# Comparing Regions Globally: Impacts of COVID-19 on Supply Chains – A Delphi Study

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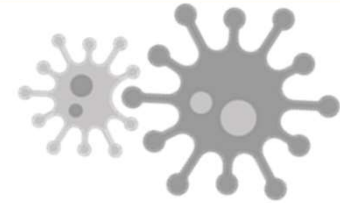
PEESA III Hybrid Meeting

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# Agenda

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**2**   **Research Questions/Objective**

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# Rising pressure due to interrupted supply chains caused by pandemic

**Coronavirus Disease 2019 and Supply Chain Management**

➢ On top of causing global **health crisis**, pandemic severely impacted local and global economies and **disrupted global supply chains** (SCs) for most product categories (Ivanov, 2020; Sodhi & Tang, 2021; Yang et al., 2020)

➢ During pandemic: SC's failed to get **products to market** (van Hoek, 2020)

➢ **Shortages** due to unpredictable **demand** increase and interrupted global SCs (Ivanov, 2020a)

➢ COVID-19 led to *"the largest and fastest decline in international flows – including trade, foreign direct investment, and international travel in modern history"* (Altman, 2020)

➢ **Global interest** in seeing how the Covid 19 crisis is changing SCM **standards and practices**

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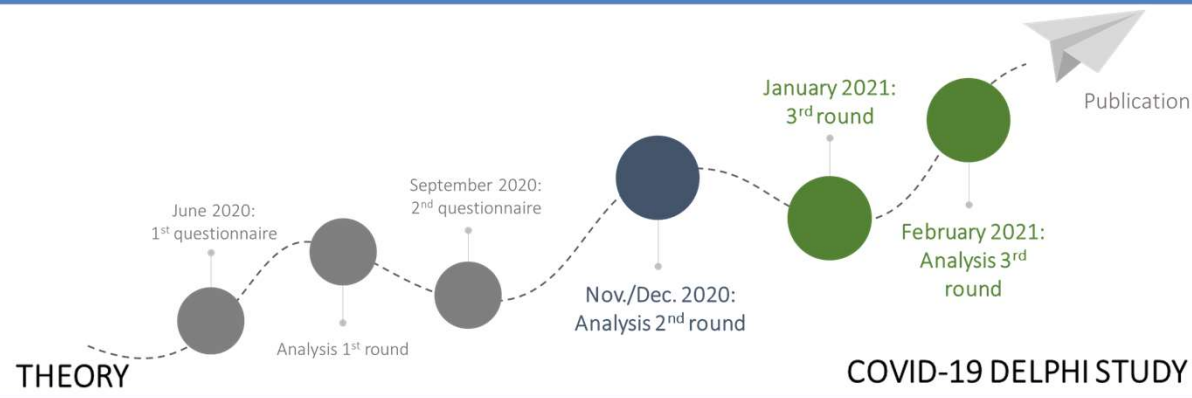*ronakeh.warasthe@hs-flensburg.de*

# Research Questions/Objective

**Research Questions:**

➢ What vulnerabilities are firms and their SCs facing due to COVID-19?

➢ How do they respond, build resilience and restore their operations?

➢ What are the regional similarities and differences?

**Objective of the study:**
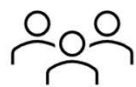
➢ Gain insights on how the pandemic is affecting supply chains and their management in various geographical contexts

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# Three-round global Delphi study



January 2021:
3rd round

Publication

September 2020:
2nd questionnaire

June 2020:
1st questionnaire

Nov./Dec. 2020:
Analysis 2nd round

February 2021:
Analysis 3rd
round

Analysis 1st round

THEORY

COVID-19 DELPHI STUDY

01 Definition of theses and questions

Expert panel:
→ SCM researchers with an academic background
active in the respective country or region

02 Selection of a group of
experts based on the topic

**1st round**

Questionnaire with open questions
→ four areas: *vulnerabilities, response measures,
resilience building,* and *restoring operations.*

03 Several rounds of questionnaires are sent out
→ Expert panel respond to several rounds
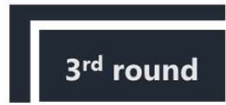→ Feedback is provided

Until no new results are generated

**2nd round**

Questionnaire with closed questions
→ four questions which adress the SC perspective
→ based on findings of 1st round

**3rd round**

Questionnaire with closed questions:
→ re-evaluate items of 2nd round in order to
validate the obtained results

Source: Linstone/Turoff (1975).

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# Condensation of answers in first round basis for constructs in further rounds

➢ After **Round 1** answers to open questions were condensed into **ten constructs**:

(1) digitization, (2) finance, (3) government, (4) human resource and hygiene management, (5) logistics, (6) risk management culture, knowledge, and system, (7) SC volatility/agility, (8) SC disruption, (9) SC disturbance, and (10) supply network

## SCOR:

➢ Model maps both the **internal** and **external** business processes in an organization's inter-company SC (APICS, 2017)

➢ This study examines the **impact** of the pandemic on SCs, looking primarily at the sourcing, manufacturing and distribution processes



**Frequency analysis:**

➢ Due to the binary nature of results, the homogeneity of second and third round results has been tested by means of a Kruskal-Wallis test for all 99 items in all six regions

➢ high degree of internal validity of the responses, as more than 80% from the second round were confirmed in the third one.

| Region | Round 1 | Round 2 | Round 3 |
|--------|---------|---------|---------|
| Africa | 15 | 17 | 10 |
| Brazil | 9 | 20 | 21 |
| China | 14 | 16 | 16 |
| Europe & North America | 33 | 37 | 29 |
| India & Pakistan | 24 | 18 | 23 |
| Iran | | 16 | 18 |
| **Total** | 95 | 124 | 117 |
| **response rate** | 12.4% | 15.9% | 14.9% |

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# 4a: Inductive content analysis lead to condensation of answers in first round

➢ *Supply network:* dependencies on **few suppliers**, especially in Africa and Europe & North America **high dependency** on China lead to difficulties. Companies in all regions **respond** to these vulnerabilities by **increasing cooperation** between SC partners and seeking **alternative suppliers**.

➢ *SC volatility/ agility:* challenged by **changing demand** pattern, shifts in customer requirements and **inability** to quickly adjust **production capacities** due to lean management measures. Developing in-house capabilities to **reduce dependence** on suppliers is the focus in Brazil and India & Pakistan and Iran.

➢ *Workforce/HRM:* Occupational **health safety** and **hygiene regulations** pose vulnerabilities. This leads to staff being **absent** due to illness or closed borders, as well as **reduced working hours** and teleworking especially in Europe & North America. All regions, but especially Brazil, take measures, like **hygiene regulations, training, and teleworking**, to ensure the health and safety of workers

➢ *Risk management culture, knowledge and system:* Risk identification, risk assessment and risk **mitigation measures** are taken by all regions. China uses travel and contact **monitoring data** to manage the restoration of business operations. Europe, India & Pakistan and Iran **redesign** their **business models**. **Incident response** and **contingency plans** are developed.

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# 4b: Frequency analysis reveals main constructs for the regions within the process stages

➤ A **cross-regional** evaluation shows that **SC disruptions** occur primarily in **source**

➤ **Financial problems** arise both in the **sourcing** process and in **manufacturing**

➤ The **workforce/ HRM** construct is a challenge above all in **make** and is therefore primarily improved in this process

➤ **Logistical challenges** are primarily present in **deliver**, thus logistical performance is mainly improved in this process

➤ Strengthening the **supply network** is of great importance in **all processes** as a responding measure, resilience building and restore operations

| Question | Source | | Make | | Deliver | |
|---|---|---|---|---|---|---|
| Q1: Vulnerabilities | SC disruption(s) | 5 | Workforce/ HRM | 6 | Logistics | 6 |
| | Finance | 3 | Finance | 4 | | |
| Q2: Responding measures | Supply network | 5 | Workforce/ HRM | 4 | Logistics | 6 |
| | Risk management | 4 | | | SC agility | 3 |
| Q3: Resilience building | Supply network | 5 | Supply network | 4 | Logistics | 4 |
| | SC agility | 3 | Digitization | 3 | Supply network | 4 |
| | Risk management | 3 | | | | |
| Q4: Restore operations | SC agility | 4 | Workforce/ HRM | 5 | Logistics | 5 |
| | Supply network | 3 | Government | 3 | Digitization | 4 |
| | | | | | Supply network | 3 |

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# 4c: Cluster analysis groups regions that are similar within one cluster

Results of the cluster analysis when considering all constructs and processes per question:

➢ In all **four** questions, **China** represents a cluster of its own and thus clearly **stands out** from the other regions

➢ **Iran** also forms its own cluster, except for Q4,

➢ **Africa** stands apart in the questions on **vulnerabilitie**s and **response measures**

➢ **Brazil** forms its own cluster in **restoring operations**. In the other cases, Brazil is always in a cluster together with Europe & North America and India & Pakistan

| Question | Cluster |
|---|---|
| Q1 Vulnerabilities | Africa |
| | Brazil, E&NA, I&P |
| | China |
| | Iran |
| Q2 Response measures | Africa |
| | Brazil, E&NA, I&P |
| | China |
| | Iran |
| Q3 Resilience building | Africa, Brazil, E&NA, I&P |
| | China |
| | Iran |
| Q4 Restoring operations | Africa, I&P |
| | Brazil |
| | China |
| | E&NA, Iran |
| Across all questions | Africa |
| | Brazil, E&NA, I&P |
| | China |
| | Iran |

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| Construct | Question | Source | Make | Deliver |
|---|---|---|---|---|
| Digitisation | Q1 | | Brazil, E&NA, I&P | Iran |
| | Q2 | | Africa | |
| | Q3 | | | |
| | Q4 | Africa, I&P | Africa, I&P | Brazil |
| Finance | Q1 | | | Africa |
| | Q2 | | | Iran |
| | Q3 | Iran | | |
| | Q4 | | China | |
| Government | Q1 | | Africa | |
| | Q2 | Africa | | Africa |
| | Q3 | Afr., Bra., E&NA, I&P | Iran | Afr., Bra., E&NA, I&P |
| | Q4 | Africa, I&P | E&NA, Iran | |
| Logistics | Q1 | | | China |
| | Q2 | | Brazil, E&NA, I&P | China |
| | Q3 | Afr., Bra., E&NA, I&P | | China |
| | Q4 | E&NA, Iran | Brazil | China |
| RM culture, knowledge and system | Q2 | Brazil, E&NA, I&P | Iran | |
| | Q3 | China | | |
| | Q4 | | E&NA, Iran | |
| SC disruption(s) | Q1 | | | Africa |
| SC disturbance(s) | Q1 | Iran | Brazil, E&NA, I&P | |
| SC volatility/ agility | Q1 | Iran | | China |
| | Q2 | China | | Brazil, E&NA, I&P |
| | Q3 | | China | |
| | Q4 | | China | Brazil |
| Supply network | Q1 | | | |
| | Q2 | | Iran | China |
| | Q3 | | Iran | |
| | Q4 | | | |
| Workforce/ HRM and hygiene management | Q1 | | China | Brazil, E&NA, I&P |
| | Q2 | | | |
| | Q3 | | | |
| | Q4 | | | |

➢ **Europe & North America** focus activities on improving **logistics** performance in **sourcing**, **Brazil** on the **manufacturing** and **China** in **delivery** process.

➢ **Governmental support** is important for **India & Pakistan** in **source**, for **Africa** in **source and deliver**, and for **Iran** in **make.**

➢ **China** increase **SC agility** in **make**, while **Brazil** focuses on the **delivery** process

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# Conclusion – Summarized findings

➢ For all the **developing** and **emerging** regions, **closed borders** and **restricted freight transport** represent major **challenges** arising from the pandemic

➢ Strong **supply network** and the **digitization** of the SC is mentioned in all regions as **essential** for overcoming the **disruption,** as well as for building **SC resilience**

➢ COVID-19 has shown many companies the negative aspects of **globalized SCs** and calls for **localization** have been raised especially in **Africa, Europe & North America**

➢ **Iran's isolated position** might explain study's finding that Iran **differs** in many aspects of the **manufacturing** process. The country also shows comparatively high values for **vulnerabilities** due to **SC volatility** and the increase of **SC agility** as measure

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# Study deepens understanding of impact of the pandemic on global supply chains

➢ The pandemic provides a unique opportunity to explore how companies and their management in **different regions** respond to and perform in this **unprecedented** situation

➢ The research design enables a comprehensive **insight** into SC **vulnerabilities** and **response** measures to improve **resilience** and to **restore** operations

➢ Study contributes to **resilience literature** in the context of **extreme situations**

➢ Extreme events likely to become more frequent in the future, **insights** into how SCs can be **managed** under such extreme conditions and insights into **regional differences** are crucial

➢ Limitations arise from condensation of answers into constructs and the use of the SCOR model to structure the response options

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