We believe that this new supply chain solution will be a transformative technology with the potential to completely disrupt and change the way global trade is done” (Bridget van Kralingen, Senior Vice President, Industry Platforms, IBM)
Blockchain + Supply chains

=Disruption?

- What are the implications for supply chain management?
  - Blockchain 101
  - Chains in chains – Theory and Practice
  - The background – unethical behavior in the road haulage industry
  - The “ReLog” Blockchain pilot (2015-2018)
WHAT IS BLOCKCHAIN?

BLOCKCHAIN IS AN INCORRUPTIBLE LEDGER OF TRANSACTIONS STORED ON THOUSANDS OF COMPUTERS GLOBALLY.

Courtesy of Chainvine
TIMELINE AND DESCRIPTION

STEP 1
Owner 1 wants to send asset to Owner 2

STEP 2
REQUESTED TRANSACTION IS BROADCASTED TO WHOLE NETWORK CONSISTING OF NODES/COMPUTERS
STEP 3
THE NETWORK OF NODES VALIDATES TRANSACTIONS, USING KNOWN ALGORITHM.

STEP 4
ONCE VERIFIED THE TRANSACTION IS ADDED WITH OTHER TRANSACTIONS CREATING A NEW BLOCK OF DATA FOR THE LEDGER, NEW BLOCK ALSO CONTAINS SIGNATURE OF PREVIOUS BLOCK

how does blockchain work?

Courtesy of Chainvine
STEP 5
THE NEW BLOCK IS THEN ADDED TO THE BLOCKCHAIN. THE BLOCK IS NOW IMMUTABLE MAKING IT PERMANENT & UNCHANGEABLE, NEW BLOCK IS COPIED TO ALL NODES.

CHECK CONFIRMATION ON LEDGER
TRANSACTION COMPLETE

how does blockchain work?

Courtesy of Chainvine
Chinese “Mining farm”
Chains in chains: Theory

- Korpela, Hallikas & Dahlberg et al. 2017:
  - Suggests blockchain can help overcome some challenges in intra-business information sharing, however standards work remain

- Hofmann et al. 2017: Supply chain finance

- Babich & Hilary 2019: Blockchain will transform supply and operations management
Chains in Chains: Theory

Wüst & Gervais 2017: “Do you need a blockchain?”
Chains in Chains: Practice
Chains in Chains: Practice Pilots

- IBM supply chain pilots
- Provenance
- Modum.io
- ReLog
- IBM & Maersk blockchain pilot — many-to-many information sharing.

http://fortune.com/2016/10/19/walmart-ibm-blockchain-china-pork/
ReLog: Background – lack of transparency
Cabotagestudien

- Smartphone app: +600,000 position reports
- +4,000 volunteers
ReLog: Scan product/shelf to get transparency

1. Prepare pallets
2. Load
3. Unload
4. Cross docking
5. Load
6. Unload COOP

Iowa State University
## Pilot: Revelatory case study

<table>
<thead>
<tr>
<th></th>
<th>Role</th>
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<tbody>
<tr>
<td><strong>Retailer 1</strong></td>
<td>Head of logistics development</td>
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<td></td>
<td>Logistics developer</td>
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<td></td>
<td>Logistics CSR</td>
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<td>Head of transport purchasing</td>
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<tr>
<td><strong>Retailer 2</strong></td>
<td>Logistics developer</td>
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<td>Terminal manager</td>
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<td><strong>LSP 1</strong></td>
<td>Head of quality</td>
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<td></td>
<td>Logistics developer (2)</td>
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<td></td>
<td>Head of network planning</td>
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<td></td>
<td>Account manager</td>
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<tr>
<td><strong>LSP 2</strong></td>
<td>Integration analyst</td>
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<tr>
<td></td>
<td>Project manager (2)</td>
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<td><strong>LSP 3</strong></td>
<td>Account manager</td>
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<td><strong>Haulier association</strong></td>
<td>CEO</td>
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<td>Head of member relations</td>
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<td><strong>Environmental association</strong></td>
<td>Head of freight sustainability certification</td>
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<td><strong>Transport booking provider</strong></td>
<td>Head of enterprise customers</td>
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<td>Account manager</td>
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<td></td>
<td>Integration analysts (2)</td>
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<tr>
<td><strong>Municipalities</strong></td>
<td>Purchasing officers (2)</td>
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<td></td>
<td>Freight planner</td>
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<tr>
<td><strong>Technology provider</strong></td>
<td>Technology executive</td>
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<td></td>
<td>Nordic blockchain leader</td>
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<td></td>
<td>Lead architect</td>
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<tr>
<td><strong>Technology consultancy</strong></td>
<td>Technical architect</td>
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<td></td>
<td>Head of innovation</td>
</tr>
<tr>
<td></td>
<td>Technical project leader</td>
</tr>
</tbody>
</table>

- 3 years and 3 proof of concepts
  - Interviews
  - Project meetings
  - Testing
- Conceptual work
A new app could make road freight more sustainable…

New app makes the transport industry transparent

https://www.youtube.com/watch?v=nWVdg6KU1MI&t=3s
Themes evolving

- System integration
- Supply chain workers:
  - Privacy
  - Involvement – data entry
- Need for blockchains?
Blockchains for Coffee and chocolate

1. A created {chocolate: 210}
2. A created {coffee: 100}
3. A transferred [{coffee: 100}, {chocolate: 200}] to C
4. C aggregated [{coffee: 100}, {chocolate: 200}] to {shop_cage[{coffee: 100}, {chocolate: 200}]: 1}
5. C transferred {shop_cage[{coffee: 100}, {chocolate: 200}]: 1} to D
6. {shop_cage[{coffee: 100}, {chocolate: 200}]: 1} is not active (*delivered to destination*)
7. {coffee: 100} is not active
8. {chocolate: 200} is not active
The supply chain paradox of Blockchains in logistics

Blockchains will work when:

1. We can monitor the actual physical status and/or identity
2. Organizations are tightly coupled
3. Organizations are technologically advanced
[M]IOTA – the alternative?
Thank you!

Questions?
Henrik@iastate.edu

Do you need a blockchain?

perhaps
a permissionless blockchain might work

definitely
NO

Autonomous logistics: How do we create self-controlled deliveries of vegetables?
Unethical behaviour:
How can we stop the predatory truck towing of an occupied vehicle?

“This does not happen to cars, this does not happen to campers,” says Leander Richmond of the phenomenon of private-lot booting of trucks in which drivers are sleeping, most often during federally mandated rest periods, of course. With parking pressures exacerbated in some senses by the electronic logging device mandate, drivers’ willingness to utilize that last-resort spot on a given lot has in Richmond’s view brought the predatory-boot issue to the fore. He’s seen it in cases of his own 12 trucks’ drivers from time to time, with fees to remove the boot as high as $2,400 in the most egregious case.

But “let’s just call it what it is,” he says of such practices. “Stealing from truck drivers.” (Picture of Richmond above by Denise Marhoefer.)