

MARKETING IN TIMES OF CLIMATE CHANGE AND CORONAVIRUS PANDEMIC: TACKLING SUPPLY CHAIN FRAGILITY THROUGH EU ECONOMIC AND REGULATORY POLICIES BASED ON 5G NETWORK IMPLEMENTATION AND BLOCKCHAIN TECHNOLOGIES

Alexis DAJ¹

Abstract: *The ongoing coronavirus pandemic - in juxtaposition with recurring evidence of the negative effects of global climate change - has stress tested the overwhelming majority of worldwide supply networks. The dire sanitary crisis has shown that free market mechanisms alone are not able to resuscitate the broken links of the global economic system, and thus the need for a novel mix of economic, regulatory, and technology-based government policies became more evident than ever. Against this backdrop and with an emphasis on the EU, the present paper gives an overview of the possible pathways for marketing to embrace the opportunities offered by 5G network implementation and blockchain technologies to tackle supply chain fragility.*

Key words: *Supply Chain Fragility, Digital Marketing Transformation, Distributed Ledger Technologies - DLT, Blockchain, 5G Network Regulation.*

1. Introduction

As the study entitled “Supply Chain Management 2040 - How will logistics change in the future?” - elaborated in 2020 by Fraunhofer IPA and Ginkgo Management Consulting -illustrates, **logistics has evolved in distinct stages:**

- At its beginnings, the initial technologies and methodologies for standardized transport, as well as for the company-wide management of material movement, storage and transport systems were created - all with a limited focus on the temporal and spatial optimization of transport processes.
- In the subsequent years, the contemporary perception of logistics as a “holistic

¹ Transilvania University of Braşov, alexis.daj@unitbv.ro, ORCID ID: 0000-0003-3885-5592

leadership theory” has emerged; in this context, “**Supply Chain Management** looks at the cross-company material flow, from the resource to the finished product, optimizing all transport processes along the value chain”. Therefore, to satisfy the diversifying needs of customers, automated conveyor and storage systems have been created and information systems between different participants have been applied, and - as a result - extremely effective, hierarchically organized value chains were established, which make goods globally available - based on demand and on employing “just-in-time” delivery methods. At this stage, “the central goal of the SCM is the cost-effective planning of the entire manufacturing process and not just individual steps”.

- The Fraunhofer study emphasises that the path towards **Industry 4.0** (the Fourth Industrial Revolution) embodies the next stage of evolution for logistics: “up to now rather rigid value chains are developing into increasingly flexible, more complex, intelligent networks in which goods and information are exchanged not only between individual but also between all actors”. At this current stage, the defies of an unpredictable business environment and the need for additional supply chain streamlining (e.g., by implementing big data analyses and artificial intelligence) generate a renewed dynamic and versatile logistics system (Fraunhofer IPA, 2020).

In response to these developments, the **Council of Supply Chain Management Professionals - CSCMP** (founded in 1963) stresses that the definition of what a supply chain is can be in doubt and, frequently, the Supply Chain Management - SCM can be mistaken for the concept of “logistics management”. Therefore, **official definitions** have been created:

- *“**Supply chain management** encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies.”* - and -

- *“**Logistics management** is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements.”*

Furthermore, according to Fraunhofer’s study, the future need for the **resilience** of supply chains will foster stronger ties between suppliers, production partners, customers, and the company, while enabling more agile value-added networks. As a result, “in real time, production, logisticians, dealers, and customers communicate with each other and enable the right product to be provided flexibly, cost- and resource-minimally.” (Fraunhofer IPA, 2020).

2. Correlations between Marketing, Logistics and Supply Chain Management

In the last two decades, the connections between the fields of supply chain management, logistics and marketing have been examined by several researchers (Mentzer and Gundlach, 2010; Lindee and Crawford, 2018), who have shown the growing importance of the mutual relationships between all these processes for the

companies' overall **value proposition** towards the customers and the **promises-management approach of modern marketing**.

As Grönroos formulates it, "the supplier's process and the customer's corresponding process proceed partly simultaneously as parallel processes, but from a value creation perspective they merge into one joint value co-creation process where both parties are active as a resource inside each other's processes" and, through a marketing perspective, it is crucial to realise that "during the joint value co-creation process the supplier is part of the customers' processes and thus also part of their value fulfilment". (Grönroos, 2009)

Hence, the **marketing science** has progressed through the expertise that is acquired in view of an expanded unit of analysis that takes into account supply chains, as well as the managerial goal and principles of integration that lie at the foundation of SCM. Likewise, **SCM research** has profited from the extensive knowledge that has formed within marketing regarding, aspects such as interfirm and interpersonal coordination and collaboration - all examined by the analysis of interorganizational relationships (Mentzer and Gundlach, 2010).

Nowadays, customers require more than merely the product - they also assume services related to that product and companies have grasped how impactful an efficient supply chain can be to their customer service levels and to their global profitability. Consequently, the intra-organization correlation between the marketing function and the supply chain function is essential, and marketing has to communicate to the internal supply chain employees - in order for these people to implement an appropriate supply strategy - otherwise, customer demand would not be suitably covered, and customer expectations not properly met. Recently, enterprises have therefore recognized that **customer satisfaction** and the global **customer experience** are substantially reliant on the **superior customer-oriented supply chain type services** (that extend beyond the customer getting the right product) which entail a **competitive advantage** through conveniences like "placing an order online and picking it up at the store", or "customer scanning of items as they place them in their cart and then skipping the check-out line at a retail store", and options for "online ordering with to-the-home grocery delivery" (Lindee and Crawford, 2018).

3. Supply Chain Fragility – Problems and Hazards

3.1. Configuration of the global economic exchange activity

The configuration of the current global economic exchange activity (see Figure 1 regarding the highest valued export commodity for every country) has been shaped by the profound globalisation and delocalisation process of the last three decades. In this context, entirely local-based supply chains have become less prominent in recent decades, with two-thirds of today's global trade being based on global value chains and supply networks. We can identify both positive and negative complex outcomes of these globalised structures: "On the one hand, they have employment-promoting effects and have a positive effect on prosperity. On the other hand, there are extreme social, environmental and economic imbalances along the supply chains." (Liedtke et al., 2020).

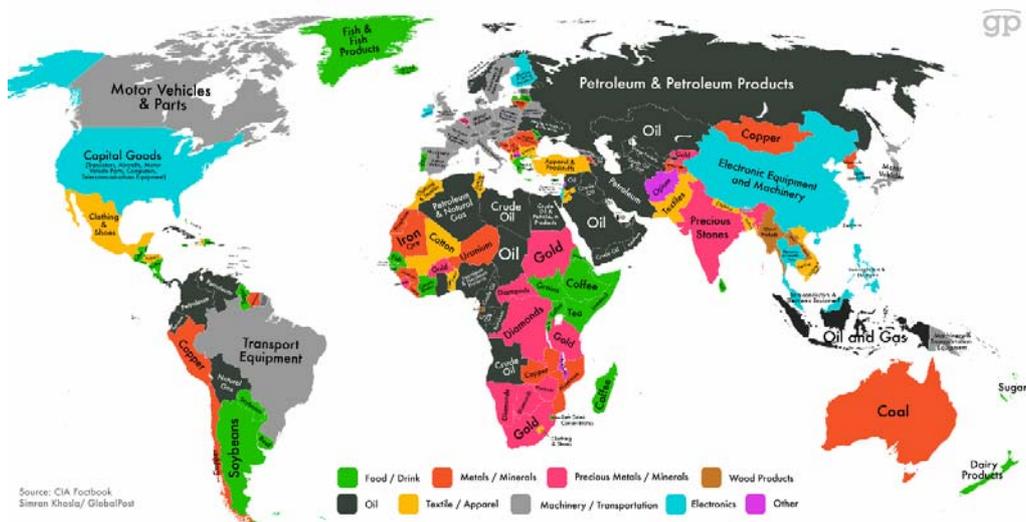


Fig. 1. *The highest valued export for every country - the commodity that earns the country the most money in the global market - data from the CIA World Factbook* (Source: Map by Simran Khosla – Global Post, 2014, www.pri.org)

3.2. Supply chain – Problems and hazards

Although, in the last four decades, enterprises have considerably extended their global value chains, the Corona pandemic could speed up the extant opposing tendencies and force countries and businesses to decrease their reliance on global commerce - with tremendous consequences on business models and even on individual countries' performance. Even if the environmental policy is disadvantaged by the different perception of "urgency", citizens have often demonstrated willingness to pay a price for societal benefits and, in this context, the vital political reaction to COVID-19 could represent a blueprint for the climate change response (Deutsche Bank, 2020).

In order to design appropriate supply chain resilience policies, there is a need to define and to determine how to **measure the supply chain fragility**. **Fragility** - the susceptibility of the supply chain to different forms of disruption - deals with collapse, and therefore, we can consider it as the opposite of **robustness**.

Asbjørnslett and Rausand - in their 1999 paper "Assess the vulnerability of your production system" - define **robustness** as "a system's ability to resist an accidental event and return to do its intended mission and retain the same stable situation as it had before the accidental event".

Moreover, operations management has to be preoccupied not only with the robustness of the supply chain against fragility, but also with the design of a proactive strategy to deal with turbulence and change - because a resilient supply chain must also be adaptable, and thus, Stonebraker can identify two core **components of resilience: agility and robustness**.

Stonebraker, Goldhar and Nassos (2007) further underscore the difficulty of assessing either sustainability or robustness - with the complex character of this problem resulting

from the “simultaneous interactivity of multiple variables measured in different units and by different methods for different periods and in different entities”. They pinpoint the following **four steps** to executing the **measurement processes**: “1) selecting and grouping factors, 2) measuring and weighting factors, 3) evaluating the fit and cost of alternatives, and 4) managing implementation policies and adjustments”.

Recognizing that the things which “could go wrong” will differ “from industry to industry, from company to company, and from entity to entity”, Stonebraker, Goldhar and Nassos (2007) combine these different **Fragility Factors** by aggregating them as: **internal factors** of the supply chain, **externalities**, and **unanticipated / random events** – as presented in Figure 2 below.

Internal Factors to the Supply Chain	
1. Physical Logistics	Mechanical Breakdowns; Damage en-route; Shipping Mishaps; Accidents (Oil Spill, Sunken Ship)
2. Behavior of Suppliers	Key Supplier Going Out of Business; Significant Increase in Prices; Contract Limitations
3. Behavior of Customers	Changes in Market Share (Change in Customer Preferences) Changes in Customer's Perceptions of Company's Product; Law suits or other legal actions
4. Information, Communication & Control Systems	Data Accuracy & Integrity, Feedback & Feed Forward Quality Control, Inventory Control, Scheduling, Delivery & Control
5. Product and Process Design	Safety, maintainability, appeal, efficiency, cost, non-replicability
6. People	Labor, training, professionalism
Externalities	
1. Legal, Political & Acts of Government	Import duties, Trade Barriers, Lack of Political Stability Form of Government (Dictatorship, etc); Extent of Government Interference & Control
2. Behavior of Competitors	Price wars, Competitors Acquiring a Key Supplier
3. Financial and Economic Factors	Foreign Exchange Risk, Interest Rate Risk, State of the Economy,
4. Environmental Impact	Pollution, recycling, eco-health, reverse supply chain
Unanticipated / Random Events	
1. Acts of Nature (Weather)	Earthquake, Flood, Storm, Fire, etc.
2. Other External Factors	War & Terrorism, Piracy, Distance, Time, Language, Culture
3. Other Factors	Corruption, Subversion, Lack of Cooperation, Failure of Communication

Fig. 2. *The Supply Chain Fragility Factors (Source: Stonebraker, Goldhar, Nassos, 2007)*

While the Corona pandemic is a stark illustration of the **possible crises** that the global and networked value chains will have to face in the short run, other catastrophes are developing more gradually and, consequently, less detectable – as in the case of **global climate change**. As diverse as they are, the crises reveal a common denominator: they demonstrate the fragility of global social and economic structures and show the effects of global trade on the world's regions and people (Liedtke et al., 2020).

From this perspective, the NGFS Climate Scenarios (2020) indicate that **global warming**, and the associated changes in climate, will have “significant impacts on the economy by the end of the century in a Hot house world scenario”, while “economic impacts at high degrees of warming would be unprecedented and much more severe than currently estimated” – especially with a correlation to existing maritime transportation bottlenecks, as nearly 80% of global merchandise is shipped by sea (GIS 2021) (see Figure 3 - A and B).

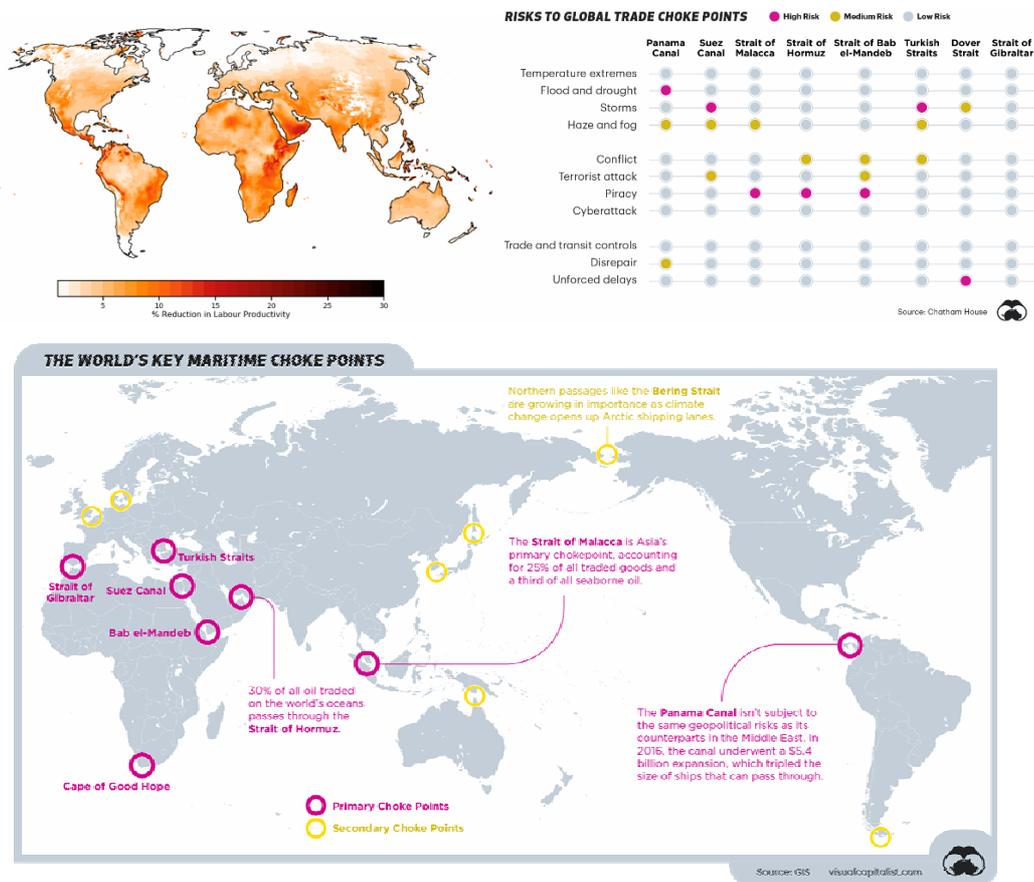


Fig. 3. A (UP) – Maritime transportation risks and climate change impacts on labour productivity at 3°C global warming 2100 compared to 1986-2005 (Source: NGFS Climate Scenarios, 2020) – and B (BELOW) - Maritime transportation bottlenecks - GIS 2021

In its “Life after covid-19” report from 2020, the Deutsche Bank points out three **factors that can exacerbate the shock to global supply chains**:

- The first factor is the **synchronization of shocks**, in other words, when multiple calamities happen at once.
- The second occurs when **restrictions on freedom of movement** are involved. Today, these restrictions are the consequence of state-enforced quarantines and border closures (similar to some natural catastrophes which hindered movement as transportation systems collapsed).
- The third factor that can increase shocks for value chains is now one of the biggest risk factors: **protectionism** combined with **export restrictions**.

From a **EU policy perspective** - in view of the complexity of supply chains to the EU, Trade Commissioner Phil Hogan said: “*Strategic autonomy does not mean that we should aim for self-sufficiency... We have to look at how to build resilience based on how we can diversify, not be totally reliant on one geographical entity for supplies of everything*”.

4. Supply Chain Fragility – Solutions and Favourable Prospects

Overall, we can say that humanity has almost certainly experienced the best quarter-century in its existence – at least from an economic perspective. There are significant achievements that can be listed: Since 1980, more than a billion people have been rescued from extreme poverty, and infant mortality has halved. Thanks to **globalization**, the literacy rate has increased by 80 percent in 20 years and life expectancy in developing countries grew to 65 years. This is even more remarkable when thinking that the world's population has meanwhile increased by almost two billion (Deutsche Bank, 2020).

While - until now - the **Global Value Chains** were directly involved in these impressive global socio-economic advancements, in the ongoing pandemic crisis, the shortcomings of the global market system have led the renowned MIT Professor Noam Chomsky to say: “It is a colossal market failure. It goes right back to the essence of markets exacerbated by the savage neoliberal intensification of deep social-economic problems”. Romano Prodi also considers that: “Our social models are under pressure – with a huge and as yet unsatisfied requirement to modernize and adapt to the needs of all our citizens, and the opportunities presented by a digitally-transformed world” (Errouaki, 2020).

Moreover, the extensive Corona virus contagion, mostly due to human hyper-interconnection, is significantly accelerating these developments, and Errouaki (2020) believes the world is in “urgent need of a common vision and plan of action for leveraging the latest advances in scientific research, emerging technologies and new data sources in the fight against COVID-19” - as “wisdom today involves promoting the evolution of governance so that revolution is no longer seen as the sole answer”.

The necessity of **boosting Europe’s open strategic autonomy** to reinforce **EU’s resilience to future shocks** and secure its **place in next-generation global value chains** is highlighted at **economic, political, and regulatory level**. In the **Communication from the EU Commission “Strategic Foresight - Charting the Course towards a More Resilient Europe”** - Report (COM(2020)-493 final), **resilience is declared the new compass for EU Policies**, i.e. “the ability not only to withstand and cope with challenges but also to undergo transitions in a sustainable, fair, and democratic manner”. Hence, the Commission is promoting a **set of shared reference foresight scenarios** as a strong forward-looking framework for **stress-testing policy** proposals or launching ex ante impact assessments. Accordingly, the **European Central Bank** broad **climate stress test** covers in the three next decades about four million companies worldwide and 2,000 banks - mainly in the euro area, targeting a precise evaluation of the **impact on costs** and the **likelihood of default** of companies - while exposing the **trade-off between the costs** of transitioning towards a greener economy and a no-transition scenario (De Guindos, 2021).

The **ECB stress-test** fuses company exposure data with the combined trajectories for transition and physical risk enclosed in **scenarios** devised by **NGFS** (Network for Greening the Financial System), stressing that certain economic sectors and regions in EU may be especially exposed. For the **transition risk**, manufacturing activities, mining, and energy are the most carbon-intensive sectors, impacting business profitability and household wealth. For the **physical risk**, deviations exist (Fig. 4): Southern EU countries are prone to heat stress and wildfires, while middle and northern countries are more exposed to flooding risk.

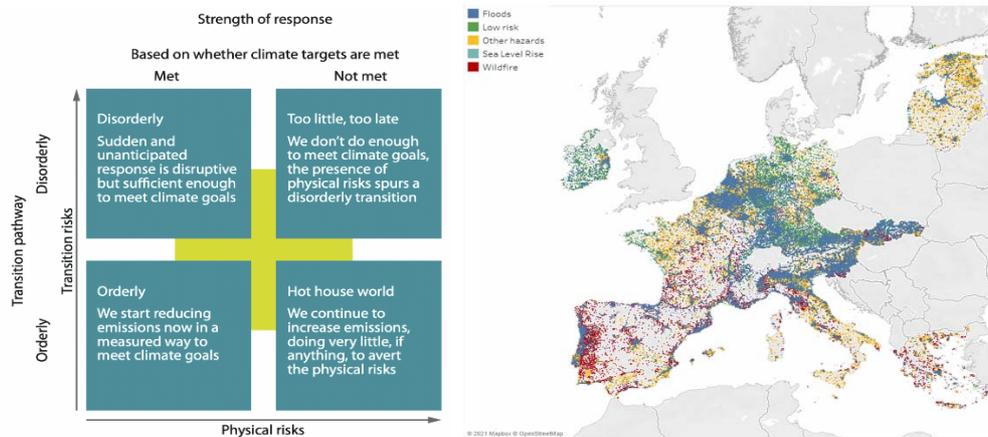


Fig. 4. A (LEFT) NGFS Climate Scenarios Framework (Source: NGFS 2020) /

B (RIGHT) Forward-looking physical risk score of euro area firms (Source: ECB 2021)

Resilience-focused measures like **dual sourcing**, **alternative factories** and **larger safety inventories** defy the ingrained philosophy of **lean supply chains**. Yet, novel technologies could unsettle supply chain operating models, offering a competitive advantage. Benefits of **decentralised data systems** via **edge and fog computing** - mixed with the deployment of new **mobile communications** technologies (**5G** and **6G**) and low energy processors used by **Internet of Things applications** that can reduce energy use - will be greatly enhanced by a rigorous legislative and financial support for the creation of a **single EU market for data**. The use of **smart contracts** (see Fig. 5-Top) will change supply chain **power relations**: transparency in blockchain-based SC networks will allow customers to set minimum and maximum prices for each workload and resource, while the opportunities for process improvements and more efficient SC management are enormous (Fraunhofer, 2020).

To boost the value offered by supply chains, firms must apply new technologies to the base they already possess, leveraging the existing investments by adding on new technologies that drastically rise performance without disrupting the whole operation.

While the **rebalancing of efficiency and resiliency** will not be easy - because increased resilience usually creates additional costs, **automation technologies** such as **artificial intelligence (AI)** and **robotic process automation (RPA)**, together with **edge computing** and **supply chain governance**, provide opportunities to offset high labour costs, making domestic production in Western economies economically viable.

Thus, **AI** can analyse data from public and proprietary sources to learn from past phases of disruption and make proposals for improving the supply chain operation against future threats - while later, AI could even freely shift to supplementary suppliers in the event of a failure. Moreover, in Gartner's "Hype Cycle for Supply Chain Strategy 2020", **next-generation supply chain tools and strategies** are being modelled by the technologies on the left of this Hype Cycle (Gartner, 2020). Those on the right are supporting a more traditional, steady-state approach to SCM and logistics planning (see Figure 5-Left).

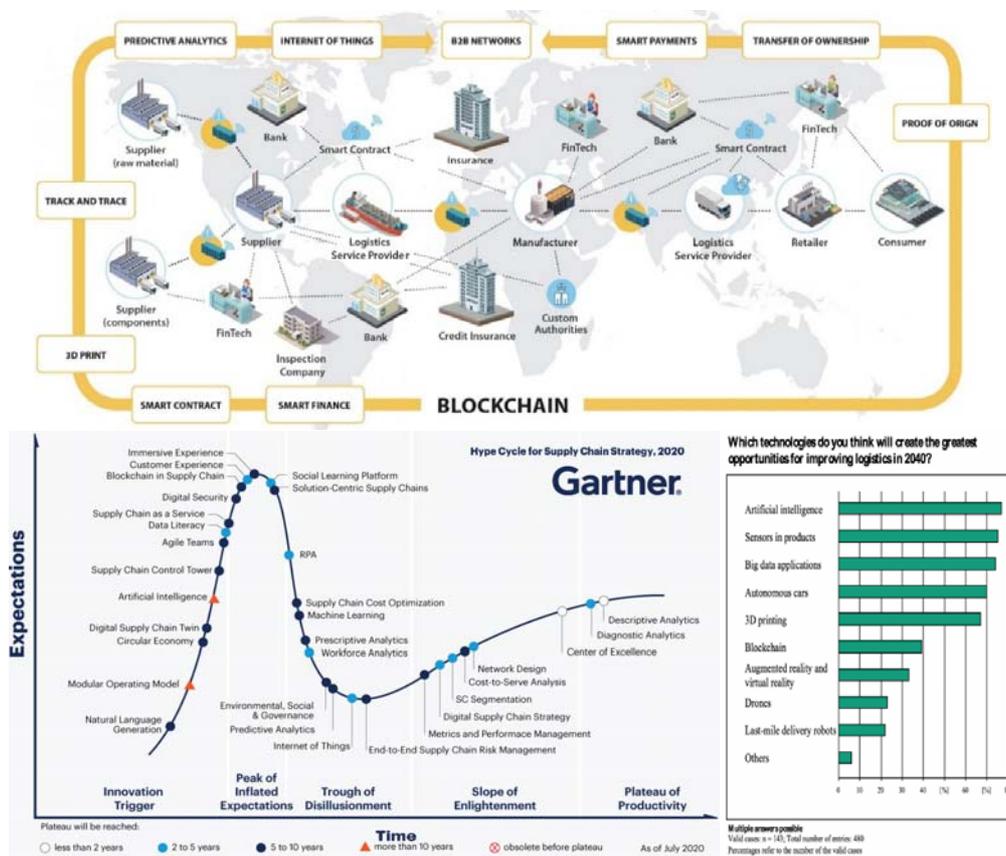


Fig. 5. Supply Chain Technologies, (Source - Left: Gartner 2020 / Right: Fraunhofer 2020)

5. Conclusions

As marketing and supply chain management are confronted by monumental challenges - with logistics related to receiving a product being now part of the package, while the product and the delivery are now bundled in a customer's view - revenue opportunities may well be lost, and peoples' vital needs could remain uncatered for. Thus, Errouaki (2020) stresses: the success of the global society is reliant on forging a common vision and a plan of action for leveraging the latest achievements in scientific advances, emerging innovative technologies (like 5G networks, AI and Blockchain) and new data sources in the fight for economic and social sustainability - with governments having the paramount obligation to correct market failures through efficient regulatory measures and compelling policies. If countries pay attention to the lessons of the coronavirus pandemic, the silver lining could be that the world will be better prepared for the next catastrophe.

From this perspective, Noam Chomsky's conclusion appears enlightening:

"The sordid spectacle of states competing when cooperation is needed to combat a global crisis highlights the need [...] to construct true internationalism, if we hope to avoid extinction. The crisis is offering many opportunities to liberate ourselves from ideological chains, to envision a very different world, and to move on to create it."

References

- Asbjørnslett, B. E., 1999. Assess the Vulnerability of Your Production System. *Production Planning & Control*, 10(3), pp. 219–229. <http://dx.doi.org/10.1080/095372899233181>.
- De Guindos, L., 2021. Shining a light on climate risks: the ECB's economy-wide climate stress test. *The ECB BLOG* [blog] 18 March. Available at: <www.ecb.europa.eu/press/blog/date/2021/html/ecb.blog210318~3bbc68ffc5.en.html> [Accessed 1 April 2021].
- Deutsche Bank, 2020. *Life after covid-19*. Available at: <https://www.dbresearch.de/PROD/RPS_EN-PROD/PROD000000000507960/Konzept_%23_18%3A_Life_after_covid-19.PDF> [Accessed 13 April 2021].
- Erruaki, K., 2020. Is this the end of globalisation (as we know it)? In: *WEA Commentaries*, 10(2), pp.9-15. Available at: <<https://www.worldeconomicsassociation.org/files/2020/05/Issue10-2.pdf>> [Accessed 8 April 2021].
- Fraunhofer IPA, 2020. *Supply Chain Management 2040 - How will logistics change in the future?* Available at: <https://www.ipa.fraunhofer.de/de/Publikationen/studien/supply_chain_management_2040_en.html> [Accessed 11 April 2021].
- Gartner, 2020. *Hype Cycle for Supply Chain Strategy, 2020*. Available at: <<https://www.gartner.com/smarterwithgartner/5-trends-from-the-gartner-hype-cycle-for-supply-chain-strategy-2020>> [Accessed 9 April 2021].
- Grönroos, C., 2009. Marketing as promise management: Regaining customer management for marketing. *Journal of Business & Industrial Marketing*, 24, pp. 351-359. <https://doi.org/10.1108/08858620910966237>.
- Liedtke, C., Köhlert, M., Wiesen, K., Stinder, A. K., Brauer, J., Beckmann, J., Fedato, C., El Mourabit, X., Büttgen, A., Speck, M., 2020. *Nachhaltige Lieferketten* (Zukunftsimpuls Nr. 11). Wuppertal Institut. Available at: <https://epub.wupperinst.org/frontdoor/deliver/index/docId/7635/file/ZI11_Lieferketten.pdf> [Accessed 10 April 2021].
- Lindee, C. and Crawford, A., 2018. Demonstration of the Importance of the Relationship of Logistics to Marketing: Incorporating Supply Chain Capabilities into Marketing Efforts. *International Journal of Business and Applied Social Science (IJBASS)*, 4 (12). Available at: SSRN: <https://ssrn.com/abstract=3308740> [Accessed 6 April 2021].
- Mentzer, J.T. and Gundlach, G., 2010. Exploring the relationship between marketing and supply chain management: introduction to the special issue. *Journal of the Academy of Marketing Science*, 38. pp. 1-4. <https://doi.org/10.1007/s11747-009-0150-4>.
- NGFS, 2020. *Climate Scenarios for central banks and supervisors*. Available at: <https://www.ngfs.net/sites/default/files/medias/documents/820184_ngfs_scenarios_final_version_v6.pdf> [Accessed 8 April 2021].
- Stonebraker, P., Goldhar, J., Nassos, G., 2007. Toward a Framework of Supply Chain Sustainability: The Fragility Index. In: *Proceedings of the Production Operations Management Annual Conference 2007*. Available at: <https://www.pomsmeetings.org/ConfProceedings/007/CDProgram/Topics/full_length_papers_files/007-0006.pdf> [Accessed 8 April 2021].