



## LOOKING TO THE FUTURE OF SUPPLY CHAINS

 MIT Center for Transportation & Logistics

1

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## Themes – Friction in the Supply Chain



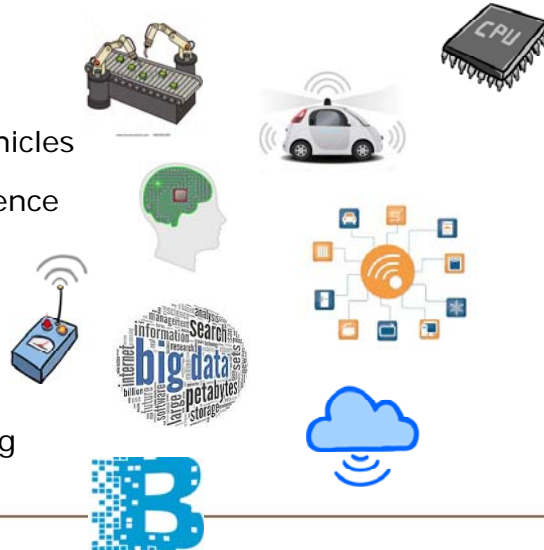
- Global unrest
- Anti-globalization
- Nationalism
- Dangers
- Challenging trends

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## Themes – ICT Advances

- Digital control
- Robotics/3D
- Autonomous vehicles
- Artificial intelligence
- IoT
- Sensing
- Big data
- Cloud Computing
- Blockchain



## Technologies – 3D Printing

### Implications:

- + End of mass production? Hyper-customization?
- + Complexity is free
- + Speed up design/engineering
- + Impact on SC structures
  - + Reduce number of suppliers
  - + Reduce supply chain tiers
- + Lower inventory levels (forget end-of-life)
- + (Almost) zero waste
- Impact on IP
- Cyber security
- Manufacture of illicit products
  - Drugs
  - Guns

## Technologies - Virtual/Augmented Reality

- AR - Assisted operations (e.g., warehousing, MRO, health diagnostics & surgery). Real time manuals
- VR – Training and education, entertainment, therapy, prototyping, procurement (examine offering, negotiations, bidding)
- Next generation Skype/enhancing human connection
  - Shopping experience
  - Collaboration

## Technologies - ICT

- Cloud computing
  - What's new (SaaS redux?) (add: Infrastructure as a service (IaaS)?, platform as a service (PaaS?))
  - Emphasis on service; not technology
  - Need – identify service needs, consumption, patterns of use (peaking?)
- Internet of Things
  - What's new? (RFID redux?) (sensors everywhere?)
  - Getting to the consumer/home level? Alexa?
  - Increased in-transit visibility? (cloud-based GPS + RFID)
    - Pedigree (pharma), fake products, CSR
  - Insight into consumer use of product (?)
  - Collect huge data
    - Use by big data analytics to find hot spots (asset loss, component failure, delays, temperature in cold chain,...)
    - Optimize inventory in real time



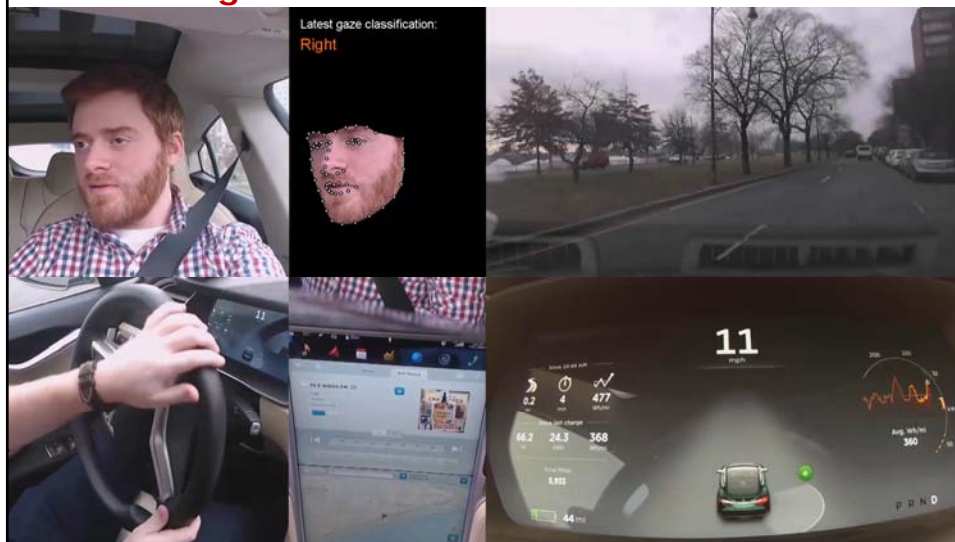
## Technologies - Autonomous vehicles

(Coupled with ride sharing)

- + Better flows
- + Lower costs
- + Safety – reduction in highway death and injuries
- Unemployment
  - 3.2 million truck drivers; truck stops workers...
- Cyber terror opportunity
- Future of automotive companies – who will buy cars? (Power shift in the chain?)



## Technologies - Autonomous vehicles



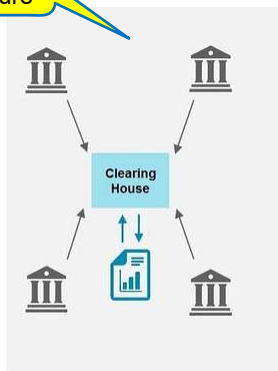
## Technologies – Block Chain

### What?

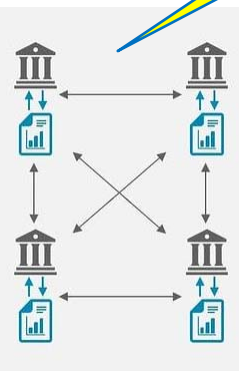
- A data structure that makes it possible to create a digital ledger of transactions and share it among a distributed network of computers. It uses cryptography to allow each participant on the network to manipulate the ledger in a secure way without the need for a central authority
- Once a block of data is recorded on the ledger, it is difficult to change or remove. If a participants in the network wants to add to it, the majority of nodes have to agree by running algorithms to evaluate and verify the change (e.g., it has to match the history). When approved, a new block is added
- Bitcoin is “permission-less” – anybody can join. With supply chain, likely “permissioned” block chains – allowing only known participants

## Blockchain – Shared Registry

Standard  
architecture



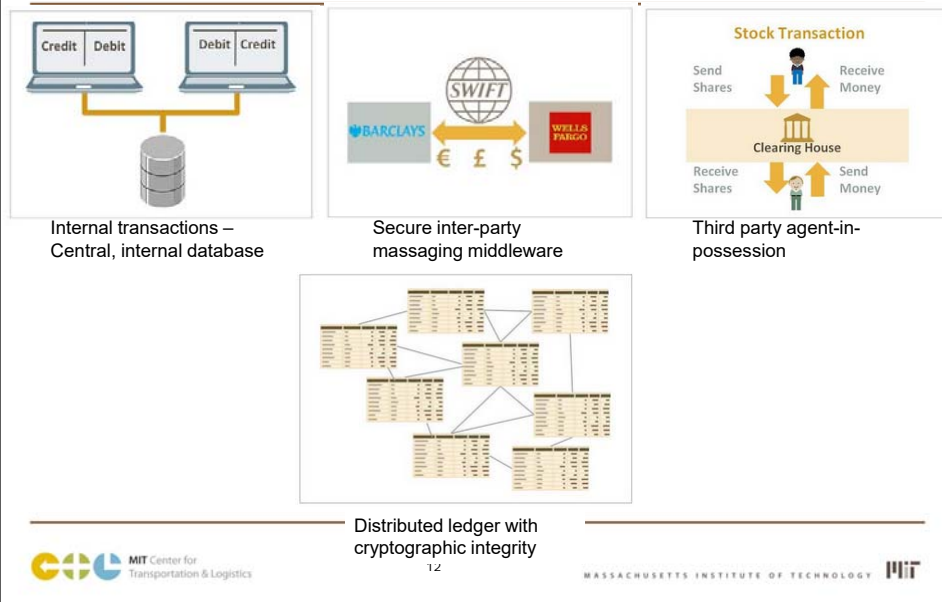
Distributed  
Ledger



The  
network  
records  
ownership  
through a  
shared  
registry

No need  
for a  
middleman

## Existing architectures



## Blockchain Technology - Supply Chain Implications

### Use:

- Recording the quantity and transfer of assets - like pallets, trailers, containers, etc. - as they move between supply chain nodes
- Tracking purchase orders, change orders, receipts, shipment notifications, or other trade-related documents
- Assigning or verifying certifications or certain properties of physical products; for example determining if a food product is organic or fair trade
- Linking physical goods to serial numbers, bar codes, digital tags like RFID, SenseAware, etc.
- Sharing information about manufacturing process, assembly, delivery, and maintenance of products with suppliers and vendors

## Blockchain Technology - Supply Chain Implications

### Benefits:

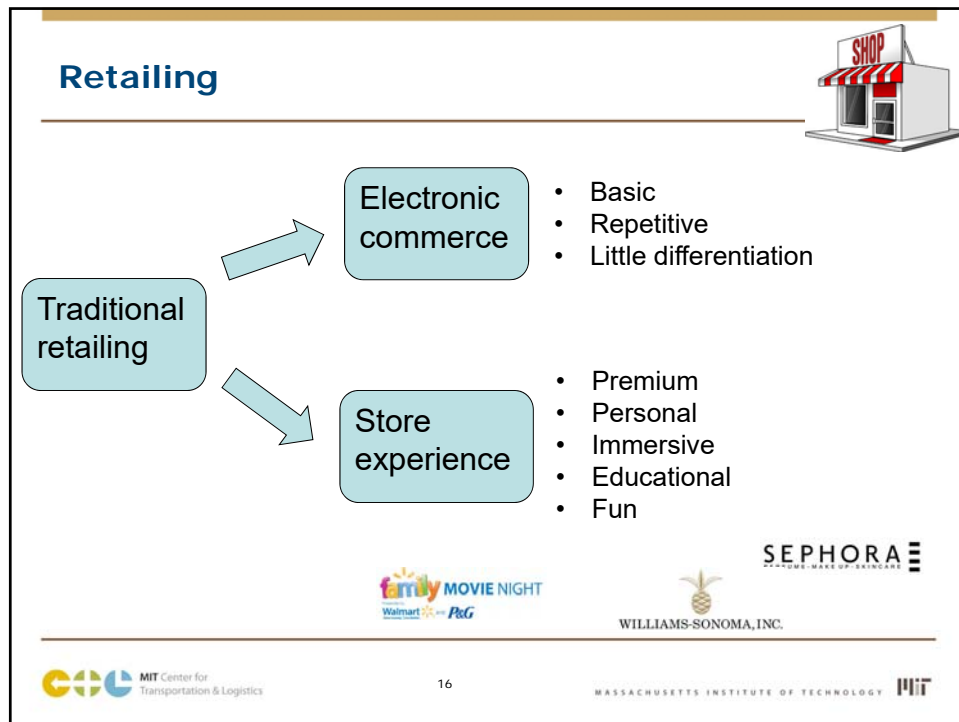
- Enhanced Transparency. Documenting a product's journey across the supply chain reveals its true origin and touchpoints, which increases trust and helps eliminate the bias found in today's opaque supply chains. Manufacturers can also reduce recalls by sharing logs with OEMs and regulators.
- Greater Scalability. Virtually any number of participants, accessing from any number of touchpoints, is possible.
- Better Security. A shared, indelible ledger with codified rules could potentially eliminate the audits required by internal systems and processes.
- Increased Innovation. Opportunities abound to create new, specialized uses for the technology as a result of the decentralized architecture.

## Blockchain Technology - Supply Chain Implications

- Traditional supply chain: multiple bilateral contractual links joined together to form a chain
- Blockchain supply chain: formation of an open ecosystem for collaboration
- Issues addressed:
  - Lack of open and trustworthy information technology across the supply chain
- Reasons
  - Trust between partners
  - Technology gaps
  - Legacy practices

### Result:

- An eco-system where information flows openly and securely between permissioned participants
- Reduced the assumed risk => lower costs
- Increased agility and adaptiveness





## Retail Delivery

The new competitive landscape:

- Inexpensive
  - Free delivery
- Fast
  - Within hours
- Customized
  - GSK – tailored medicines
  - 3D-printed
- Anywhere
  - Japan – delivery to transit stations
  - Nike – during the Boston Marathon



## Future Delivery Technologies



## Product Servicization

- Product centric - extraction of more utility from a product
  - Inventory management
  - Maintenance and repair
  - Spare parts support
  - Training and certification
  - Testing and audit
- Customer centric – providing expertise, resources, alliance
  - Customization
  - Consulting
  - Business development
  - Integration & turnkey projects
  - Outsourcing and managed services

Whole product  
services

Value creation  
services

## Why Servicizing?

- Growth:
  - Stimulating product sales by selling additional services
  - Competitive advantage through differentiation
  - Higher barriers to entry
  - Protection against product reverse-engineering/imitation
- Margins
  - High capacity utilization
  - Service markets have superior margins
  - Avoid price competition
  - Protection against demand shocks
- Relationship
  - Increased "stickiness"
  - Understanding customer needs better and learning about it fast
  - Fast penetration of innovation/new technology to the market

## Servicization -



Drippers company

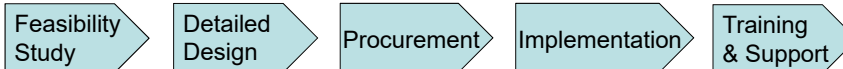
Managed Services  
for specific verticals:

- Green houses
- mining

Professional Services:

- Consulting
- Integration
- Project management

Expertise:



Value:



## The Future...



Yossi Sheffi  
[sheffi@mit.edu](mailto:sheffi@mit.edu)

