approach. *Int. J. Supply Chain and Operations Resilience*, Vol. 1, No. 1, pp.3–27. URL: https://www.researchgate.net/profile/Susana-Azevedo/publication/280795287_Supply_chain_management_resilience_A_theory_building_approach/links/55f0a12c08aef559dc46d9f8/Supply-chain-management-resilience-A-theory-building-approach.pdf
- Cascio, J. (2020) Facing the Age of Chaos. URL: <https://medium.com/@cascio/facing-the-age-of-chaos-b00687b1f51d>; last call 2023-02-02.
- CO-VERSATILE (2022) Europe's manufacturing rapid responsiveness for vital medical equipment; Europe's manufacturing rapid responsiveness for vital medical equipment | CO-VERSATILE; last call 2023-03-14.
- Frieske B.; Huber A. (2022) Zukunftsfähige Lieferketten und neue Wertschöpfungsstrukturen in der Automobilindustrie; Deutsches Zentrum für Luft- und Raumfahrt e.V. – Institut für Fahrzeugkonzepte
- Fuchslocher G. (2020) Audi setzt auch in Ingolstadt auf Aluminium Closed Loop; <https://www.automobil-produktion.de/produktion/audi-setzt-auch-in-ingolstadt-auf-aluminium-closed-loop-108.html>; last call 2023-03-14.
- Ganser O. (o.J.) Catena-X: Das erste offene und kollaborativ angelegte Datenökosystem; <https://catena-x.net/de/ueber-uns>; last call 2022-03-14.
- Klaus, P.; Kille, C. (2006) Die Top 100 der Logistik. Marktgrößen, Marktsegmente und Marktführer in der Logistikdienstleistungswirtschaft. DVV Media Group, Hamburg.
- LBBW (2021) LBBW Blickpunkt Corporates - Wenn's mal wieder länger dauert...! Lieferengpässe, die Gründe und ihre Auswirkungen auf Branchen. URL: https://www.lbbw.de/konzern/research/2021/blickpunkte/20211008-lbbw-blickpunkt-corporates-lieferengpaesse_adp-9d37yok_m.pdf?origin=/2021-studie-weihnachtsbescherung; last call 2023-02-07.
- Lehmann S. (2022) Kreislaufwirtschaft: Audi möchte altes Autoglas wiederverwenden. <https://logistik-heute.de/news/kreislaufwirtschaft-audi-moechte-altes-autoglas-wiederverwenden-36708.html>; last call 2023-03-14.
- Lippert, B.; Perthes, V. (2020) Strategische Rivalität zwischen USA und China – Worum es geht, was es für Europa (und andere) bedeutet. *Strategische Rivalität zwischen USA und China - Stiftung Wissenschaft und Politik (swp-berlin.org)*; <https://doi.org/10.18449/2020S01>; last call 2023-03-14.
- Lidell, P.; Agarwal, R.; Barret, R.; Desrosiers, P. (2022) The supply chain trends shaking up 2023; KPMG; The supply chain trends shaking up 2023 - KPMG Global; last call 2023-03-14.
- NDR (2022) EU genehmigt Hapag-Lloyd-Einstieg beim JWP. URL: https://www.ndr.de/nachrichten/niedersachsen/oldenburg_ost-friesland/EU-genehmigt-Hapag-Lloyd-Einstieg-beim-JWP,jadeweser-port1350.html, last call 2023-03-09.
- Notteboom, T.E.; Parola, F.; Satta, G.; Pallis, A.A. (2017) The relationship between port choice and terminal involvement of alliance members in container shipping, *Journal of Transport Geography*, vol. 64, p. 58-173.
- Proff H. (2021) Die Pandemie als Beschleuniger des Strukturwandels in der Automobilindustrie. *ifo Schnelldienst*; 74:9–12.
- Pumpe, A.; Vallée, F. (2017) A typology for selecting an appropriate Total Landed Cost method in international supplier selection decisions. *Transportation Research Procedia* 25 (2017) 853–869.
- Ronan Mclvor, Lydia Bals (2021) A multi-theory framework for understanding the reshoring decision, *International Business Review*, Volume 30, Issue 6, 101827, ISSN 0969-5931, <https://doi.org/10.1016/j.ibusrev.2021.101827>.
- Sardesai, S. (2022) Bewertung und Verbesserung der Robustheit des Servicelevels in CKD-Produktionsnetzwerken unter Risiken. Wiesbaden: Springer Fachmedien Wiesbaden, 2022.
- Sardesai, S., Schreckenberger, F., & Kippenberger, J. K. (2023) Transformation von Lieferketten. *Whitepaper*. https://www.iml.fraunhofer.de/content/dam/iml/de/documents/OE%202020/Whitepaper_Transformation%20von%20Lieferketten.pdf; last call 2023-03-11.
- Schreckenberger F, Motta M. (2021) Catena-X Automotive Network: Fraunhofer Unterstützung im BMWI-geförderten Forschungsprojekt "Catena-X Automotive Network"; https://www.iml.fraunhofer.de/de/abteilungen/b2/supply_chain_engineering/forschungsprojekte/CatenaX.html; last call 2023-03-14.
- Schwemmer, M.; Dürrbeck, K.; Klaus, P. (2021) Die TOP100 der Logistik 2020-2021. Marktgrößen, Marktsegmente und Marktführer. DVV Media Group, Hamburg.
- Taisch M, Casidsid M, Acerbi F, Gonzáles C, May G, Padelli V et al. (2022) The 2022 World Manufacturing Report: Redesigning Supply Chains in the New Era of Manufacturing [Stand: 12.03.2023]. Verfügbar unter: https://worldmanufacturing.org/wp-content/uploads/17/6-2022_World-Manufacturing-Report_EBook.pdf.

Endnotes

- 1) See Cascio 2020.
- 2) Estimates indicate that the TCO of the semiconductor industry in Asia is 20-35% lower than in the USA; see LBBW (2021).
- 3) Various approaches for the calculation of TLC can be found in the literature; see, for example, Pumpe et al. 2017.
- 4) See Sardesai 2022.
- 5) See Sardesai 2022.
- 6) See Carvalho et al. 2014.
- 7) The national logistics data show that stock inventories in Germany account for roughly 15% of all costs, totalling over 40 billion € for the logistics sector overall (estimate in the “TOP100 in Logistics” study series; see Schwemmer et al. 2021, p. 58.). It appears plausible to assume that this cost item increased in proportion to the growth in inventories. This does not include the cost of additional personnel for the administration of the inventories or the cost of storage space (rental and ancillary costs for real estate).
- 8) More and more new logistics properties are meanwhile being built on brownfield sites in order to reduce the level of soil sealing caused by construction projects.
- 9) See Lippert und Perthes 2020.
- 10) See Lidell et al. 2022.
- 11) See Fuchslocher 2020.
- 12) See Lehmann 2022.
- 13) See Frieske, Huber 2022.
- 14) See, for example, the achievements of start-up Scoutbee.
- 15) See CO-Versatile 2022.
- 16) See NDR 2022.
- 17) See Proff 2021.
- 18) See Schreckenbergr und Motta 2022.
- 19) See Blackburn 2018.

transport logistic

transport logistic is the international trade fair for logistics, mobility, IT and supply chain management and the world's largest fair for the multi-faceted activity of freight transport by road, rail, sea and air. transport logistic also incorporates air cargo Europe, an exhibition of the global air freight industry. Alongside the leading international transport logistic fair in Munich, there is also the transport logistic China every two years, alternating biannu-

ally with the transport logistic China Forum, with both the fair and forum held in Shanghai. In Turkey, the Messe München trade fair company and EKO Fair Limited stage the logitrans International Transport Logistics Exhibition in Istanbul every year. The air cargo segment plays a key role in all the fairs. As part of transport logistic in Munich, the air cargo Europe fair is the largest air freight fair worldwide, while air cargo China leads the field

in Asia. Then there are the independent air cargo India and air cargo Africa fairs, which also alternate with each other in the spring. In November 2023, Messe München together with transport logistic Southeast Asia and the air cargo Southeast Asia will be taking the trade fair platform to the Southeast Asian market for the first time.



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