Supply Chain 4.0 Points of View

Benoit Montreuil
Director, Supply Chain and Logistics and Physical Internet Institutes
ISeY at Georgia Tech

MODERATED BY
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Adjunct Prof, Va Tech
Global Perf Excellence Webinars
Team Lead, IISE

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Author of Digital Supply Networks
ISE at West Virginia University

Webinars that Matter in Times of Turblence
25 January 2021
11:00  Scott Tee up
11:05  Benoit
11:20  Thorsten
11:35  Q&A
11:55  Close-out and Next Steps
Thank You to Our Sponsors and Partners

Our Sponsor for Today

IISE Professional Affinity Groups (Partners)
Our Global Personal and Professional Development Series for IISE Members and Customers……

THEMES:

- Enterprise Transformation and OpEx
- Operational Analytics
- Cultures to support Perf Excellence
- Integration of People, Strategy, Process and Technology
- Integrated Lean Sigma
- Industry, Service, Healthcare 4.0
- Personal and Professional Learning and Development
- Change Leadership and Management
- Navigating through Turbulent (VUCA) times
- Supply Chain and Logistics Optionality
Performance Excellence

Supply Chain 4.0 Related

- Benchmarking Industry: How to Engineer Performance Excellence
- Pioneering and Engineering a New World
- Risk Management and Resilience Engineering Strategies for Supply Chains
- Business Continuity Strategies and Tactics in Periods of Major Disruption
- Smart Supply Chains and Industry 4.0
- Restarting the Economy: Guidance on the Backside of the Disruption
- Rapid (AGILE) Deployment and Execution of Integrated Systems Engineering Principles and Methods in Times of Major Disruption
- Creating Cultures that Support Full Potential Performance/Operational Excellence

• Benchmarking Industry: How to Engineer Performance Excellence
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This Link gets you to these great Archived Webinars in our Virtual Learning Library

A webinar recording will be edited and made available on the IISE Website within a week.

The Presentation will also be available on the IISE website and shared in the thank you e-mail the day after the webinar to those who attended.

Questions? Scott will review them as they come in and integrate into the dialogue as appropriate and time permits.

Follow up questions are welcomed and contact information is provided at the end of the presentation.

And, the Recording and Presentation pdf will be available on IISE's website for IISE members shortly after the webinar date—Training/Webinars/Performance Excellence.

Certificates of attendance are mailed 1 day after the webinar is completed.


Membership Has Privileges!!
ISE’s Create Value by Integrating People, Strategy, Process and Technology

IN SERVICE SYSTEMS

Enhancing the way you think and plan

Strategy
Organizational Alignment
Trust/Values
Technology
Leveraging hyper-connectivity and the full power of IT Enablement

Changing the way we exchange value with our employees and manage our culture.

Performance Excellence

What we do and how we do what we do.
SC4.0 represents huge opportunity for ISE’s

IISE Body of Knowledge

1. Work Design & Measurement
2. Operations Research & Analysis
3. Engineering Economic Analysis
4. Facilities Engineering & Energy Management
5. Quality & Reliability Engineering
6. Ergonomics & Human Factors
7. Operations Engineering & Management
8. Supply Chain Management
10. Safety
11. Information Engineering
12. Design & Manufacturing Engineering
13. Product Design & Development
14. System Design & Engineering

How does the ISE Body of Knowledge and Skills translate to the unmet and unfulfilled needs of Small and Medium Sized Enterprises? Let’s explore that....
Agenda & Panel Questions

11:00  Scott Tee up

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The Physical Internet
Enabling the Supply Chain 4.0 Era

Professor Benoit Montreuil

Coca-Cola Chair in Material Handling and Distribution
Physical Internet Center
Supply Chain & Logistics Institute
H. Milton Stewart School of Industrial & Systems Engineering
Georgia Institute of Technology

Industrial & Systems Engineering Council
Supply Chain 4.0: Innovative Concepts and Methods Driving Transformation Panel, 2021/01/18
Worldwide Grand Challenge Driving Toward Next-Generation Supply Chains, Logistics & Transportation

To improve by an order of magnitude the economical, environmental and societal capability, efficiency, resilience, and sustainability of fulfilling humanity’s needs for physical object services

Induced cost reduction
Price reduction
Disruption & crisis risk reduction
Business opportunity
Economic development opportunity

Reduction of
Greenhouse gas emissions
Energy consumption
Waste, Pollution
Traffic & Congestion
Impact of disasters & climate change

Improved
Quality of life
Goods accessibility
Faster more precise delivery
Novel service capabilities
Persistence to pandemics

COVID-19 Pandemic is providing a vibrant worldwide illustration of this challenge!
Internet Metaphor Inspiring, Guiding, and Steering Toward Supply Chains & Logistics Meeting the Grand Challenge

Building a Physical Internet dealing with material objects (goods, food, etc.) Learning from, yet not mimicking, the Digital Internet dealing with informational objects

Physical Internet Manifesto

Transforming the way physical objects are moved, stored, realized, supplied and used, aiming towards greater efficiency and sustainability

Professor Benoit Montreuil
Canada Research Chair in Enterprise Engineering
CFREI Interuniversity Research Center
on Enterprise Networks, Logistics and Transportation
Laval University, Québec, Canada


Montreuil B. (2009-2012). Physical Internet Manifesto: Globally Transforming the way physical objects are handled, moved, stored, realized, supplied and used, versions 1.1 to 1.11, www.physicalinternetinitiative.org


Rethinking the Global Supply Chain

Science Magazine
June 6, 2014
Physical Internet (PI, p)

Hyperconnected global logistics system enabling seamless open asset sharing and flow consolidation through standardized encapsulation, modularization, protocols and interfaces to improve the capability, efficiency and sustainability of serving humanity’s demand for physical objects.

Hyperconnected: Components and actors intensely interconnected on multiple layers, ultimately anytime, anywhere

Interconnectivity layers: digital, physical, operational, business, legal and personal

Definition by B. Montreuil, International Physical Internet Conference, Keynote Presentation, July 2015; Image source: clydeathbone.com
Toward Hyperconnected E-Commerce & Omnichannel Supply Chains
Open Asset Sharing & Flow Consolidation Essential to Sustainably Meet Expectations

Expected Convenient and Reliable Delivery or Pickup with Minutes, Hours, maybe a few Days
With Minimal Stock Smartly Flowed and Deployed Between Suppliers and Customers

Physical Internet Building Blocks

Enabling Efficient, Sustainable, Smart, Agile, Adaptable, Scalable, Resilient, Hyperconnected Supply Chains

- Certified Open Logistics Service Providers
- Smart Data-Driven AI, Analytics, Optimization & Simulation
- Open Logistics Decisional & Transactional Platforms
- Global Logistics Monitoring System
- Certified Open Logistics Facilities and Ways
- Standard Logistics Protocols
- Containerized Logistics Equipment and Technology
- Unified Set of Standard Modular Logistics Containers
Towards Cloud-Based Digital Supply Chain Interconnectivity Platforms

Seamless, Trustworthy, Ubiquitous Monitoring, Traceability & Transactions

Simple Links
Exploitation of industry-wide supply chain monitoring concepts from Consumer Forum Group

Internet-of-Things
Widespread exploitation of smart connected devices, and of sensor-actuator networks

BlockChain
Exploitation of emerging distributed ledger technology for SC trust insuring platform

Marketplace + Platforms
Match, orchestrate & optimize supply & demand for fast, seamless & fair contracts

Transparency, tracking, traceability, smart contracts and distributed routing
Hyperconnected Distribution & Fulfillment: Current Large-Scale Models

Dynamically deploying products for rapid on-demand fulfillment
Exploiting Physical Internet principles, Beyond client dedicated facilities and services

Shared Distribution Centers
Amicolo, ES3.com
Openly shared manual or automated DC
Multi-manufacturer: full load inbound
Multi-retailer full load outbound
Enables Direct-to-store
Medium-to-Long-Term Commitment
From 1 center to 100+ DC network

On-Demand Storage Marketplaces
FLEXE.com
On-Demand Warehousing
Asset-free platform
Multi-warehouse, Multi-User
AirBnB-like shared economy model
Pay-per-Use

Fulfillment Web Services
Darkstore, Fulfillment-By-Amazon
First Open Large-Scale Asset-Based Storage and Fulfillment Service Provider
Asset-Intensive: US fulfillment center network
Open to any vendor, selling or not on Amazon
Inspired by Amazon’s huge success in cloud storage
Hyperconnected Supply Chains
Supporting Live, Multi-Party, Multi-Agent Protocols, Predictions & Decisions

Enabled by Analytics, AI, Data Science, Digital Twins, Heuristics, Machine Learning, Optimization, Simulation
Enabling Logistics Service Providers to Thrive in Hyperconnectivity Through Data-Driven, Analytics-Based Capacity Management

Automated Logistics Hubs and Warehousing Centers

- Develop Facility Concepts, Leveraging Leading-Edge Paradigms, Smart Technologies, Automation & Robotization
- Develop Facilities Design Methodologies and Optimization Models
- Develop Large-Scale Agent-Oriented Discrete-Events Simulation and Emulation Capabilities, Toward Digital Twins
- Develop Alternative Multi-Agent Decision Architectures, Decision Optimization, Heuristic, Protocols for each Agent
- Perform Rigorous Experimental Assessments of alternative Facility Concepts, Designs, and Decision Architectures
Hyperconnected Logistics Infrastructure

- Energy Infrastructure: Smart Grid, Fuel & Charging Distribution
- Transportation Infrastructure: Roads, Ports, Airways, Railways, ...
  - Autonomous Mobility
- Information & Communications Infrastructure: Digital Internet, Internet-of-Things
European Roadmap to Fully Mature Physical Internet

System Level Functionality
- Pooling and Alliances
- Sectorial, regional, seamless vertical integration
- Multimodal, multi-tier vertical integration
- Vertical inter-network connectivity
- Horizontal inter-network connectivity
- Complete PI functionality and connection capability

Access and Adoption
- Scattered and unbalanced terms, rules, standards and regulations
- Regulations and governance for existing asset-sharing platforms
- Harmonized terms and rules for vertically integrated intermodal networks
- Asset-sharing and competition rules in horizontally integrated networks
- Governance processes and bodies for open global PI network

Governance
- Rise of booking platforms
- Operational synchronomodality
- Multiple shipment join/split
- Sense and respond capabilities for network flows
- Fully autonomous PI network services and operations

PI Network Services
- Non-standardized transshipment hubs
- Hub service offering PI-like (I/O)
- Automated node service request and response
- Nodes interconnect across networks
- Autonomous PI node services

PI Nodes
- 2015-2020
- 2020-2025
- 2025-2030
- 2030-2035
- 2035-2040

Physical Internet Journey Leadership Grows in China and Japan

Keynote videos available online

The Physical Internet: Shaping a Global Hyperconnected Logistics Infrastructure

Professor Benoit Montreuil
Coca-Cola Chair in Material Handling and Distribution
Physical Internet Center
Supply Chain & Logistics Institute
H. Milton Stewart School of Industrial & Systems Engineering
Georgia Institute of Technology
IPIC 2020, International Physical Internet Conference, Shenzhen, China 2020/11/18

The Physical Internet: Origin, Progress, and Projection

Professor Benoit Montreuil
Coca-Cola Chair in Material Handling and Distribution
Physical Internet Center
Supply Chain & Logistics Institute
H. Milton Stewart School of Industrial & Systems Engineering
Georgia Institute of Technology
Physical Internet Symposium 2021, Tokyo, Japan 2021/01/21
Towards Enabling/Exploiting the Physical Internet: Impact Synopsis

Efficiency, Sustainability, Capabilities and Competitiveness

Enables competitiveness improvement of smart hyperconnected businesses, industries and territories

Exploiting and/or enabling PI

Enables order-of-magnitude capability improvement of businesses, industries and territories

Ex: omnichannel, responsiveness, synchromodality, agility, scalability, trustability

Enables across-the-board order-of-magnitude Improvement of economic, environmental & societal efficiency, resilience & sustainability

Improving the playing field across territories, industries and businesses worldwide
Thanks!

Questions, comments, feedback, suggestions are most welcome

Professor Benoit Montreuil

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Director, Supply Chain & Logistics Institute
Director, Physical Internet Center
H. Milton Stewart School of Industrial and Systems Engineering
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Atlanta, Ga, U.S.A.

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11:00  Scott Tee up
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Resilient Digital Supply Networks

*Transform your SC with disruptive technologies & reimagined processes*

**IIE webinar – Supply Chain 4.0**

January 25, 2021

Morgantown, WV
COVID-19 exposed fragile global Supply Chains

...and reinforced the call for more resiliency across the board!


Dr. Thorsten Wuest
thwuest@mail.wvu.edu
Companies and Supply Chains need to evolve and embrace the digital transformation
Agenda

1. Introduction
2. From SCM to DSN
3. Resilient Digital Supply Networks
4. Key capabilities & playbook
5. Reflections
Dr. Thorsten Wuest

- Director of Smart Manufacturing Lab at West Virginia University
- J. Wayne & Kathy Richards Faculty Fellow
- One of SME’s 20 most influential professors in Smart Manufacturing (2020)
- WVU Statler Outstanding Teacher of the Year 2019
- Research funded by industry, DOE, NIST, etc.
- Research focus: AI/ML in Manufacturing, Smart Manufacturing / Industry 4.0, Hybrid Analytics, PLM, Product Service Systems

www.thorstenwuest.com
“An important and timely subject that most companies are grappling with!”

Yossi Sheffi, Director, MIT Center for Transportation & Logistics, MIT

“[…] excellent source to understand both the components and overarching framework for the digital transformation of the extended enterprise. With COVID-19 driving the future of resilient supply chain design and execution, this book provides practical guidance.”

Stephan Biller, PhD, VP Watson IoT & Chief Innovation Officer, IBM

“The COVID-19 pandemic shows us that in times of increasing complexity and speed, we depend on transparency, fast reaction, or even prediction to reduce the vulnerability of our entirely globalized supply chains. […] This book provides helpful insights, explaining more technical details in a digestible manner.”

Stefan Waskow, Partner, Volkswagen Consulting

“Exciting times ahead—the digital transformation will unlock new opportunities and hence needs to be the key strategic topic for organizations. A fascinating read for executives who intend to drive the digital journey using the emerging technologies.”

Diana Volks, Head of Supply Chain Management, Bayer

www.digitalsupplynetwork.com
The traditional view on SCM

Supply Chain Management (SCM) Process

1. Develop
2. Plan
3. Source
4. Make
5. Deliver
6. Return

Supply Chain Management (SCM) Flow

Material Flow:
- Supplier
- Information
- Plant
- Information
- Distribution Center
- Information
- Customer

Money Flow:
- Supplier
- Information
- Plant
- Information
- Distribution Center
- Information
- Customer


Dr. Thorsten Wuest
thwuest@mail.wvu.edu
From SCM to Digital Supply Networks

Develop → Plan → Source → Make → Deliver → Return

Digital core

- Synchronized planning
- Connected customer
- Dynamic fulfillment
- Digital development
- Intelligent supply
- Smart factory


Dr. Thorsten Wuest
thwuest@mail.wvu.edu
Digital Supply Networks

- Transition from sequential SC processes to network structure build around **capabilities**
- Focused on **customer** - fulfilling requirements and demand
- Embraces disruptive **digital technologies**
- **Digital core** at the center to connect nodes
- **NOT** a technology implementation framework!
- Aims at critically assessing status quo and developing a **strategic vision** and implementation roadmap

Companies with Digital Core
Mitigating SC & Manuf impact of COVID-19 with AI

Digital transformation looks different across DSNs

industry
digital supply network
company
factory
manufacturing system
machine tool
part

## Key DSN capabilities

<table>
<thead>
<tr>
<th>Digital Development</th>
<th>Synchronized Planning</th>
<th>Intelligent Supply</th>
<th>Smart Factory</th>
<th>Dynamic Fulfillment</th>
<th>Connected Customer</th>
</tr>
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<tbody>
<tr>
<td>Optimize product lifecycle management with advanced digital tactics</td>
<td>Provide significant efficiencies through synchronization</td>
<td>Reduce costs through new advanced technologies, models, and capabilities</td>
<td>Unlock new efficiencies by a more connected, agile, and proactive factory</td>
<td>Boost customer service through new levels of speed and agility</td>
<td>Create seamless customer, engagement from inspiration to service</td>
</tr>
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Business Strategy and Digital Supply Networks

Digital Supply Networks Strategy

What are our vision, goals and aspirations?
- Purpose
- Financial objectives
- Nonfinancial objectives

Where will we play?
- Customers
- Products
- Geography
- Channels

How will we win?
- Value proposition to customers
- Sources of defensible advantage
- Profit model(s)
- Partnerships
- Constituent engagement

How will we configure?
- Distinctive capabilities
- Enabling organizational system

How will you design the supply network?
Segmentation by customer, product, geography, or channel? Partners & competitors?

Where will you compete on?

Where do you need to transform your supply networks to meet your strategic business objectives?

How will you deploy and execute your DSN strategy?

What priority initiatives?
- Tactics
- Investments
- M&A / Partnerships
- Change Program


Dr. Thorsten Wuest
thwuest@mail.wvu.edu
DSN Strategy

Supply network strategy.

Technology capability.

DSN strategy

Key messages of today’s talk

COVID-19 exposed fragile SCs, yet underlying issues precede pandemic

Reshoring does not solve the issues

Agility, resiliency, and visibility are key moving forward

Companies with digital core and mindset have advantage

Investing in technology for technology’s sake is doomed to fail

Align DSN strategic with your business strategy / objectives

This is not optional!

Dr. Thorsten Wuest
thwuest@mail.wvu.edu
Thank You!
… And order our book ;-)
ISE’s CAN/DO Create Value by Integrating People, Strategy, Process and Technology

In Supply Chains as they migrate towards 4.0 and beyond

The Q&A focused on these questions:

1. How do you build migration plans?
2. What are the keys to going from Good 2 Great with Supply Chain and Logistics?
3. What are the pragmatic first steps?
4. How does this represent a great opportunity for ISE’s? What do ISE’s need to get skillful at to contribute to this type of transformation?
Customer and Member Satisfaction and Feedback Survey

Supply Chain 4.0

You can download the deck (handouts)
You will receive an e-mail tomorrow with link to recording.
You can go to this IISE link soon and get deck and recording.

Quarter 1 Webinar Program/Lineup is a WOW!!!

Feb 2: Industry Benchmarking: Operational Excellence Best Practices
Registration URL https://attendee.gotowebinar.com/register/8999875819356527883

Feb 16: Operational Analytics: IISE’s new Certificate Opportunity for you
Registration URL https://attendee.gotowebinar.com/register/8785162089172971787

Mar 9: Data Sciences Overview—Strategy, People, Process and Technology (AI/ML/Decision Sciences/Benefits Realization)
Registration URL https://attendee.gotowebinar.com/register/8255002871166158605

Mar 18: Using Control Towers to Integrate your Digital Supply Network OR Using Control Towers to Digitize your Supply Chain
Registration URL https://attendee.gotowebinar.com/register/7872822524972939276

April 1: A Big Interview with John Webb—the art of Personal and Professional Mastery
Registration URL https://attendee.gotowebinar.com/register/5274860167335450892
IISE’s Annual Conference

Membership Has Privileges—Consider joining IISE?

https://www.iise.org/Details/?id=560
over 850 professionals, academicians, students attended our most recent Virtual Annual Conference.

We envision over 2000 at next year’s Virtual Annual IISE Conference.

No Travel, lower registration fees, pick and choose live sessions, have access to session recordings and presentations for up to a year!

Virtual Networking worked great!!

Can purchase access to our library of sessions from the conference even if you did not get a chance to attend.

Sampling of Sessions on next slide
Sampling of Sessions just from the Performance Excellence Track for May 2021

Industry Best Practices Virtual Benchmarking:
- Healthcare
- ISE Consulting
- ISE in Small and Medium Size Enterprises
- ISE Deployments in Large Enterprises
- Simulation to accelerate Benefits Realization

Industry 4.0, Smart Factories
Operational Analytics
Strategies for Designing and Executing Disruptive Innovation

Very difficult to get this kind of compressed learning at the price of registration anywhere, so please consider our upcoming Conference and Track.
Thank You!

An e-mail tomorrow from Go2Webinar will provide a link to the recording and you can also access the presentation and recording on the IISE website.


Contact us for More Info or to provide feedback:

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