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Adrian Gheorghe

Farinaz Sabz Ali Pour

Unal Tatar

Omer Faruk Keskin

Cornel Vintila

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Authors
Adrian Gheorghe, Farinaz Sabz Ali Pour, Unal Tatar, Omer Faruk Keskin, Cornel Vintila, and Laura Manciu

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2021-05-19

Integration of Blockchain Technology into Supply Network for Resilient and Efficient Acquisition [video]

Gheorghe, Adrian; Pour, Farinaz Sabz Ali; Tatar, Unal; Keskin, Omer Faruk; Vintila, Cornel; Manciu, Laura

Monterey, California. Naval Postgraduate School

http://hdl.handle.net/10945/68225

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Blockchain for a Resilient, Efficient, and Effective Supply Chain: *Evidence from Cases*

Dr. Adrian Gheorghe, ODU
Farinaz Sabz Ali Pour, ODU
Dr. Unal Tatar, SUNY at Albany
Dr. Omer Keskin, ODU
Cornel Vintila, Aurachain
Laura Manciu, Aurachain

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Aim of the Research

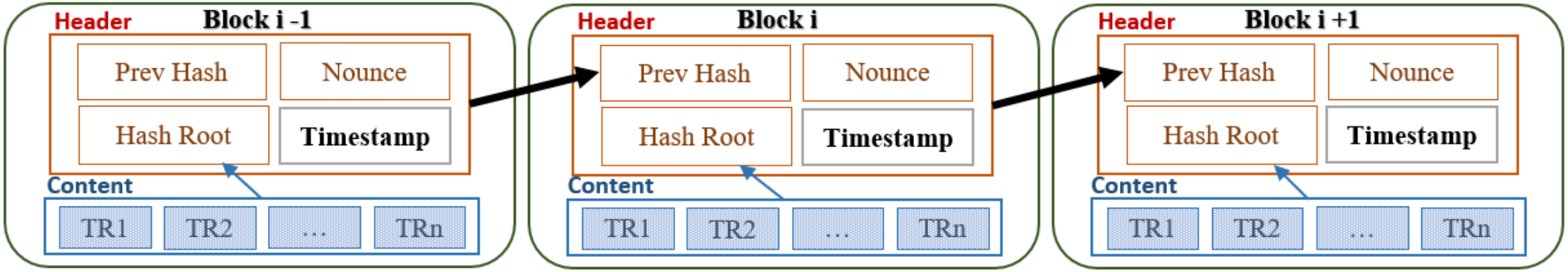
- Aim:

  "Review and analyze the selected current blockchain technology adoptions to enhance the resiliency of supply network management by facilitating collaboration and communication among suppliers and support the decision-making process."

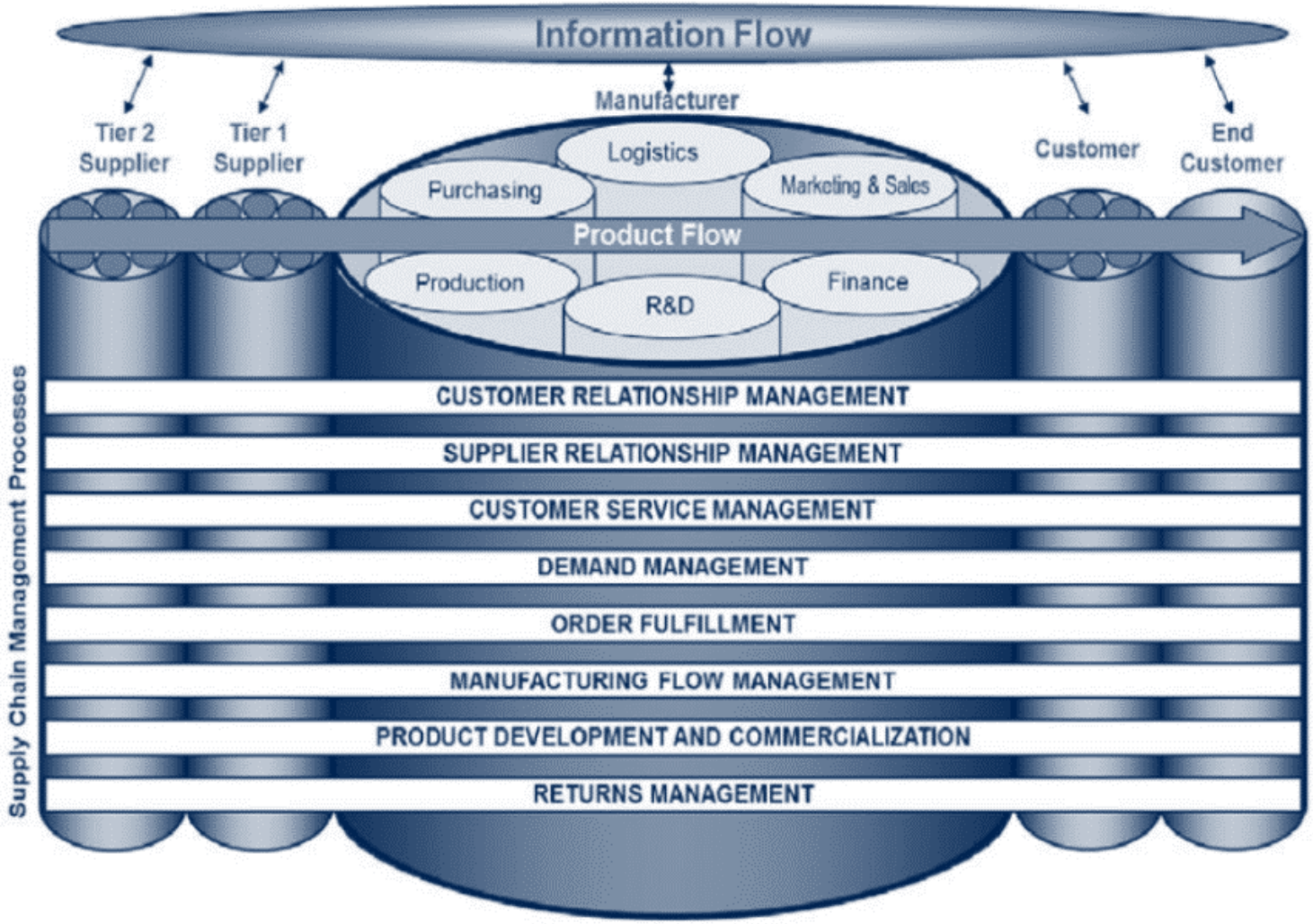
- What is in this presentation?
  - Limitations and challenges of the supply chain system that can be addressed by integrating Blockchain technology
  - Blockchain - Supply chain use cases
  - Future Work

Blockchain Technology

- Distributed digital ledgers of cryptographically signed transactions grouped into blocks
- Each block is cryptographically linked to the previous one after validation
- As new blocks are added, older blocks become more difficult to modify.
- Everyone has a copy of the ledger



Supply Chains and Management Process



Supply Chain Resiliency

- Resiliency metrics:
  - Availability
  - Connectivity
  - Accessibility
- Resiliency can be improved by:
  - decentralized,
  - distributed, and
  - fault-tolerant

  Blockchain technology

2021 Suez Canal Obstruction

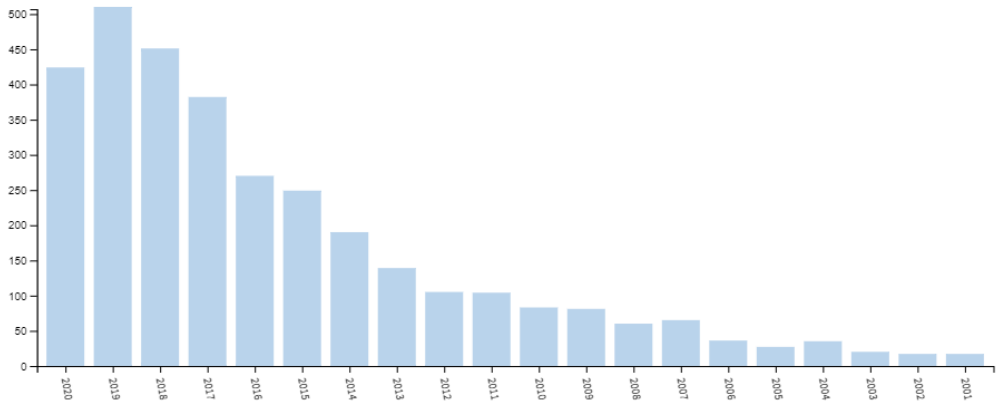
Literature Review Methodology

- Systematic Literature Review

Search History:

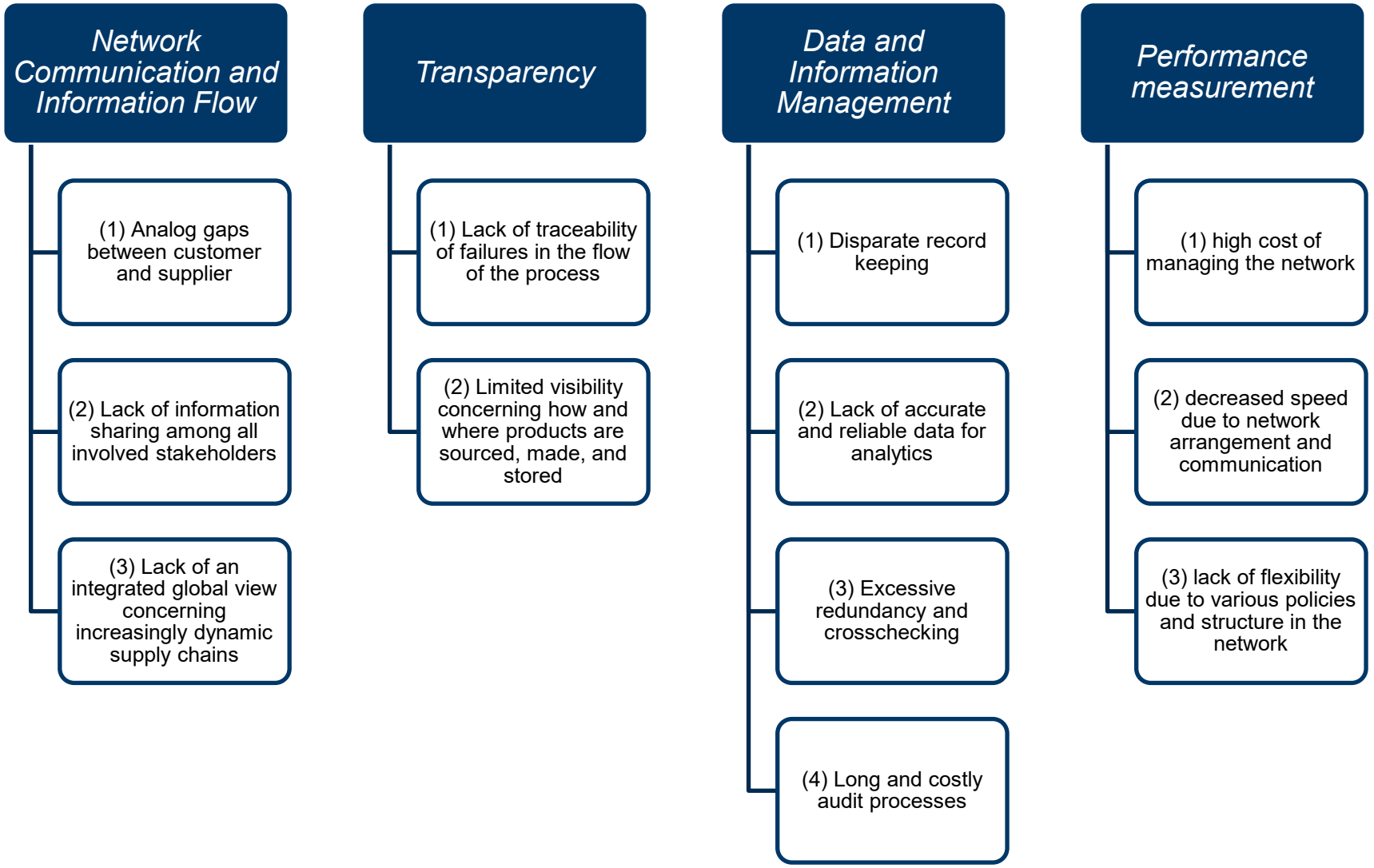
Set	Results	
# 3	29	#2 AND #1 *Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=2000-2020*
# 2	338	(TS = (blockchain AND supply chain)) *AND* **LANGUAGE:** (English) *AND* **DOCUMENT TYPES:** (Article) *Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=2000-2020*
# 1	3,217	(TS = (supply network challenges)) *AND* **LANGUAGE:** (English) *AND* **DOCUMENT TYPES:** (Article) *Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=2000-2020*

Database	Total # of results	Number Selected of papers
Web of Science	3217 + 338	29
Google Scholar	132	127
Total	3687	156

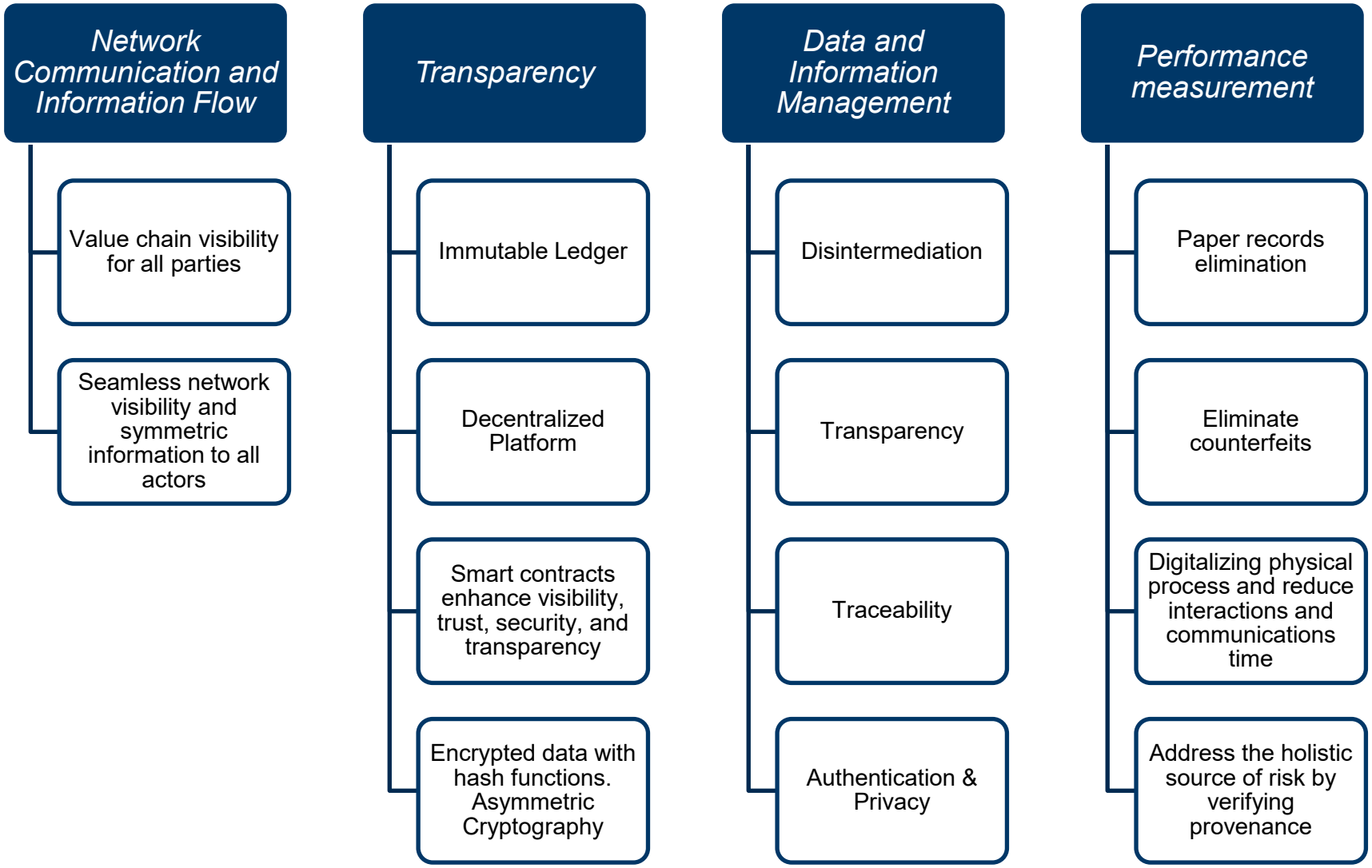


Supply network challenges publications (2001-2020)

Supply Chain Challenges



Supply Chain Challenges and Adaptation with Blockchain Technology



Case Studies: Walmart for Food Supply Chain

- **Partners:** IBM, JD.com, and Tsinghua University
- **Purpose of Blockchain:** To enhance transparency, designing blockchain solutions for food tracking, traceability, and safety.
- **Benefits of Blockchain:**
  - Traceability includes tracking and tracing the products throughout both directions of product flow within the supply chain.
    - Tracking from origins to the stores, and from the shelves to the farms
    - Identifying the sources of foodborne illnesses and tracing back to the farms/origins can be reduced from days to seconds.
  - Improved security and trust with immutability that avoids any alteration and transparency that provides everyone to access the ledger. To reduce the chance of food fraud and human errors.
  - Reduce waste by providing faster routes for perishable items

Case Studies: Maersk for Global Supply Chain

- **Partners: Maersk partnered with** IBM to develop the TradeLens platform.
  - Hapag-Lloyd, Ocean Network Express (ONE), CMA CGM, and Mediterranean Shipping Company (MSC), joined TradeLens.
- **Purpose of Blockchain:** To improve collaboration and trust across the partners of the global supply chain and to increase the efficiency.
- **Benefits of Blockchain:** Supply chain visibility, ease of documentation, and the ability to add new features on top of the platform. The built-in security enables trust among the partners and keeps the records digitally
- **Method:** Maersk and IBM utilized the open-source Hyperledger technology
- **Initial Phases:** A pilot project involved shipment with Saudi Customs demonstrated immutability, auditability, and transparency features of the platform, in addition to reducing costs and processing time.
  - The initial phase resulted in a significant decrease in the administrative costs up to 15% of the cargo value based on the initial tests.

MAERSK

Case Studies: DHL & Accenture for Pharmaceutical Industry

- **Partners:** DHL and Accenture
- **Purpose of Blockchain:** To fight against counterfeit medications
- **Benefits of Blockchain:**
  - The ability to verify the point of origin of the drug and whether it is genuine or counterfeit.
  - The ability to track every step of drugs in their lifecycle.
  - Better management of drug inventory at any part of the supply chain by determining faster delivery routes, handling and storage conditions, and tracking expiration.
- **Method:** blockchain-based serialization prototype with supply chain partners in six locations to track the life cycle of drugs.
  - Simulations demonstrated that the blockchain platform for genuine medicine could process seven billion new serial numbers and 1500 new transactions per second.
  - A serial number is given to each sealed unit of drugs. Information including manufacturer, plant ID, and the expiration date is associated with the serial number and stored in the Blockchain. Blockchain can track the exact location and learn more about the history and properties of each drug unit.

Conclusion and Future Work

- **Findings:**
  - Blockchain brings several opportunities for resiliency and efficiency of supply chains
  - There is a cost of Blockchain adoption
  - We need more quantitative studies to support decision making.

Scenario 1

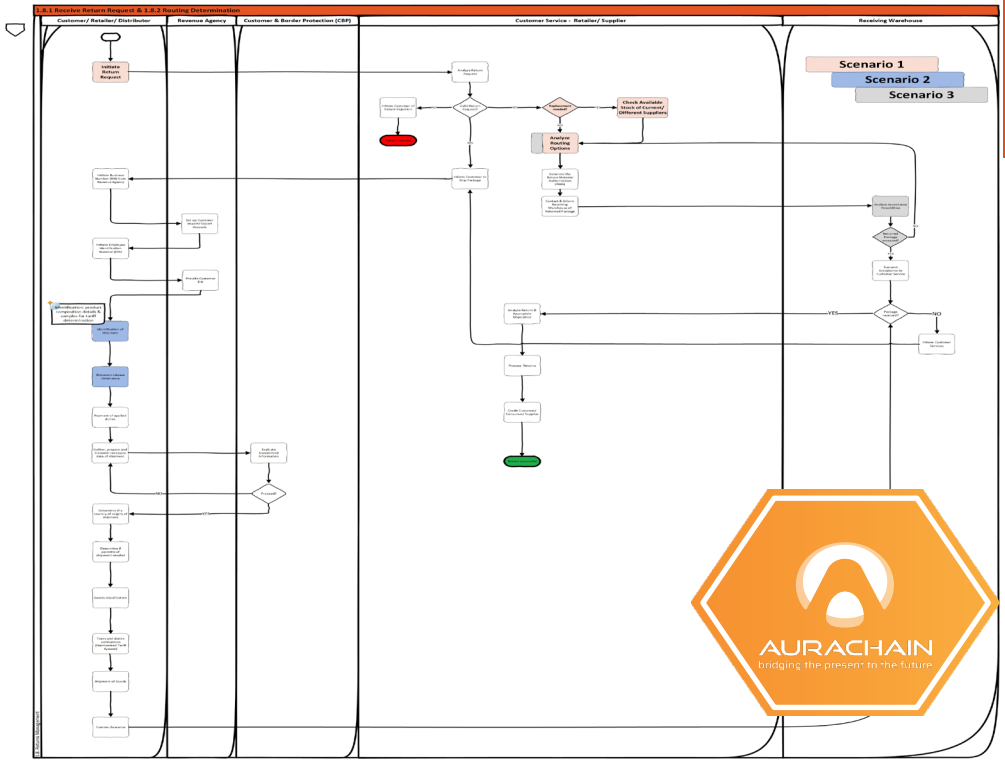
- ***Case & Story:*** Order of computer chips – issue emerges at two suppliers; there is a need to re-route supply
- ***Challenge:*** Lack of effective communication

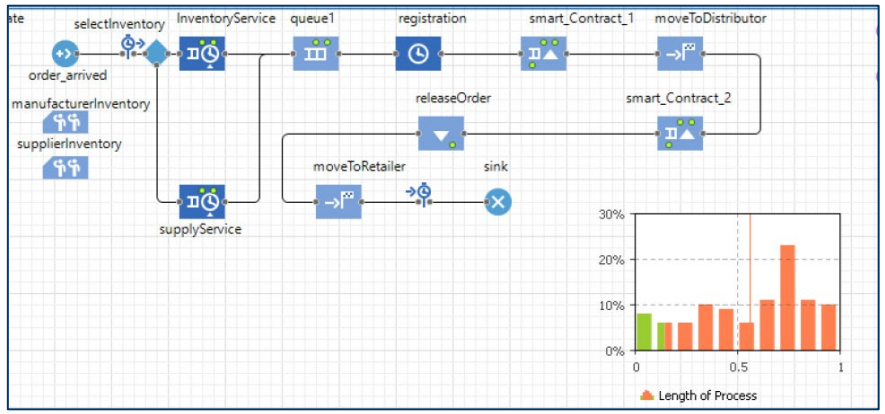
Scenario 2

- ***Case & Story:*** Pharmaceutical – fraud record/ product found
- ***Challenge:*** Lack of transparency in origin and quality of product

Scenario 3

- ***Case & Story:*** Liquid/ Lubricant – Damaged packaged discovered; reroute to meet demand
- ***Challenge:*** Lack of monitoring products to destination





Thank you!

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