

IOWA STATE UNIVERSITY

Debbie and Jerry Ivy College of Business

INNOVATE at Iowa State

SUPPLY CHAIN INNOVATION FORUM

Presentation for
National Press Foundation Webinar
7 July 2020



2019-2020 Supply Chain Innovation Forum

INNOVATE at Iowa State

Membership



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Food Supply Chain Innovation

- Farm to Table
- Meat Processing Automation
- Vertical Farming
- Unmanned Farmers Markets
- Drone delivery networks
- Autonomous farming equipment



Focus on Supply Chain Innovation

Supply Chain Automation

- Warehouse automation
- Autonomous trucks
- Port and terminal automation
- Last mile automation with robots and drones
- Drone distribution networks

Supply Chain Visibility

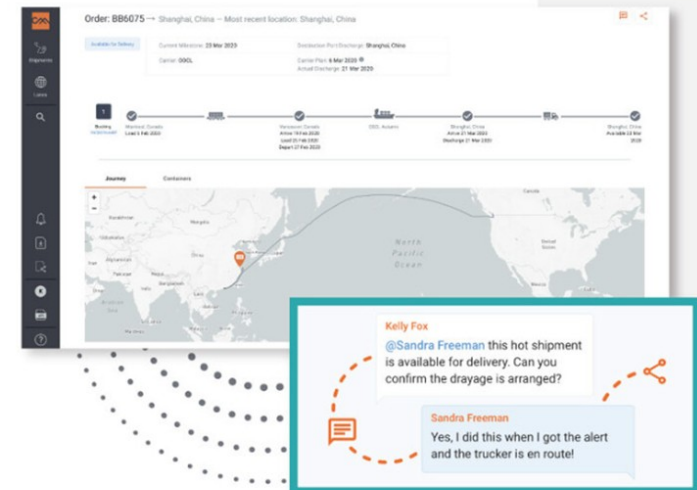
- EDL and GPS enable live tracking
- Exception management
- Live ETA & Dynamic optimization

Supply Chain Network Optimization

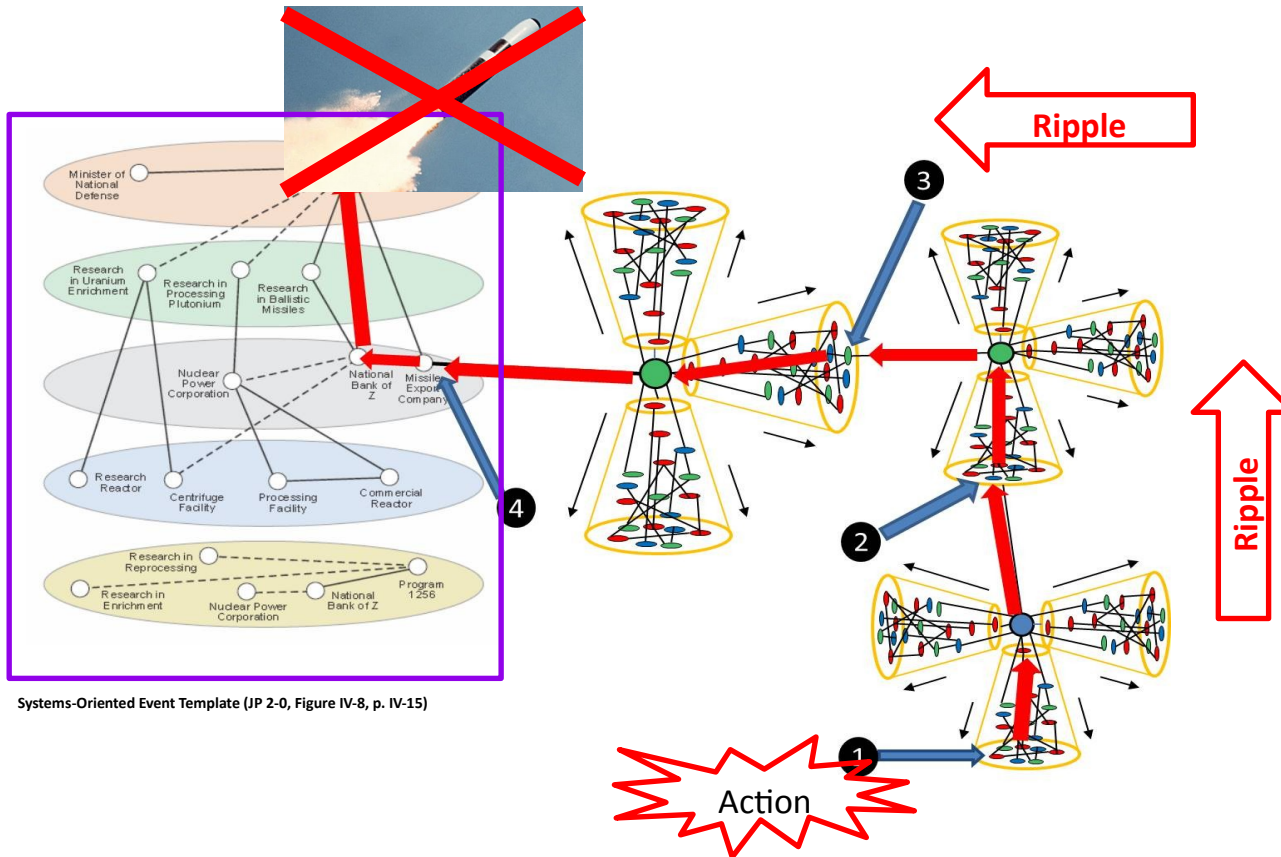
- Digital Twins
- Simulation
- Multi-objective and multi-mode optimization (HPC)

Supply Chain Forensics

- Leverages data, IIOT and artificial intelligence
- Predicts supply chain disruptions

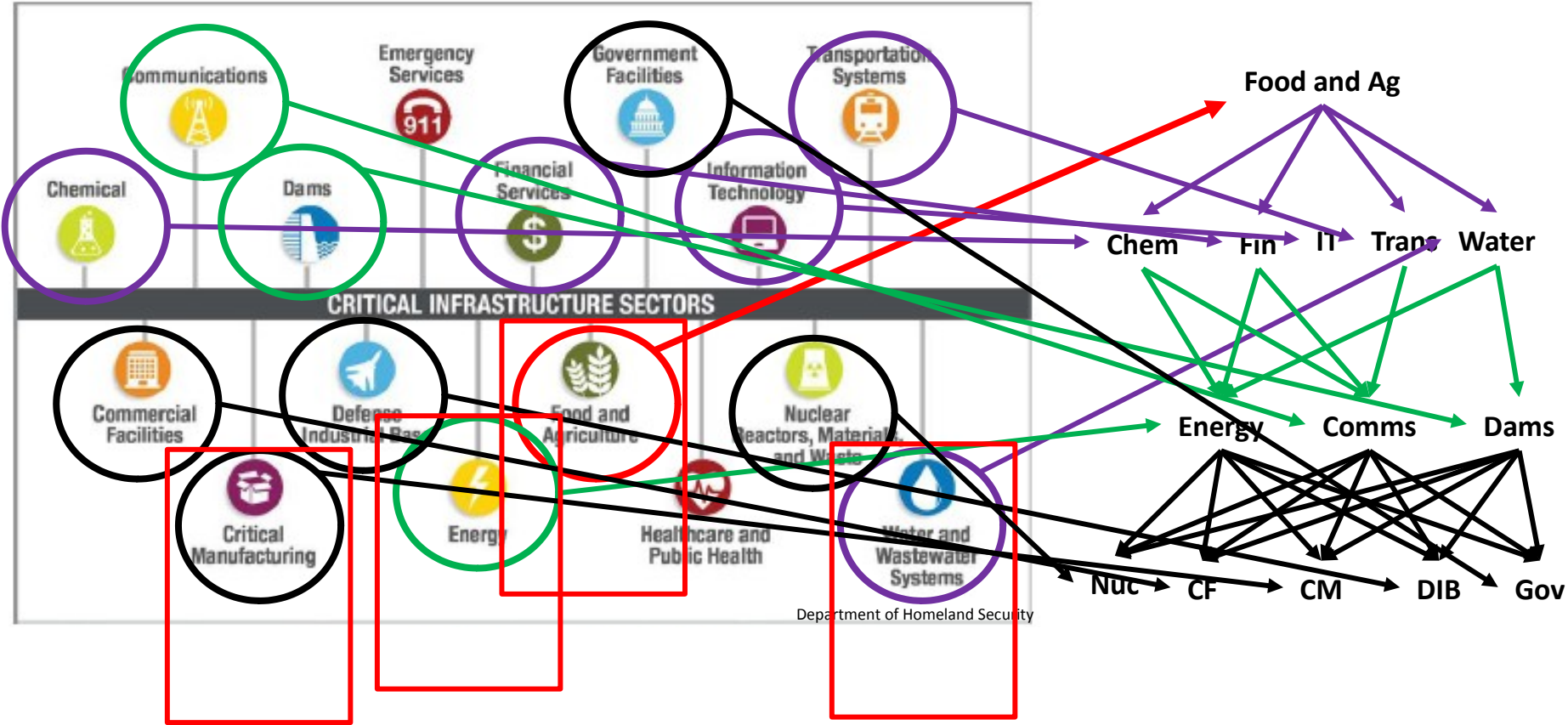


Supply Chain Forensics



Source: Partnership Solutions International

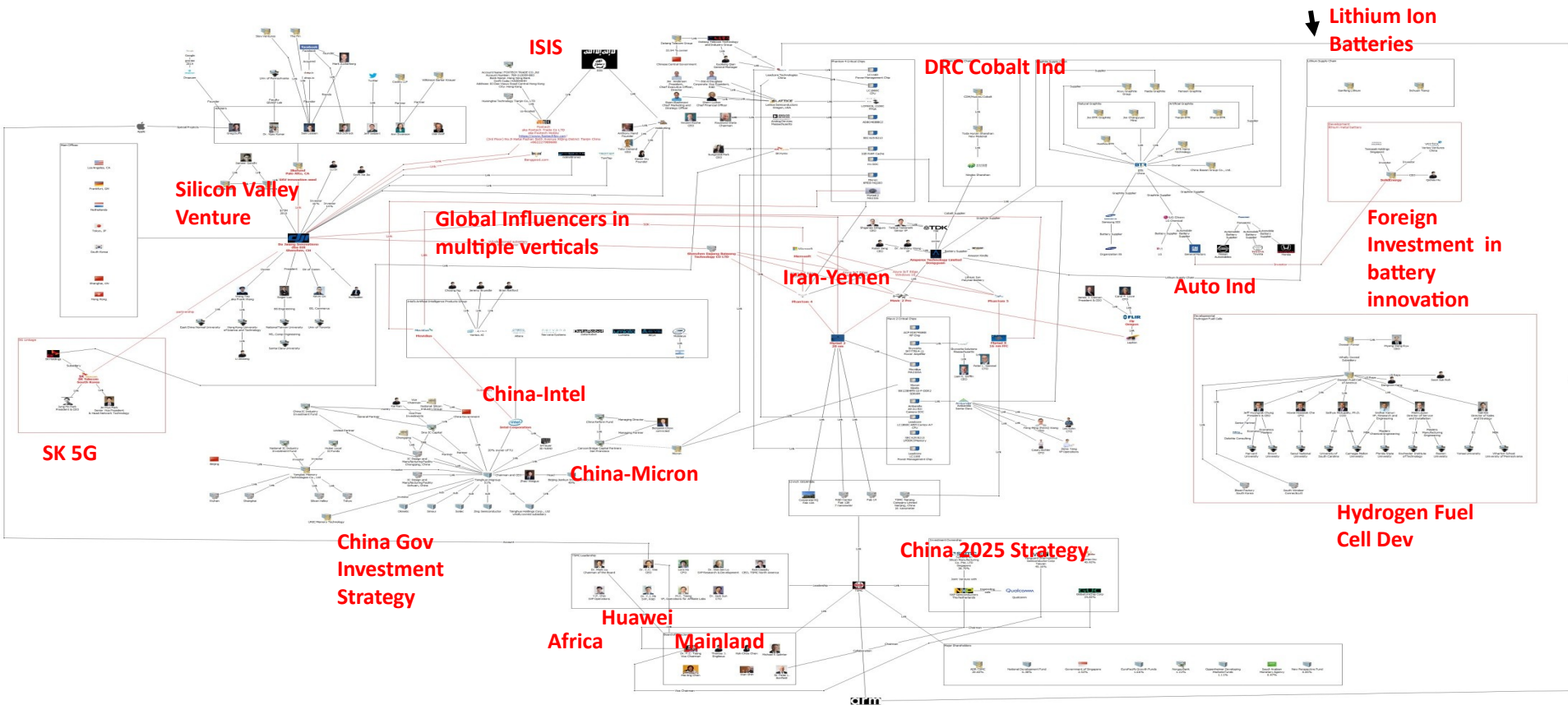
Traditional versus Forensic Approach



Department of Homeland Security

Source: Partnership Solutions International

Power of Databasing



Source: Partnership Solutions International

Critical Ingredients

There are 156 life saving drugs for which the US is entirely dependent on foreign sources.

There are dozens of food and feed grade vitamins, minerals and preservatives for which the US is entirely dependent upon foreign sources.

Critical Vitamins

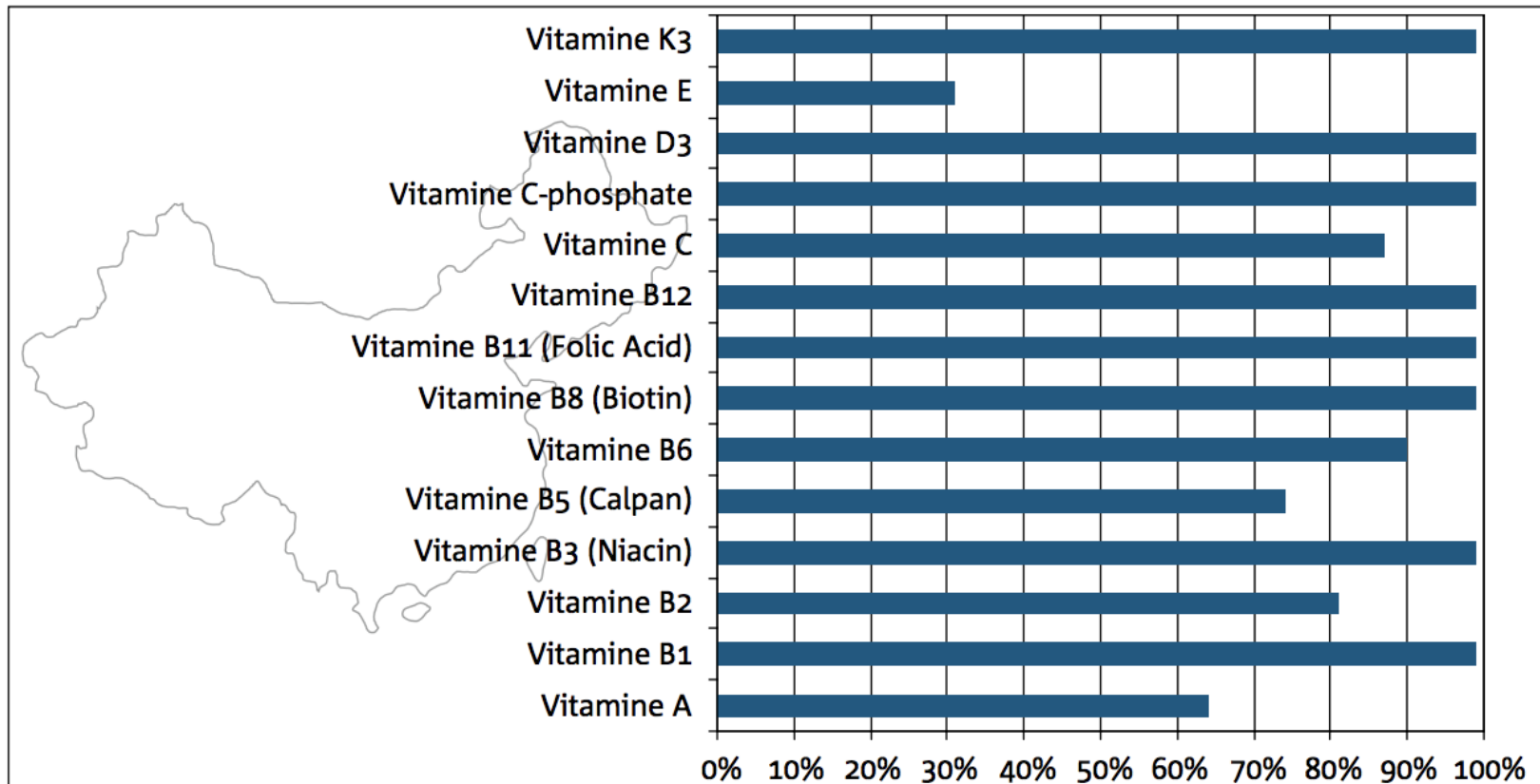
A	For healthy vision, skin, bones, teeth & reproduction	Liver, Eggs, Fish, Milk, Carrots, Sweet Potato, Pumpkin, Spinach
B1 THIAMIN	Helps convert food into energy and is critical for nerve function	Pork, Soy, Watermelon, Tomato, Spinach
B2 RIBOFLAVIN	Helps convert food into energy and supports healthy skin, hair, blood & brain	Dairy, Meat, Green Leafy Veggies, Enriched Wheat, Oysters
B3 NIACIN	Helps convert food into energy and is essential for healthy nervous system	Beef, Chicken, Shrimp, Avocado, Peanuts, Tomato, Spinach
B6 PYRIDOXINE	Helps make red blood cells and improves sleep, appetite & mood	Chicken, Tofu, Banana, Watermelon, Fish, Legumes
B7 BIOTIN	Helps convert food to energy & break down glucose	Whole Grains, Eggs, Almonds, Soybeans, Fish
B9 FOLATE	Vital for new cell creation and DNA synthesis	Legumes, Spinach, Leafy Greens, Chickpeas, Tomato, Asparagus
B12	Breaks down fatty acids & amino acids, helps make red blood cells	Dairy, Beef, Pork, Poultry, Fish, Eggs
C	Acts as an antioxidant, helps make new cells, & improves immune system	Fruit & Fruit Juices, Pepper, Broccoli, Tomato, Spinach
D	Strengthens and helps form bones & teeth via calcium & phosphorus	Egg Yolk, Fatty Fish, Liver, Sunlight
E	Acts as an antioxidant, helps stabilize cell membranes	Nuts, Avocado, Tofu, Whole Grains, Seeds
K	Essential for blood clotting and helping to regulate blood calcium	Broccoli, Brussels Sprouts, Liver, Leafy Greens

@cheatdaydesign

<https://cheatdaydesign.com/vitamin-cheat-sheet/>

China produces over 90% of nine critical vitamins

Figure 2.6: Estimated share of China in the world production of vitamins (in %).



⁵ http://www.niutang.com/products_food_folic.asp

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Supply Chain Mapping

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Step 1 – High Level Tier 1 Supply Chain Mapping

For each item in the BOM, identify manufacturing process, Tier 1 Sources, Warehouses, Modes of Transport and Packaging. Reese’s Peanut Butter Cups are produced in Hershey, PA but ingredients come from four continents.



Step 1 – High Level Tier 1 Supply Chain Mapping

Understanding the manufacturing process



FROM COCOA BEAN TO CHOCOLATE

Turning cocoa beans into chocolate is a long chain of processes: picking, fermenting, drying, transporting, roasting, grinding, pressing, blending, rolling, ripening and manufacturing.



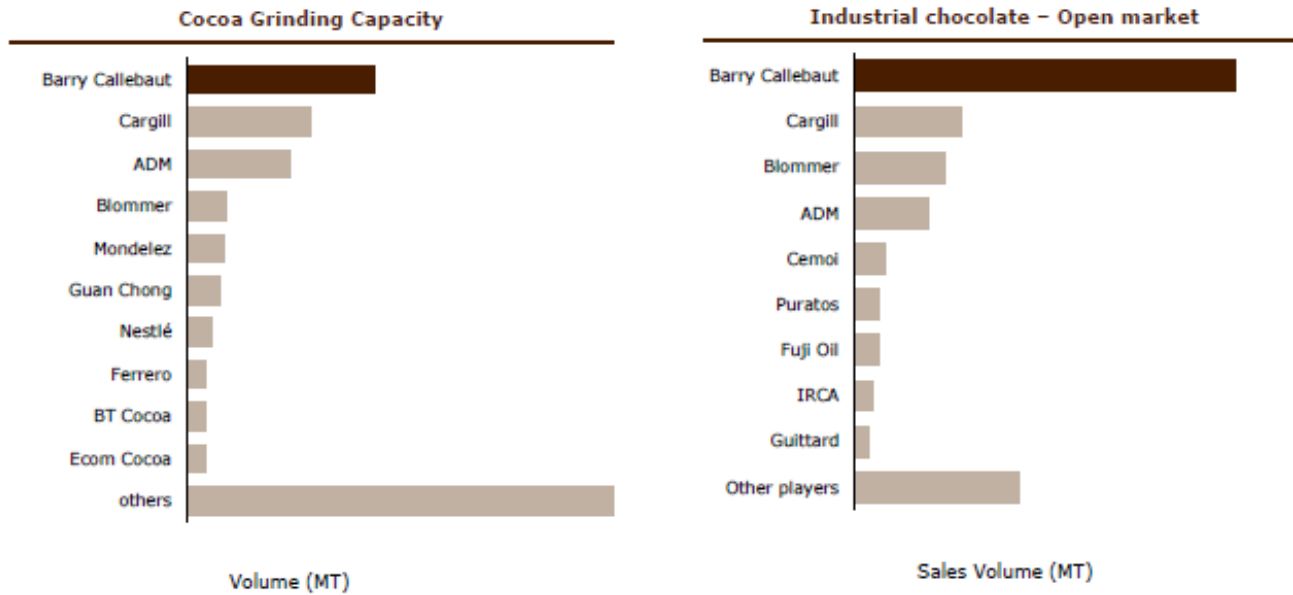
THE PRICE OF CHOCOLATE

Of the price paid for chocolate in the west, no more than 3 percent ends up with the cocoa farmers. Thirteen percent goes to the traders and processors of the cocoa beans and to pay local taxes. The rest of the price is made up of the costs of marketing, trading, production and retail margins.



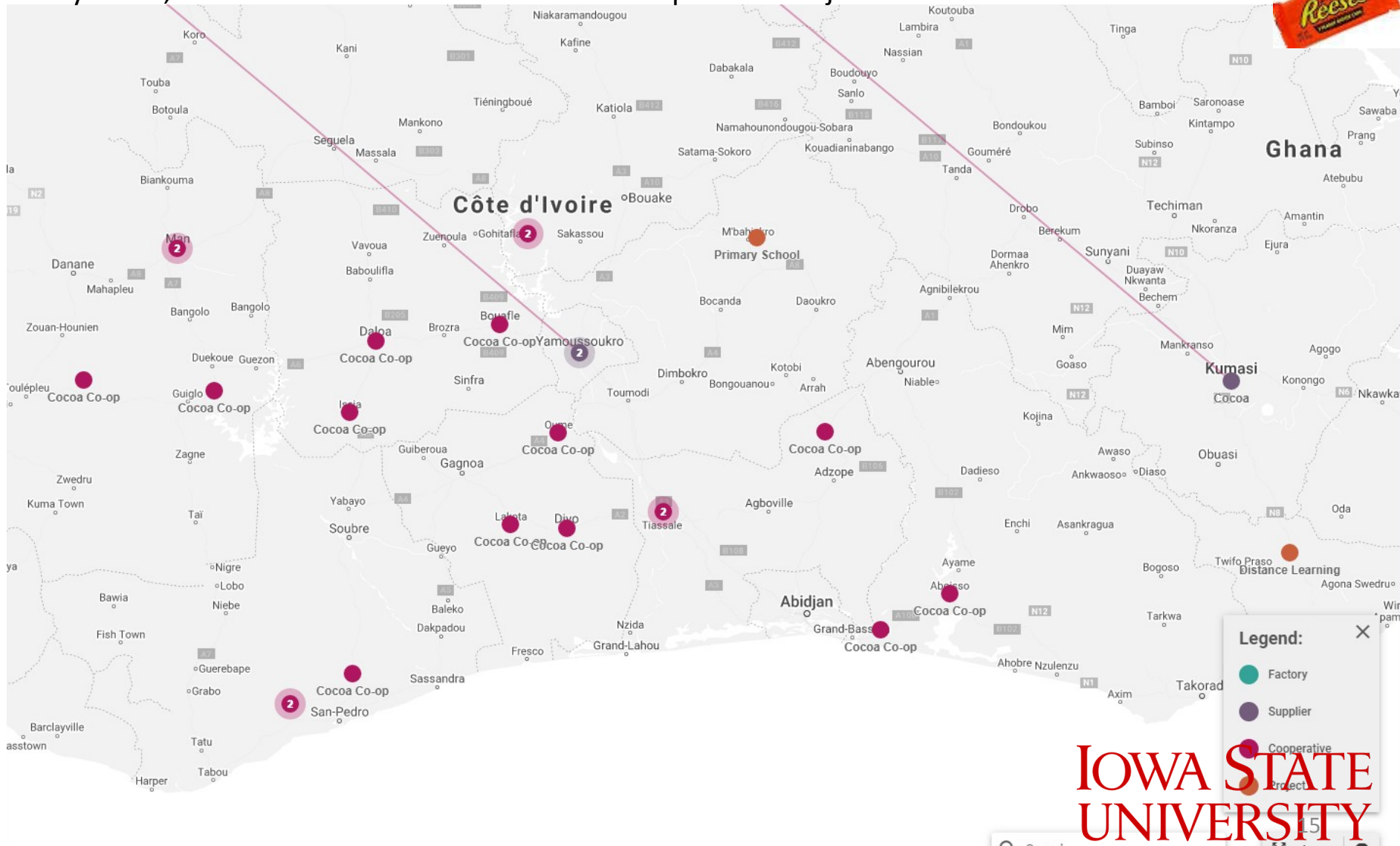
Step 1 – High Level Tier 1 Supply Chain Mapping

Hershey's buys chocolate from industrial chocolate processors like Cargill.



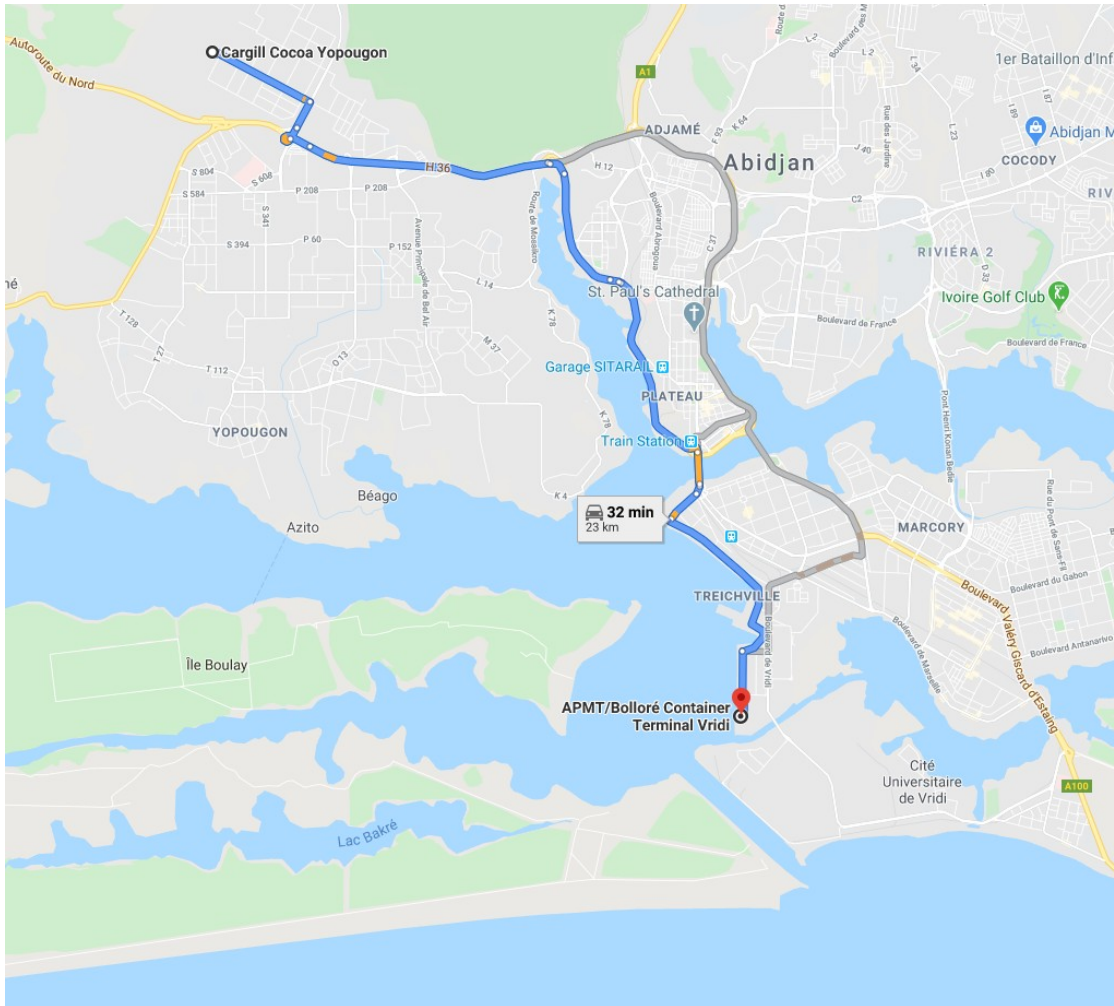
Step 2 – Detailed Tier 2 Mapping

Cargill acquires Cocoa Beans from over 30 Co-Op's in Ecuador, Ghana and the Ivory Coast. In the Ivory Coast, beans flow from Yamoussoukro to the port of Abidjan.



Step 2 – Detailed Tier 2 Mapping

Cargill acquires Cocoa Beans from over 30 Co-Ops in Ecuador, Ghana and the Ivory Coast. In the Ivory Coast, beans are packaged in sacks and flow via truck from Yamoussoukro to be processed in the port city of Abidjan. Processed chocolate butter and liquor is then containerized and sent through the city to the warehouse outside APM Terminals.



Step 2 – Detailed Tier 2 Mapping

At the port, Cargill loads pallets into intermodal shipping containers which are then loaded onto Maersk ships destined for the US East Coast.

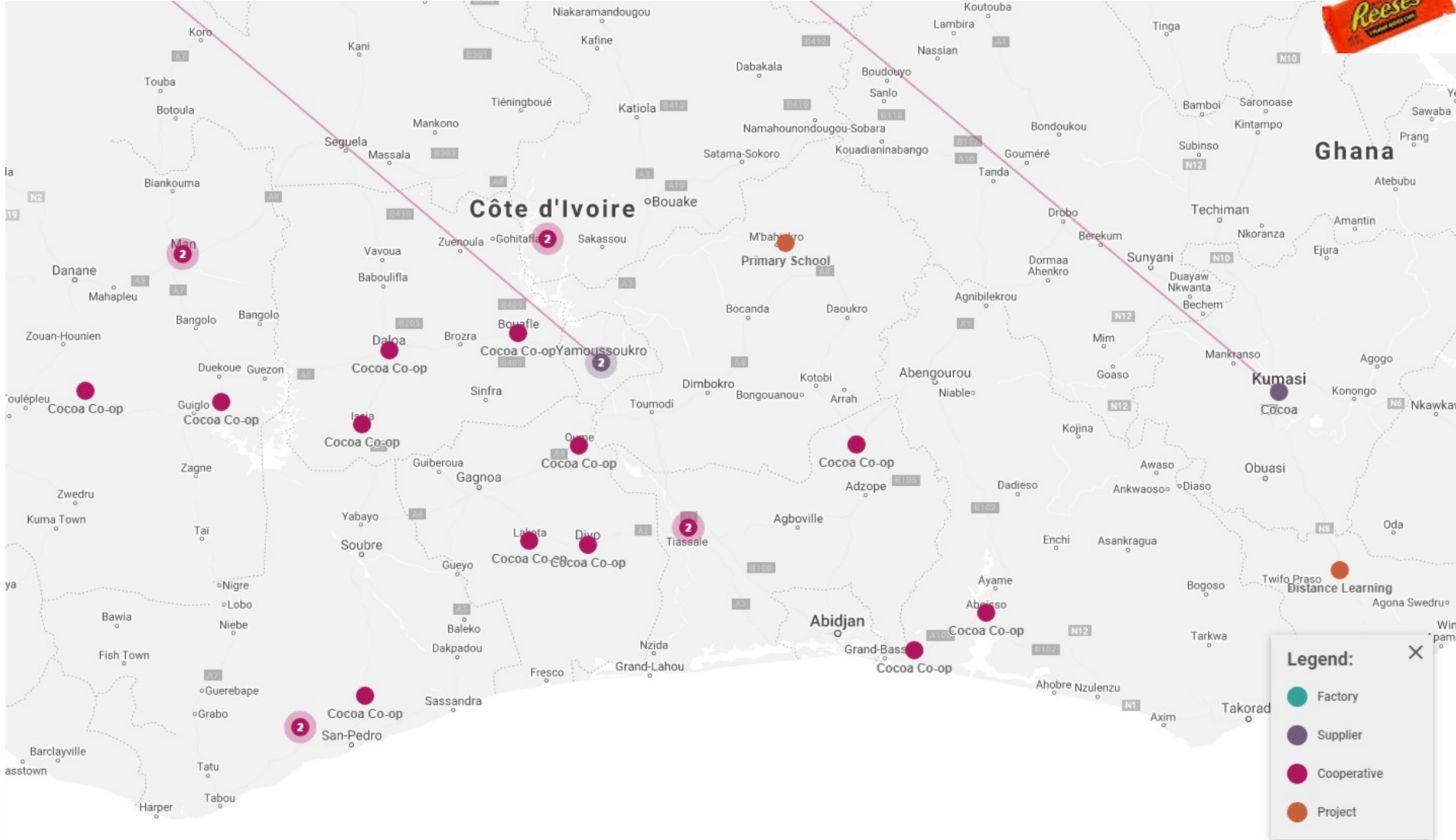


 **APM TERMINALS**

 **MAERSK**

Step 3 – Tier 3 Supply Chain Mapping

Hundreds of small farms harvest cocoa beans and sell them to the Co-Ops



Step 4 – Subsequent tiers Supply Chain Mapping

Hundreds of small farms harvest cocoa beans and sell them to the Co-Ops

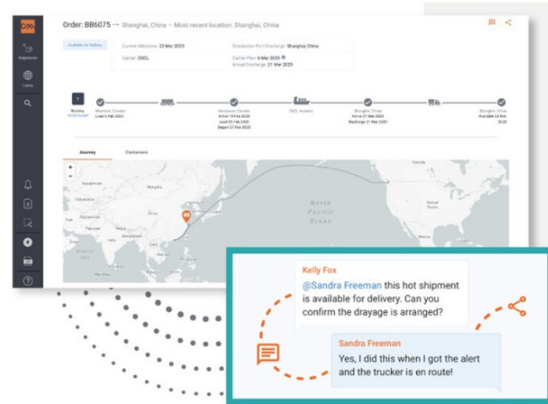


Step 5 – Identify all of the external factors that could impact supply

- People (Industry influencers and all of their colleagues, mentors and connections)
- Weather (Floods, fires...)
- Infrastructure (Roadways, bridges, communications, power)
- Port operations and capacity (Terminal operators, shippers)
- Pests and availability of pesticides (Locusts)
- Local Politics (Mama Cocoa)
- National Politics (Elections, candidate platforms,)
- International Organizations (WTO, UN, IMF...)
- Finance (Banking and availability of micro-loans)

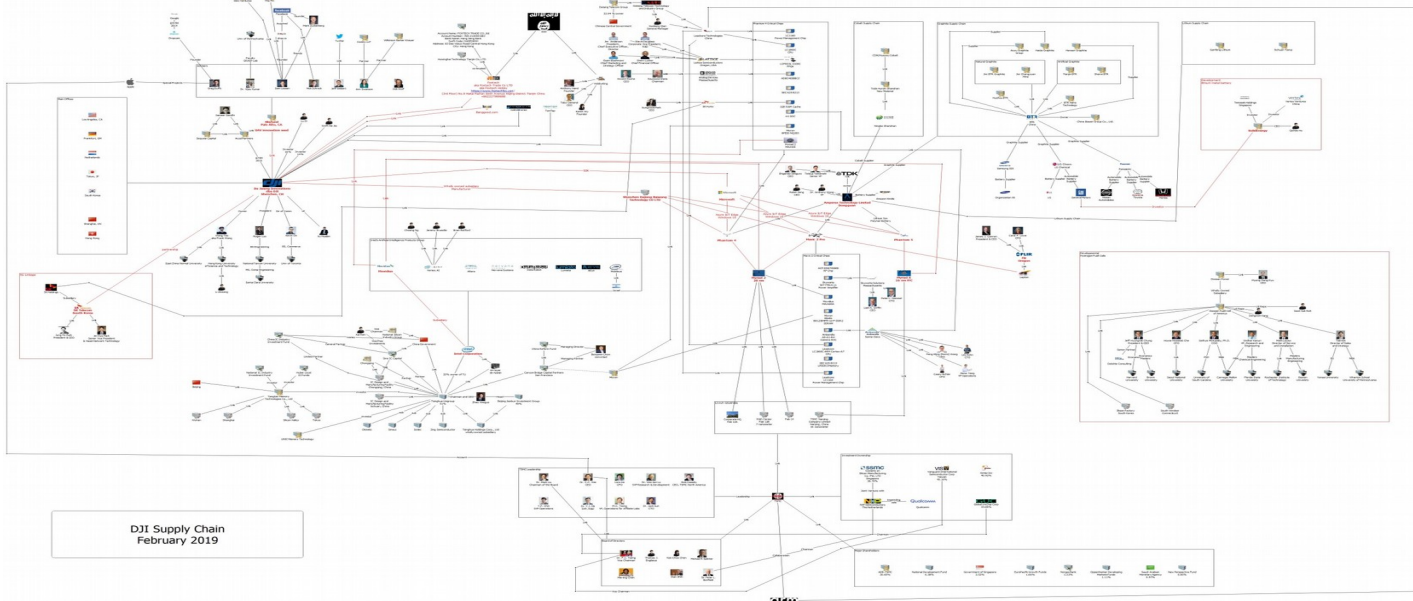
Step 6 – Monitor production and flow

IOT and Supply Chain Visibility enable anomaly detection



Step 7 – Databasing

Data “lakes” enable artificial intelligence and machine learning to evaluate structured and unstructured data to predict supply chain disruptions





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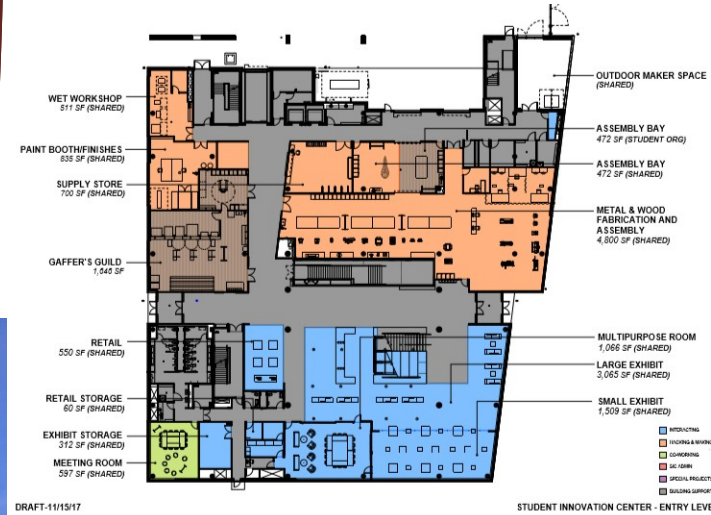
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Focus on Innovation and Entrepreneurship



The Student Innovation Center opens next month

- 5G, IOT, ML, AI, Sensor Fusion, Robotics, Drones



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THE LTL REVOLUTION IS HERE.

Drive efficiency, predictability and cost-savings throughout your supply chain with the only machine learning-powered Dynamic ETA for LTL.



“Predicting accurate arrival times for LTL loads is a genuine **breakthrough in real-time visibility**. The ability to proactively manage exceptions for LTL shipments with FourKites means **better planning, smoother operations and improved visibility** for customers.”



Dustin Braun
Senior Director - Logistics

Dynamic ETA for LTL delivers

6X THE ACCURACY

of industry-standard LTL ETAs

ETA algorithm built on

3.2 BILLION

tracked LTL miles and

1.3 TRILLION

LTL transit patterns

FourKites covers **96%** of LTL freight in the US

182% growth in FourKites' LTL volume over 2019



Leveraging FourKites' LTL capabilities, one of America's largest food producers experienced a **67% reduction in customer service calls** and a **147% improvement in customer satisfaction**.

THE STATUS QUO

VS.

THE FOURKITES DIFFERENCE

MAXIMIZE EFFICIENCY



- Unreliable ETA windows
- PRO numbers not available until delivery
- Data silos between stakeholders

- Accurate and reliable delivery windows
- Carrier and shipper PRO numbers available and accessible for all parties at load creation

REDUCE COSTS



- Manual, time-intensive process of matching alternative reference and PRO numbers
- Wasted labor and sub-optimal dock planning

- Eliminate manual processes to reduce time and freight loss
- Visibility into all loads enables optimized dock and labor planning

IMPROVE SERVICE



- No visibility on inbound LTL freight volume
- Arduous, paper-based proof of delivery processes, and documents received too late to notice missing or damaged freight

- Documents accessible to all stakeholders via cloud-based, central platform
- Shorting or over-shipping surfaced immediately so teams can take action

Supply Chain Visibility

Who is project44?

project44 is the world's only advanced visibility platform for shippers and logistics service providers.

The quicker you have visibility to potential disruptions, the faster you can react. project44 provides real-time visibility into key transportation processes to accelerate insights, collaboration, and action.

760+

Active Telematics / ELD Providers

21M

Shipments tracked annually

57+

Global TMS / ERP Integrations

48+

Countries with tracking

300+

Enterprise customers

80%

Of Carriers Onboarded within 10 Days

250+

Global Team Members

80+

Team Members across Europe in Denmark, Germany, Netherlands, Italy, France, UK and Spain

16

Languages spoken by Customer Service team

4.3M

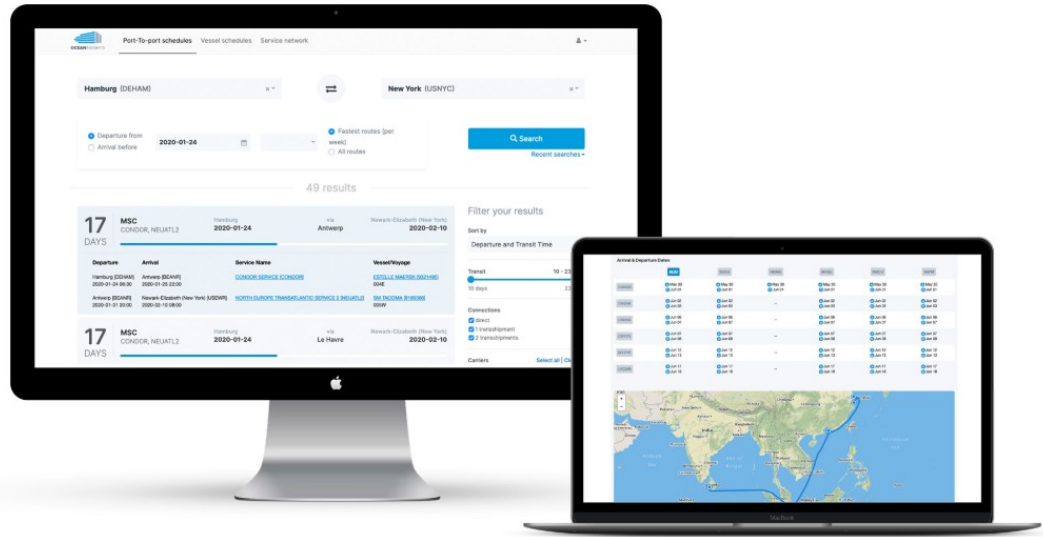
Connected drivers

5x

Larger Global Over-the-Road Network Than our Nearest Competitor



Ocean Freight Visibility



Journey Containers

Timeline:
1. Hamburg, Canada Load 1 Feb 2020
2. Vancouver, Canada Arrive 19 Feb 2020 / Load 21 Feb 2020 / Depart 27 Feb 2020
3. 2000, Korea Arrive 21 Mar 2020
4. Singapore, China Arrive 27 Mar 2020
5. Shanghai, China Arrive 13 Mar 2020

Chat:
Kelly Fox @Sandra Freeman this hot shipment is available for delivery. Can you confirm the drayage is arranged?
Sandra Freeman Yes, I did this when I got the alert and the trucker is en route!

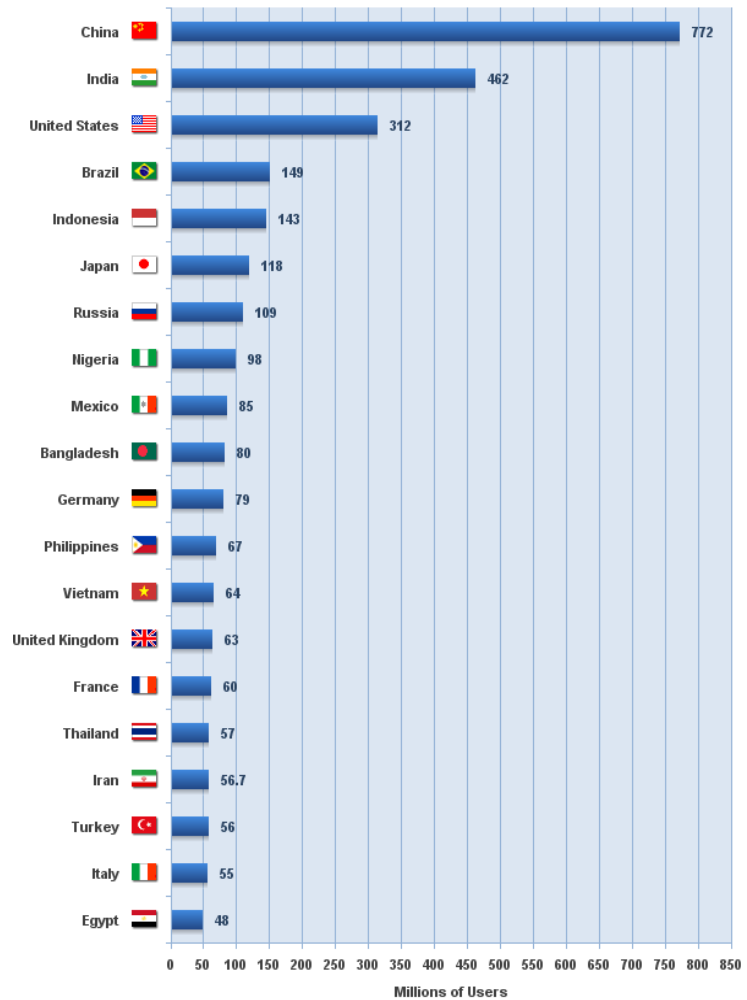
In 2000, China and India had 42 million internet users.

Today, China and India have over 1.2 billion users.

Almost 2/3 of World Population now have internet access.

Anybody, anywhere, can learn anything.

TOP 20 INTERNET COUNTRIES - 2018
With the Highest Number of Internet Users



Source: Internet World Stats - www.internetworldstats.com/top20.htm
2,937,139,302 Internet users in the Top 20 countries in December 31, 2018
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