CONNECTED SUPPLY CHAIN:
Envisioning an IoT-enabled Supply Chain

Archana Vidyasekar
Global Research Manager
Agenda

- Frost and Sullivan Perspective & QA 10 Mins
- Breakout Session: Polling 5 Mins
- Ideation Exercise: Macro to Micro Implications 15 Mins
- Team Presentations 10 Mins
## Technology Transformation in Logistics will be Profound

<table>
<thead>
<tr>
<th>Now vs. Emerging</th>
<th>Appification</th>
<th>Mobile TMS and warehouse systems through Web service APIs and cloud computing</th>
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<tbody>
<tr>
<td>Electronic data interchange (EDI)</td>
<td>New user interface in logistics</td>
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<td>Radio frequency identification (RFID)</td>
<td>Communication</td>
<td>Smart systems and M2M logistics technologies</td>
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<td>Real-time and M2M</td>
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<td>Smart deliveries – basic tracking using GPS, telematics</td>
<td>Autonomous systems</td>
<td>Driverless trucks, drone deliveries</td>
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<td>Self-managed</td>
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<td>Manual and order picking in warehouse</td>
<td>Augmented Reality (AR) &amp; Wearables</td>
<td>Hands free/vision picking technology</td>
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<td>Virtual supply chains</td>
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<td>Low-cost sensors for basic level communication</td>
<td>Internet of Things</td>
<td>Integration of IoT, wearables, and cognitive tools for enhanced communication within the supply chain</td>
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<td>Sensorization of supply chain</td>
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<td>Reactive analytics</td>
<td>Data 2.0</td>
<td>Predictive analytics and on-demand deliveries</td>
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<td>Data is the new oil</td>
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<td>Traditional pick-ups and semi-automated machines</td>
<td>Future of Robots</td>
<td>Mobile robots, human-robot collaboration</td>
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<td>Robotics warehouse</td>
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## 5G as the key IOT enabler

5G will be rolled out from 2020 onwards enabling more 80 Billion Connected Devices

<table>
<thead>
<tr>
<th>Generation</th>
<th>1G</th>
<th>2G</th>
<th>3G</th>
<th>4G</th>
<th>5G</th>
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<tbody>
<tr>
<td>Device</td>
<td>Analog Voice Calls</td>
<td>Digital Voice Calls</td>
<td>Data</td>
<td>Video Streaming</td>
<td>M2M</td>
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<tr>
<td>Specifications</td>
<td>Speed: 50 KBPS</td>
<td>Speed: 250 KBPS</td>
<td>Bandwidth: 20 MBPS</td>
<td>Bandwidth: 200 MBPS</td>
<td>Bandwidth: 1 GBPS</td>
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</table>

- **Less than 1 millisecond Latency**
- **90% Energy savings**
- **0 perceived down time for service provision**
- **7 trillion M2M wireless connections**

*Source: Frost and Sullivan Analysis*
Data Deluge in the Supply chain?
Data is emerging as the new oil

Applications of Predictive and prescriptive analytics

Network control & planning
Route optimization real time- Shorter lead times; deliveries to sparsely populated areas

Production & Process Flow
Control-on-the-go: Mobile devices used to enhance enterprise visibility

Managing Risks
Quicker reaction times to supply chain issues – Supply chain disruptions such as civil unrest, natural calamities, etc
Environmental control

Service level optimization
Product tracking data to understand customer purchasing behaviour and support requirements.

Market Size
$1.2 billion

2016

Descriptive and diagnostic, 80.0%
Predictive and prescriptive, 20.0%
Freight Marketplaces
Freight Industry is where the travel industry was in early 2000 before Expedia
Vision Guided Order Processing is the Future
Case Study: DHL Augmented Reality Glasses

- Accelerometer
- Gravity
- Gyroscope
- Light
- Linear acceleration
- Magnetic field
- Orientation (deprecated)
- Rotation vector
- Bar code readers
- QR code readers
Self-Orchestrating Supply Chains
In the future we can expect most moving vehicles within Logistics industry right from forklift to delivery fleets to be semi autonomous or fully autonomous

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<tr>
<th>Autonomous Guided Vehicles</th>
<th>Truck Platooning</th>
<th>Self Driving Cars</th>
<th>Mobile Roots</th>
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<tbody>
<tr>
<td>Seegrid, Kiva, Kuka, IBT</td>
<td>Daimler, Iveco, Scania, DAF</td>
<td>BMW, Ford, Toyota, Hyundai, Daimler</td>
<td>Fetch Robotics, Aethon, Blue Frog Robotics</td>
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<tr>
<td>Autonomus Trucks</td>
<td>Autonomous Cargo Rail</td>
<td>Autonomous Ship</td>
<td>Drones for last mile delivery</td>
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<tr>
<td>Otto, Navistar, Paccar, Daimler</td>
<td>Dongnam Marine Crane Co, Potain tower cranes</td>
<td>Rolls Royce, ABB Marine, Fincantieri</td>
<td>Sensefly DHL</td>
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</table>
Paperless Trade with Blockchain?
Ethereum has managed over $150 million in funding to experiment in developing smart contract based initiatives and is largely expected to transform the logistics industry

Highlights

- Decentralized platform that runs smart contracts.
- Use of Ethereum platform will facilitate in negotiating prices and monitoring inventory levels that will result in minimizing transaction costs and building more agile supply chains.
- Streamlines processes ERP systems of multiple stakeholders within the supply chain.
- Initiates more secure forms of transactions.
- Manage logistics and warehouse – Ability to trace the product to its origin.
New Supply Chain Bosses: Artificially Intelligent “Managers”
Anticipatory shipping that starts delivering shipments even before the consumer purchase

Hitachi: AI in Warehouse Management

Dell: AI in 3PL management

Self-generated swarm Intelligence for routing

AI in Product Development

Source: Frost & Sullivan
Additive manufacturing giving rise to new supply chain models

3D Printing creates new logistic models within the industry ranging from supporting supply chain needs to becoming a critical player by itself by having 3d printing hubs closer to fulfilment centers and warehouses.

### New Supply Chain Models

#### Streamlined logistic model
- **Raw Material Supplier** → **Manufacturer**
  - Long-tail components
  - Fast moving components

#### Customer managed model
- **3D Printer supplier**
  - Transports 3d printers
- **Raw Material Supplier**
  - Transports raw materials

#### 3D Printing Hub
- **Raw Material Supplier** → **Manufacturer/Logistic service provider/Governing body**

#### Home 3D Printing
- **3D Printer supplier**
  - Transports 3d printers
- **Online Retail**
  - Offering databases & marketplaces for consumers to create and exchange designs for use with home 3d printers
- **Raw Material Supplier**
  - Transports raw materials

### Implications to logistics provider
- **Simplified supply chain**
- ↓ In inventory levels
- ↓ In demand for warehousing
- ↓ Shipping time
- ↓ Transport cost
- ↓ Component cost
- Quicker response to shortened product life-cycle
- Trans border production
- Lower cost to produce/purchase goods
- ↓ Cost of tariffs as parts carried across international boundaries
- Impacts capability of supply chains
- ↑ On-time, in-full, e-fulfillment indices
- Delivers greater customization

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**FR O S T & S U L L I V A N**

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The “4PL” Effect: Unbundling of Supply Chains

Key service providers such as FedEx, UPS, see their services being unbundled by specialized market operators that focus on partial processes or services by breaking down the value chain.

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<thead>
<tr>
<th>FedEx</th>
<th>Ship</th>
<th>Track</th>
<th>Manage</th>
<th>Learn</th>
<th>FedEx Office</th>
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<td>DHL</td>
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### FedEx
- Create shipment
- Get rates & transit times
- Find FedEx locations
- Schedule & manage pickups
- Order shipping supplies
- Pack shipment
- Access International services

### DHL
- Get forms
- My forms
- Importer security filing
- eManifest

### DHL
- Fast ship
- Ship
- Get rates & transit times
- Temperature control
- Secure services
- Truckload solutions