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WHITE PAPER

THE SECOND INTERNATIONAL PHARMA LOGISTICS MASTERCLASS

WHERE BUSINESS MEETS ACADEMICS

5 - 9 September 2022, Abu Dhabi

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Executive Summary

The Second Pharma Logistics Masterclass was organised by Pharma.Aero, the University of Antwerp, Khalifa University and California State University, Longbeach, together with the Hope Consortium in Abu Dhabi, United Arab Emirates, and supported by the Belgian Embassy. The curriculum of the 5-day program was built on the major takeaways of the first edition organised at the University of Antwerp, Belgium, in 2021.

Based on a Memorandum of Understanding signed in November 2021, international experts from academic and business partners teamed up to create a comprehensive and relevant program highlighting the most critical aspects of pharma logistics. By all means, it had to highlight the need for detailed interdisciplinary and cross-sectional collaboration. It has become clear that after the Covid pandemic hit the world, collaboration between stakeholders, industries, and worlds had become a crucial enabler to successfully face a global crisis.

Five major aspects of Pharma Logistics were highlighted and further explored:

- Data as a value driver
- Setting a future supply chain strategy through economic modelling
- How Innovative Packaging and Cool Chain Innovation will support the future healthcare model when the exception turns into the standard
- Emergency and crisis pharma logistics, and
- Sustainable pharma supply chain models: how transport modes interweave

Through the 5 days of presentations, intertwined with interactive sessions and workshops, the Masterclass concluded its major takeaways, heading toward the need to create a future pharma logistics ecosystem. It became clear that we cannot think any longer linearly from point A to point B, but that different transport modes should be orchestrated in a bigger "always-on" supply chain, shaping the future healthcare logistics ecosystem.

Prof. Dr. Roel Gevaers
Chair
University of Antwerp

Dr. Omar Najim
Adviser local committee
UAE Government

Mr. Frank Van Gelder
Co-chair
Pharma.Aero

Organizing Committee

Scientific Committee:

Prof. Dr. Roel Gevaers (chair)
Prof. Dr. Ernesto Damiani (co-chair)
Dr. Sven Buyle
Prof. Dr. Wouter Dewulf
Prof. Dr. Christa Sys
Prof. Dr. Tom O' Brien

Business Committee:

Mr. Frank Van Gelder (co-chair)
Mr. Trevor Caswell
Dr. Omar Najim
Mr. Fabrice Panza
Mr. Robert Sutton

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Day 1

Program Overview

Data as a Value Driver for the Future Pharma Supply Chain

08:00 – 09:00	**Registration**
09:00 – 09:30	**Welcome Address by the Captain and the Co-pilots** **Flight Plan of the Masterclass** *Co-Chair: Prof. Dr. Roel Gevaers, University of Antwerp* *Co-Chair: Prof. Dr. Ernesto Damiani, Khalifa University* *Co-Chair: Mr. Frank Van Gelder, Secretary General Pharma.Aero*
09:30 – 10:15	**The Power of Mega Cargo Loads of Data: Impact on the Future Pharma Supply Chain Data Models and Analytics** *Prof. Dr. Ernesto Damiani, Khalifa University*
10:15 – 10:45	**When Machines Start to Think Human: The Power and Capabilities of Artificial Intelligence in Pharma Supply Chain** *Mrs. Céline Guyomard, Chief Technical Officer, Lainpharma*
10:45 – 11:15	**Coffee Break & Networking**
11:15 – 12:00	**Connecting the Data Dots of The End-To-End Pharma Supply Chain Routing:** **Use Cases and Data Command Tower** *Prof. Dr. Ernesto Damiani, Khalifa University* *Mr. Andre Verdier, Managing Director Middle East of Blue Yonder*
12:00 – 12:30	**Flying without a Risk: How Data Analytics Enlarge your Comfort Zone to Ship Pharmaceuticals** *Prof. Dr. Yvonne Ziegler, CEO Mytigate*
12:30 – 14:30	**Lunch Break with Alternating Visits to the Khalifa University Drone and Robotics Lab** *Dr. Yahya Zweiri, Khalifa Innovation Center, Khalifa University*
14:30 – 15:00	**Data Control Dashboard for Real-Time Monitoring of the Cold Chain: Use Cases for Storage of High-Value Medications and Pharmaceutical Products in Remote Areas** *Mr. Jesal Doshi, CEO, B Medical Systems*
15:00 – 17:00	**Workshop (Digital Twinning) Light in The Black Box: How Big Data Analytics Create Pharma Supply Chain Predictability (Coffee Break Included)** *Moderator: Mrs. Céline Guyomard, Chief Technical Officer, Lainpharma* *Mr. Andre Verdier, Managing Director Middle East of Blue Yonder* *Mr. Stefan Braun, Managing Director, SmartCAE*
17:00 – 17:30	**Wrap up: Pharma Greenlane - The Impact of Digitization on Sustainability** *Prof. Dr. Ernesto Damiani, Khalifa University* *Mrs. Céline Crahay, Managing Director, 3CeL*
18:00 – 20:30	**Welcome Reception Supported by the Belgian Embassy at the Belgian Ambassador Residence**

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DAY 1

The first presentation by Prof. Ernesto Damiani included:

- The specificity of Pharma Supply Chains (PSCs)
- Some key challenges
- What can AI-ML do for PSC?
- A data-driven approach
- Data collection and processing on the cloud continuum
- AI-ML pipelines, risks, and resilience
- Conclusions

Prof. Damiani spoke also about some Novel intelligent instrumentation:

- Control towers
- Hubs of information for supply chains, collecting real-time data from different sources, adding it to datasets, and providing a readable view of events to operators. This includes information related to temperature and travel conditions as well as location and information provided by couriers.
- Intelligent packages
- Secure packaging plays a crucial role in protecting the integrity of a drug product and facilitating authentication. This has become especially important since the Covid-19 pandemic due to the increased numbers of vaccines and other medications being shipped all over the world. Automating the process makes a multiproduct packaging operation faster and easier to manage and reduces the possibility of errors and forgeries. Intelligent and robust packaging may impact sustainability.
- Augmented reality
- AR overlays digital information onto real-world elements via a pair of 3D glasses or goggles. When scanning packages or important regulatory information for the destination country, it gives operators relevant information, such as transportation instructions.
- Digital twins
- Creating virtual replicas or "twins" of medical devices can then be introduced to clinicians using virtual reality while equipping them with the skills they need to ensure they can use them effectively.

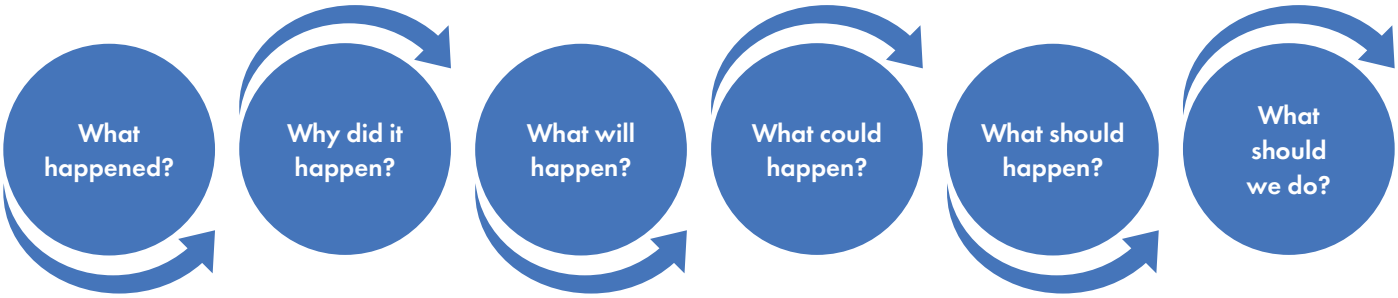
Céline Guyomard (Lainpharma): *"When Machine Start to Think Human: The Power and Capabilities of Artificial Intelligence in Pharma Supply Chain"*

André N. Verdier (Blue Yonder): *"Real-time Visibility & Orchestration - Connecting the Data Dots of The End-To-End Pharma Supply Chain Routing: Use Cases and Data Command Tower"*

The presentation demonstrated a good architecture of a Control tower, the key tenets are:

- **See and Anticipate** – Near real-time visibility to events and predicted impact.
- **Understand the Impact** – Identify what changes will drive exceptions.
- **Act on it** – Intelligent response framework, perform simulation and response (what if analysis)
- **Learn from it** – Continually learn, sense, respond, become more predictive, and identify opportunities to optimise the supply chain.

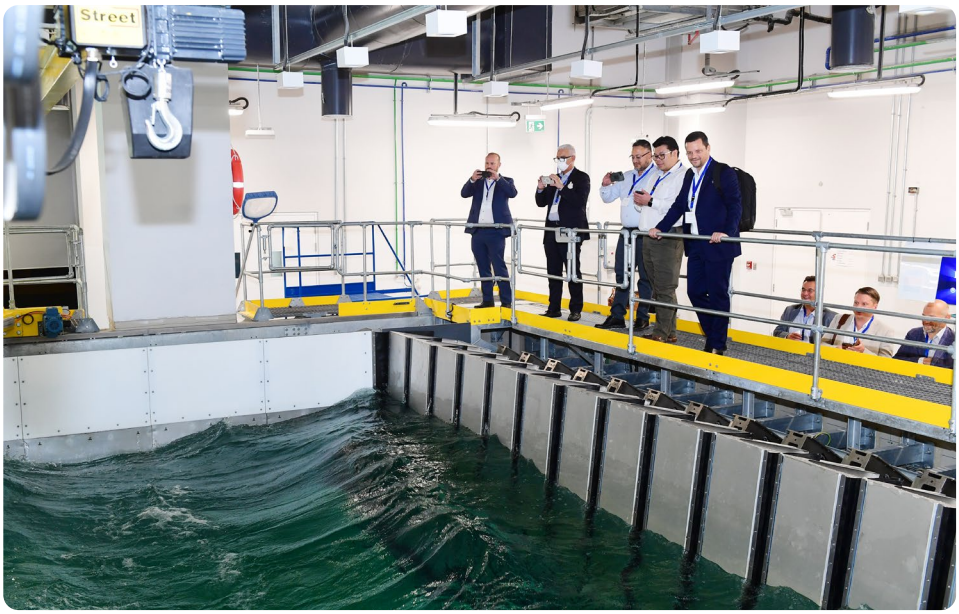
Additionally, a series of questions need to be answered to get a holistic view of the situation:



Prof. Dr. Yvonne Ziegler (Mytigate) :*"Flying without a Risk: How Data Analytics Enlarge your Comfort Zone to Ship Pharmaceuticals"*

B Medical Systems: *"Dashboards for real-time monitoring of medical cold chain"*

DAY 1



DAY 1

Main Takeaways of Day 1

- The need for a better digital mindset induces increased data quality which drives the necessary basics for predictive data models.
- Supply chain data can drive human behaviour analytics.
- Need for a digital twinning model to strengthen predictive analysis and decision-making policies.
- Machines can be trained, but human input for decisions will be needed. Digital training is critical to success.
- Focus on the classic supply chain needs to change to a full ecosystem model to include all flows.
- Meaningful insights into real-time data availability, data utilisation, and data resilience
- Opportunity to convert underutilised available data to real-life solutions.
- Mixed perceptions on the relationship between the role of humans, AI, and ML
- Classification and composition of data tower and its applications
- Understanding the principles of digital twins and their applications.

DAY 2

Program Overview

Setting your Future Supply Chain Strategy by Economic Modelling

09:00 – 11:30 **Visit to the Abu Dhabi Airport Cargo (ADAC) Facility**
Mr. Fabrice Panza, Manager Global Cool Chain Solutions, Etihad Cargo
How Evidence-Based Research Can Empower Business Development and How Business Can Create New Research Opportunities: Research-Based Commercial Value Creation
Prof. Dr. Wouter Dewulf, Faculty of Business and Economics, University of Antwerp
Mr. Frank Van Gelder, Secretary General Pharma Aero

12:00 – 13:00 **Lunch Break & Networking**

13:00 – 14:30 **When Strategic Data Like to Drive Your Entrepreneurship: Multi-Modal Evidence-Based Business Forecast**
Dr. Sven Buyle, Faculty of Business and Economics, University of Antwerp
Prof. Dr. Tom O'Brien, California State University Long Beach, Centre for International Trade and Transportation METRANS Transportation Consortium

14:30 – 15:00 **Innovation, the Enabling Key to a Resilient End-To-End Pharma Supply Chain, Robust Enough for the Future Challenges**
Mr. Nicholas Diemont, Director, Business Change Management, Middle East & Africa, DSV

15:00 – 15:30 **Coffee Break & Networking**

15:30 – 16.15 **The Pharma.Aero Membership 500 Seconds Rapid Fire Cases: How to Translate Supply Chain Strategy Vision into Motion**
ANA Cargo: Mr. Kazuya Imaoka and Ms. Satomi Yaegashi, Global Marketing, Products & Services
DFW Airport: Mr. Milton De La Paz, VP of Airline Relations, and Cargo Business Development
Changi Airport Group: Mr. Yue Ming, Cargo & Logistics Development

16:15 – 17:30 **Workshop - "Less is More": How to Develop Agile Strategies in the Pharma Supply Chain Organisation**
Prof. Dr. Wouter Dewulf, Faculty of Business and Economics, University of Antwerp
Prof. Dr. Koen Vandenbempt, Faculty of Business and Economics, University of Antwerp

17:30 – 17.45 **Wrap-up: The Future Pharma Supply Chain Economic Models Including Circular Economy**
Prof. Dr. Roel Gevaers, University of Antwerp
Mrs. Céline Crahay, Managing Director, 3CeL

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DAY 2

Day 2 started with a visit to the Airport of Abu Dhabi for a sneak peek at the soon-to-be-inaugurated pharmaceutical cool chain hub of Etihad Cargo.

The afternoon's program of presentations kicked off with a joint presentation by Prof. Dr. Tom 'O Brien and Dr. Sven Buyle: *"When Strategic Data Like to Drive Your Entrepreneurship: Multi-Modal Evidence-Based Business Forecast"*.

The key takeaways and main focuses:

- No size fits all, not one method fits all circumstances.
- How to capture regulatory issues, war pandemics, etc.?
- Forecasting at the nodal, modal, or sector level is easier, but supply chains are evolving towards multimodal systems.
- Maritime component of the supply chain is the least predictable and least transparent.
- Keep it simple! There is no need for a complex model if it doesn't perform better than a simple model.
- The importance of the time horizon
- Forecasting should be embedded in the enterprise.

DVS delivered the second presentation: *"Innovation, the Enabling Key to a Resilient End-To-End Pharma Supply Chain, Robust Enough for the Future Challenges"*, and followed by three industry insights offered by Changi Airport, ANA Cargo and Dallas Fort Worth Airport.

The day closed with a very interactive workshop conducted by Prof. Koen Vandenbempt: *Less is More (?): How to develop Agile Strategies in the Pharma Supply Chain Organization*

DAY 2

Main Takeaways of Day 2

- Strong statements from the industry should be sustained by reliable research to avoid commercial slogans.
- Data supplied by the industry can help to build bridges between academics and the industry and to enable useful and applicable research.
- Forecasting is a very useful and mandatory tool for long-term budgeting and production planning, however, not the Holy Grail.
- To make the supply chain more resilient, the industry needs to make strategic supply chain planning, leverage data, diversify the supply and manufacturing chain and manage the inventory and capacity buffers.
- The student 'products' delivered by the traditional university educational system are not always adapted to the needs of the industry.
- Internships, joint projects, and joint workshops can help to build bridges between the universities and industry.
- Cargo strategy development is back on the board tables at both airports and airlines.
- 'Adaptive innovation', the zone where companies are imagining and creating, is the non-comfort zone for many companies, however, the place to be.
- 'Busy-ness' is often the magnet that pushes organisations into the 'business-as-usual' zone.
- Organisations should be more curious by observing and associating with other industries, questioning the current organisational model, experimenting, and building bridges internally and externally.
- Sustainability is a typical topic that takes place in the 'adaptive innovation' zone of the organisational set-up, where imagination and creativity are needed to make step changes and have a long-term impact.

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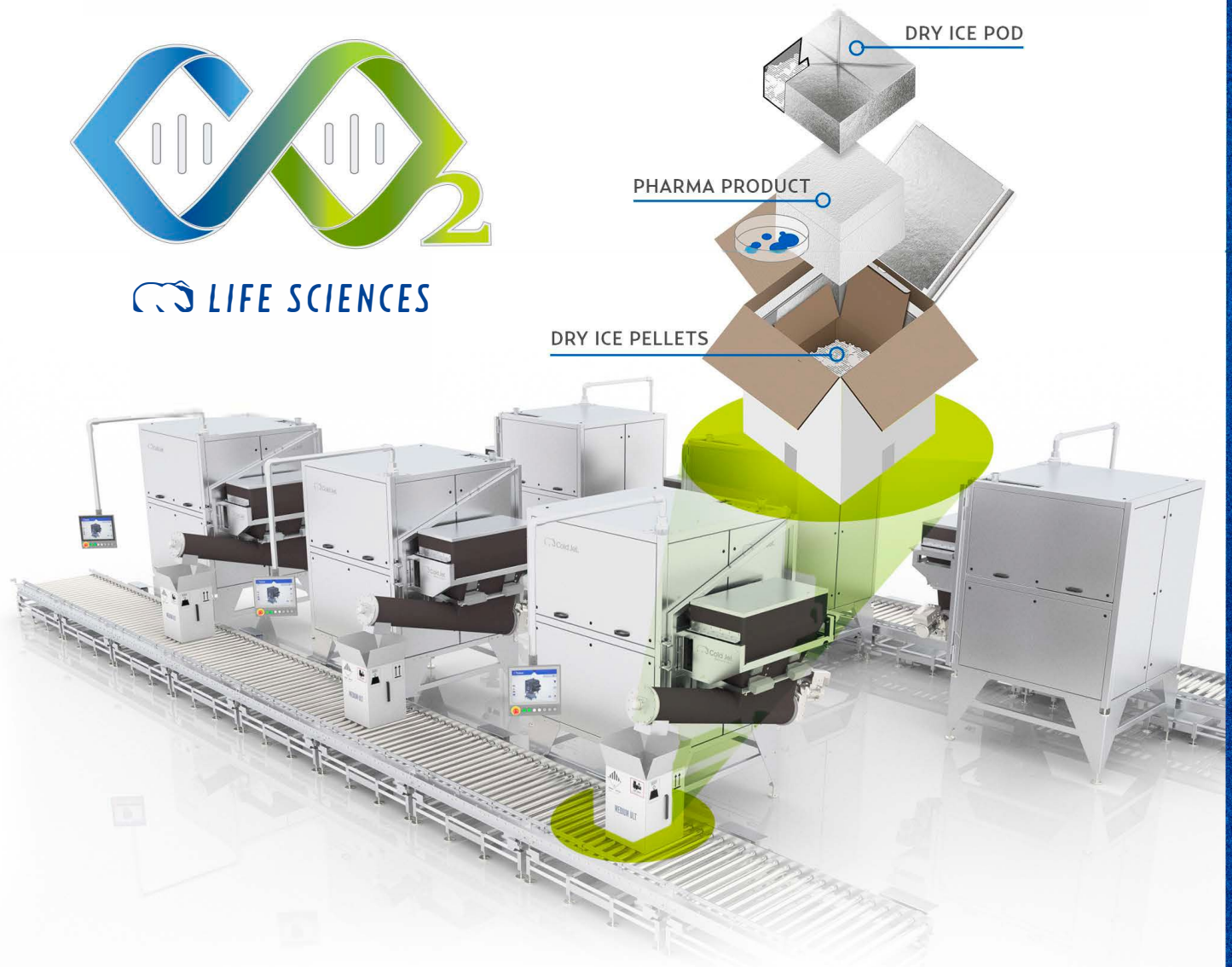

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DAY 2


SECOND EDITION
PHARMA LOGISTICS
MASTERCLASS
5 - 9 SEPTEMBER 2022 - ABU DHABI
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DAY 3

Program Overview

Pack and Go: How Innovative Packaging and Cool Chain Innovation will Support the Future Healthcare Model

09:00 – 09:45 **Setting the Scene: Wake-Up Call for Integrated Full End-To-End Visibility Supply in a Changed Healthcare Model**
Mr. Frank Van Gelder, Secretary General, Pharma.Aero
Mr. Hicham Mirghani, Director Corporate Affairs, AstraZeneca, UAE

09:45 – 10:15 **Emerging Pharma Logistics Security via IoT Networks**
Prof. Dr. Chan Yeob Yeun, Khalifa University

10:15 – 10:45 **Coffee Break & Networking**

10:45 – 11:15 **Back to the Future: Evidence-Based Business Model Change in Dry Ice Use (Industry Use Cases)**
Mr. Diego Loaiza Salazar, Director - Global DIMS Applications, Cold Jet
Mr. Naeem Bagwan, Ph.D. Researcher, University of Antwerp

11:15 – 11:45 **Cool Chain Challenges for the Last-Mile Deliveries: Stay Cool and Stable until the Vein**
Prof. Dr. Roel Gevaers, Faculty of Business and Economics, University of Antwerp

11:45 – 12:15 **Introduction to Future Packaging: Can we Cool, Wrap and Pack in a More Innovative Way**
Mr. Kristian Williams, Senior Director of Sales – EMEA, and APAC, Cold Chain Technologies

12:15 – 13:45 **Lunch Workshop: Create an Innovative Packing Solution End-To-End**
B Medical Systems
Cold Chain Technologies
Cold Jet
Khalifa University
Pharma.Aero
va-Q-tec

13:45 – 14:15 **Wrap up: Sustainability Challenges in Future Packaging and Cold Chain Technologies**
Mr. Christopher J. Storch, Global Head of Sales, va-Q-tec

15:00 – 18:00 **AD Ports Logistics' Headquarters / Centre of Genomics and System Biology & Masdar City**

DAY 3

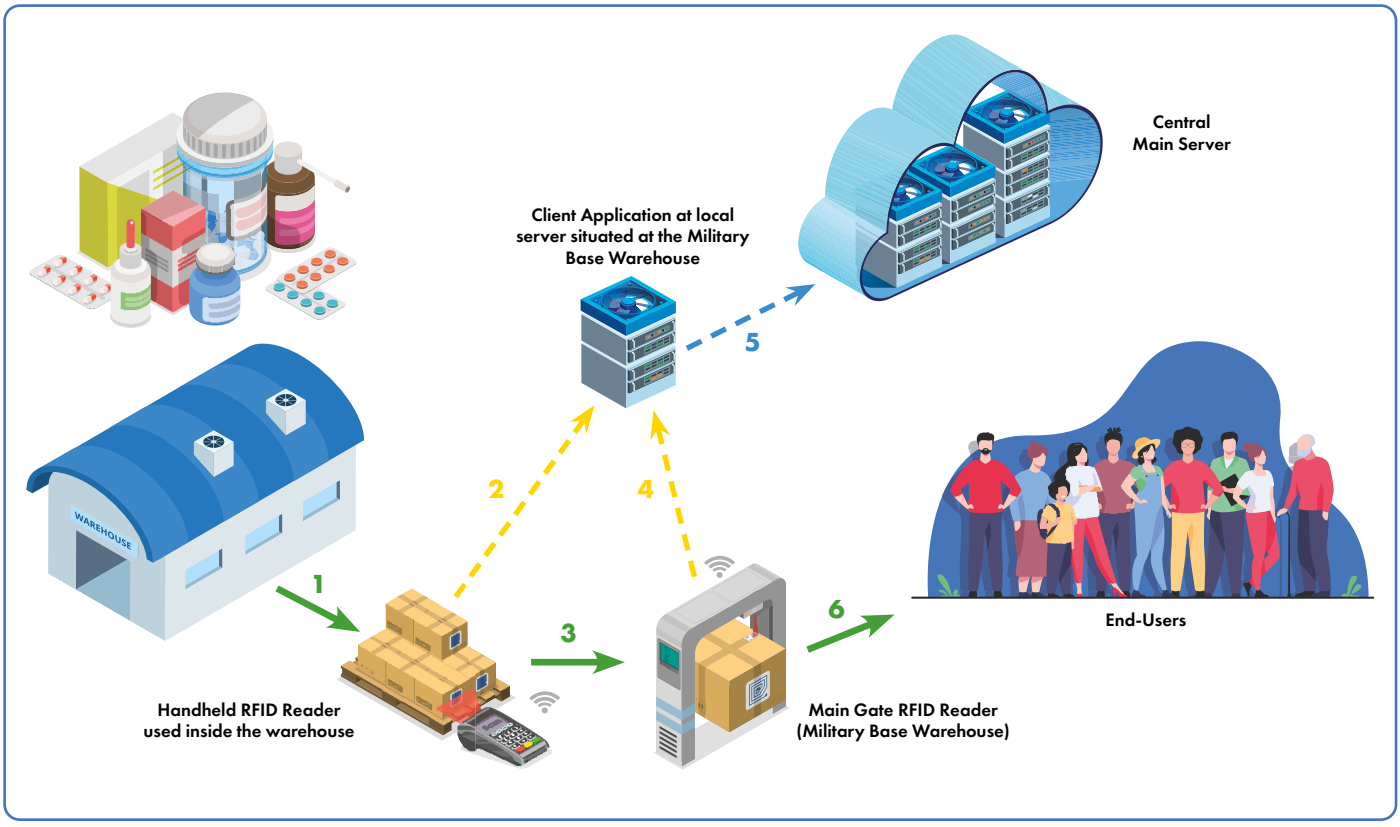
1. Emerging Pharma Logistics Security via IoT networks

In recent years, cyber-attacks have become a new type of warfare that is being utilised to create chaos in many organisations and government bodies. With the increase in the use of various technologies, hackers have become bolder in launching cyber-attacks, especially if it involves pharma logistics. To address this problem, Dr. Chan Yeob Yeun from Khalifa University conducted research to identify the design for a Secure Light-weight Cryptographic Mutual Automated Protocol between legitimate IoT/RFID/NFC readers and semi-passive tags attached to all pharma systems. The research uses passive tags chosen for the low cost and long battery life.
RFID *– The technology enabling readers to recognise, process, and utilise the information in tags without physical contact.*
IoT *– Network in which wire/wireless linkage of multiple sensors collects, integrates, processes & utilises information.*

The research identifies the necessity of a secure RFID-based pharma supply chain to address the following:

Concerns	Risks	Risk Mitigation
Confidentiality	Eavesdropping	Encryption
Integrity	Middleman Attack	Mutual Authentication
Availability	Service Denial	Partial Protection
Authentication	Spoofing	Mutual Authentication + Encryption
Anonymity	Replay attack	Mutual Authentication + Random No.
Access Control		

- ***Pharma User Base Usage***



DAY 3

2. Back to the Future: Evidence-Based Business Model Change in Dry Ice Use (Industry Use Cases)

Cold Jet presented how dry ice played a critical role in the shipment of COVID vaccines and how it prevented huge financial losses by ensuring the correct temperature was maintained. Some of the myths regarding dry ice e.g., dry ice is not eco-friendly, while in reality dry ice is manufactured from recycled CO_2. The following block diagram shows the manufacturing process of dry ice.

Market reports estimate the growth of the cold chain market size at USD 233.8 billion in 2020 and is projected to reach USD 340.3 billion by 2025, recording a CAGR of 7.8%[1]. Another report predicts that the Cell and Gene Therapy market will reach USD 35.67 billion by 2027, exhibiting a CAGR of 33.6% from 2019-2027[2].

In recent years, cultivated meat has gained traction due to the rapid change in people's food habits. The cultured meat market size was valued at USD 1.64 million in 2021 and is estimated to reach USD 2788.1 million by 2030, registering a CAGR of 95.8% from 2022 to 2030[3].

Due to Covid-19, there has been tremendous growth in the food industry e-commerce. Food and Beverage's e-commerce market size is expected to grow to USD 109.23 billion in 2026 at a CAGR of 17.6%[4].

The world is very diligently focusing on the carbon footprint and GHG emissions. Organisations and governments are taking all the steps to minimise the carbon footprint. A similar initiative is taken by the University of Antwerp and Cold Jet as collaborative research to investigate *"Dry ice as an enabler for sustainable cold chain logistics."*

[1] Cold Chain Market by Application, n.d., www.marketsandmarkets.com
[2] 2022, www.globenewswire.com
[3] Deshmukh, n. d., www.alliedmarketresearch.com
[4] Food And Beverages E-Commerce Global Market Report, 2022, n. d., www.thebusinessresearchcompany.com

DAY 3

The joint research will address the following research questions:

- *RQ 1: What can we learn from existing research and best practices of dry ice (For example cleaning industries)? What are the risks, etc.?*
- *RQ 2: Can a model be developed that indicates in which distribution areas dry ice has a higher effectivity degree in usage than other cooling means? What are the key (efficacity) indicators to be considered?*
- *RQ 3: Can a model and tool be developed to simulate and indicate the ecological footprint of dry ice versus other cooling methods and means depending on the distribution model that is used?*
- *RQ 4: How would a perfect dry ice-cooled distribution model look like for many food e-commerce, pharma, and life sciences flows?*
- *RQ 5: How should stakeholders deal with potential closed-loop models related to an increase in, for example, returnables due to dry ice?*
- *RQ 6: How can dry ice help implement direct-to-destination distribution methods, reducing the complex distribution model with many intermediaries? What can a Proof of Concept (POC) look like?*
- *RQ 7: How can dry ice be an enabler towards the need to speed up the electrification of cooled transport fleets?*

The research demonstrated that limited studies have been done concerning dry ice utilisation in the cold supply chain. There is a vast potential that is going to be investigated for the dry ice to be utilised in the various segments of the cold supply chain to reduce the carbon footprint. Additionally, research will also investigate if dry ice can be an enabler to speed up the electrification of last-mile delivery vehicles for the cold supply chain.

The research project has 5 work packages to measure the progress:

1. **Scientific Literature** – Review existing literature, Identify best practices, and Map the network for dry ice suitability.
2. **Business Case Analysis** – Review existing business models for a sustainable cold supply chain and check usability with dry ice,
3. **Develop data-driven models** – Sustainability model and financial model.
4. **Closed Loop Applications** – Investigate AI and IoT methodologies for performance monitoring to enable closed-loop solutions.
5. **Enabler for electrification of fleets** – To check if dry ice can be used with the electrical fleet to reduce GHG & CO_2 emissions, especially in last-mile delivery

DAY 3

3. Wrap up: Sustainability Challenges in Future Packaging Technologies

A very motivating wrap-up for day 3 was conducted by Christopher J. Storch (Va-Q-tec), with a major focus on the sustainability of cold supply chains. The focus was drawn from the latest regulations addressing climate change issues, and solid public interest in ESG initiatives of various organisations and of course, cost savings and energy-efficient temperature control. The presentation emphasised and demonstrated the importance of sustainable cold supply chains and identified sustainable TempChain as building a robust and resilient Green Pharma TempChain is more than simply developing biodegradable or multi-use packaging. The cold supply chain is a very energy-intensive process that creates a lot of CO_2 emissions. Not only sustainable and green packaging but also logistics solutions need to be considered thoroughly.

Calculation of CO_2 footprint for an Air freight User case was discussed with various calculations. The presentation showcased how "one size fits all" does not work when it comes to CO_2 emissions and carbon footprint. Various factors need to be considered based on the logistics solution offered. The CO_2 emissions KPI is divided into fixed and variable emissions, where fixed comes from packaging solutions and variable comes from different transport solutions. The Holistic Greenhouse Gas Protocol, which covers all aspects of the cold supply chain was also proposed.

DAY 3

Main Takeaways of Day 3

- Sustainable packaging is the way forward for pharma supply chains.
- Cell and gene therapies are pushing packaging and cooling to the next level.
- Shipment size increasingly switches from 'pallet' to 'parcel.'
- The passive cooling market segment will see significant future market growth.
- The last mile becomes more and more part of a full circular pharma logistics ECOSYSTEM.
- Shipment monitoring is increasingly used for temperature control and trace-and-tracking, especially the use of the IoT ecosystem.
- There is an elephant in the room: Reverse logistics. There is work on the shelf here!
- Several cooling methods are battling to become the standard for passive cooling. Which one is the more sustainable?
- Sustainability is not a buzzword but a verb to operationalise and sustain the often boldly launched company statements.
- Scientific research is crucial to help the industry with the above-mentioned challenges.

DAY 4

Program Overview

When the Exception Turns into Standard: Emergency and Crisis Pharma Logistics

09:00 – 09:30 **Setting the Scene: The Impact of the Global Disruption Caused by Health and Geo-Political Situations**
Dr. Omar Najim, Director of Executive Affairs UAE

09:30 – 10:00 **When All Standards are Gone: Flexible until It Snaps - Insights in Emergency Logistics**
Mr. Jeffrey Kemprecos, Director, Communications, Government Affairs & Market Access, GSK Gulf

10:00 – 10:30 **Collaboration as Key Differentiator for Future Crisis Models**
Mr. Trevor Caswell, Chairman Pharma.Aero, ***Project Sunrays***
Capt. Abhinand Madireddy, Director, Strategy & Projects, AD Ports Logistics

10:30 – 11:00 **Coffee Break & Networking**

11:00 – 11:30 **Research in the Area of Emergency Logistics: How Science Standardises Disruption and Chaos**
Dr. Andrei Sleptchenko, Khalifa University
Dr. Raja Jayaraman, Khalifa University

11:30 – 12:00 **Blockchain Applications: How New Technologies Can Drive the Future Emergency Medical and Pharmaceutical Supply Chain Data**
Dr. Raja Jayaraman, Khalifa University

12:00 – 13:00 **Lunch & Networking**

13:00 – 14:30 **Connect to the Last Difficult Mile: UAV Project Pharma.Aero**
Dr. Olivier Defawe, VillageReach Director Private Sector Engagement, Drones for Health Program Lead, Pharma.Aero UAV Project Manager

Workshop and panel:
Mr. Trevor Caswell, Chairman Pharma.Aero
Mr. Ruud van der Geer, Associate Director of Supply Chain Management MSD

14:30 – 15:00 **Wrap up: Sustainable Methodologies and Principles in Pharma Logistics**
Dr. Omar Najim, Director of Executive Affairs UAE
Mrs. Céline Crahay, Managing Director, 3CeL.

17:30 – 21:30 **Social Event: Masterclass Dinner Event & Certification Ceremony**
Event Offered by Hope Consortium

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DAY 4

Day 4 started with an enjoyable introduction by Dr. Omar Najim, shedding light on the collaborative efforts during the COVID-19 pandemic from various governments despite the geo-political situations. The key factor was the collaboration between all relevant parties, which greatly made the COVID-19 vaccine delivery successful. The introduction was followed by a series of presentations aligned with the theme of the day – Emergency & Crisis Management.

Mr. Jeffrey Kemprecos (GSK) shared valuable insights in emergency logistics, focusing on pre- and post-pandemic key challenges and lessons learned:

Key challenges (before COVID-19)	Key challenges (during COVID-19)	Major Learning (after COVID-19)
Battle for talent	Employee safety	Supply – Resilient, redundant, and flexible
Launching new medicines and vaccines	Securing supply chain	Partnership - Public and Private entities work together
Cost containment	Business continuity	Incentives – Reassurance of the pharma industry to gain big
Oil/gas prices affect healthcare financing	Anticipation of the next shock (economic, lockdown, etc.)	Communication – Policymakers and industry need to collaborate
The unpredictability of policymaking	Developing and manufacturing effective vaccines (COVID-19)	Last Mile – Anticipation for bottlenecks and develop solutions accordingly

Mr. Trevor Caswell (Pharma.Aero, Edmonton International Airport) offered demonstrated the importance of collaboration. The major highlights of his presentation are:

- Collaboration is the key to innovative technology when dealing with crisis models.
- Collaborative relationships in the supply chain are just as critical as the data and information.
- Our challenges in the supply chain are collective, to help relieve stressful hurdles we need to be collaborative.
- Collaboration is one of the strongest practical elements we control in the supply chain and the most beneficial to all partners.

Dr. Andrei Sleptchenko and Dr. Raja Jayaraman from Khalifa University highlighted the importance of research into Emergency Logistics and provided meaningful insights on how Pharma logistics need to develop resilience.

Building Resilience	Modeling and Measuring Resilience
Early Detection	Supply Reliability
Multi-Sourcing	Recovery Time
Stockpiling	Robustness
Multi-Echelon Supplies	Loss Triangle
Emergency Supplies	Emergency Logistics

DAY 4

Dr. Olivier Defawe (VillageReach) provided detailed information with real-life examples of how drones can be the fastest way to deliver vaccines in remote areas. Five (5) countries have implemented drone systems in Africa: Rwanda (2016) and Ghana (2019) by Zipline, Madagascar (2019) by Aerial Metric\ and Malawi and Democratic Republic of Congo (2020) by Swoop Aero/Wingcopter, with technical assistance from VillageReach.

Principles for integrating drones in the delivery system are paramount as they enable more efficient, responsive, and resilient supply chains, especially for locations with access challenges. Based on the projects carried out in Africa, the below table demonstrates the type of products suited to drones and land-based delivery systems.

Drone Delivery – Suitable products	Land-based Delivery – Suitable products
Lightweight	Bulky
Cold chain dependent	Cold chain independent
Short shelf Life	Long shelf life
High value	Low value
Frequent and on-demand	Less frequent and scheduled

Streamlining the first-mile air freight logistics with middle/final drone delivery will mitigate wastage, accelerate emergency responses, and reduce the burden on chain logistics, thus creating resilient delivery systems.

DAY 4

Main Takeaways of Day 4

- Innovative collaboration is key to reaching remote areas.
- Innovative projects to test new technologies like drones are needed and should be supported by the entire supply chain.
- Human factors like creative and innovative thinking are still key in responsive emergency logistics.
- Data sharing is key in agile and emergency logistics.
- Blockchain can assist where traditional data sharing and data flows lack stability.
- Blockchain is not the Holy Grail for data issues.
- Key technologies might jeopardise the affordability of future supply chains.
- There is a need for pharma-specific predictive mathematical models in disruptive event impact prediction.
- The last mile is (once again) the most complex and expensive part of the supply chain. Horizontal and vertical collaboration is key to upgrading the Pharma Logistics Industry from 1.2 to 2.0.

DAY 4


SECOND EDITION
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SUSTAINABILITY

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DAY 5

Program Overview

Sustainable Pharma Supply Chain Models: How Transport Modes Intertwine

09:00 – 09:30 **Sea Freight in the Pharma Supply Chain: Volume Versus Value?**
Prof. Dr. Christa Sys, Faculty of Business and Economics, University of Antwerp

09:30 – 10:45 **Leveraging Intermodal Transportation and Ports for Sustainable Supply Chain - Use Case: Reducing CO_2 Emissions by Transport Collaboration - Wings, Steamers, And Rail**
Mrs. Simona Ravera, Director of Solutions Sales EMEA - Lifesciences & Healthcare, BDP International
Mr. Gerry Fama, Vice President of Europe Sales, BDP International
Mr. Darrel Chong, AVP, Group Platform Solutions, PSA International

10:45 – 11:00 **Coffee Break & Networking**

11:00 – 11:30 **Is Physical Internet the Facticity to Ultimate Sustainability or part of a bigger sustainability puzzle: an industry use case "the Stargate Project"?**
Dr. Thomas Van Asch, Strategic Project Manager, Air Cargo Belgium
Mr. Samuel Speltdoorn Business Development Manager Cargo, Brussels Airport Company

11:30 – 11:45 **Digital Cold Chain: Learn How This Makes the Cold Chain Transparent, Less Risky, More Cost-Efficient, and Greener**
Mr. Stefan Braun, Managing Director, SmartCAE

11:45 – 12:15 **Do We Speak the Same Language: The Need for a Cross-Modal CO_2 Calculation Model**
Mr. Rafael Arevalo-Ascanio, Ph.D. Researcher University of Antwerp

12:15 – 12:45 **The Airline Sustainability Program: ETIHAD Industry Use Case**
Mr. Fabrice Panza, Manager Global Cool Chain Solutions Etihad Cargo

12:45 – 13:15 **Concluding the Pharma Green Lane Definition**
Mrs. Céline Crahay, Managing Director 3CeL.
Prof. Dr. Wouter Dewulf, University of Antwerp

13:15 – 13:30 **Masterclass Main Takeaways**
Mr. Frank Van Gelder, Secretary General Pharma.Aero
Prof. Dr. Roel Gevaers, University of Antwerp

13:30 – 14:30 **Masterclass Closure over Lunch & Networking**
Prof. Dr. Ernesto Damiani, Khalifa University
Mr. Trevor Caswell, Chairman Pharma.Aero
Mr. Fabrice Panza, HOPE Consortium
Prof. Dr. Roel Gevaers, University of Antwerp

16:00 – 20:00 **Social Event: La Perle Entertainment Show V-Hotel, Dubai Business District**
Event Offered by BDP International and Cold Jet – Golden Sponsors

20:00 – 22:00 **Closing Reception Dinner: Gonpachi Japanese Restaurant**
Dinner Offered by B Medical Systems and DSV – Golden Sponsors

DAY 5

On the 5th day of the Pharma Logistics Masterclass 2022, the program focused on sustainability and intermodality. Ranging from maritime, to air transport, and multimodal integration cases, this day had the objective of reviewing the sustainable challenges faced by supply networks, especially the pharma logistics sector. With the review of strategies and trends in the operation of supply networks, the participants had access to insights on Physical Internet, Digital Cold Chain, and Emission Calculation Models and their contributions to the greening challenge.

When talking about transportation in the pharmaceutical industry, the first thing that comes to mind is airplanes, air transportation. However, in recent years, the trend in the growth of the role of maritime transport in the pharma sector has been evident. This growth implies a modal shift, where air transport seems to lose territory.
According to the International Air Transport Organization (IATA), air cargo shares of global pharma transport declined from 17% in 2000 to 11% in 2013. In 2018, 0.5 million tons of pharmaceutical goods were flown while 3.5 million tons were shipped *(Prof. Dr. Christa Sys, Faculty of Business and Economics, University of Antwerp).*

DAY 5

The roadmap of the modal shift shows that although in the last two decades the trend was towards maritime transport, in the last two post-pandemic years it has been intermodal. Demand will be driven by a combination of factors: Market conditions, Global Growth, and Sustainability initiatives. Therefore, the market share in transportation is expected to be more balanced. A project that combines wings, steamed and rail demonstrates the environmental benefits of intermodal transport. This initiative shipped containers via rail from Europe to China, maintaining the product's integrity and achieving a reduction in emissions of up to 40% *(Mrs. Simona Ravera, Director Solutions Sales EMEA - Lifesciences & Healthcare, BDP International; Mr. Gerry Fama, Vice President of Europe Sales, BDP International; Mr. Darrel Chong, AVP, Group Platform Solutions, PSA International).*

Implementing strategic models such as the Physical Internet - PI for the transport of pharmaceutical products is a green logistics initiative. Brussels Airport presents the Stargate project (**S**us**T**ainable **A**i**R**ports, the **G**reen he**A**r**T** of **E**urope), which seeks to become a node for the implementation of IP. Supported by a series of technological innovations such as AI and IoT, BRUcargo aims to build an international network with end-to-end visibility through collaboration. The idea is to create interconnectivity and transparency to allow for interoperability to ultimately benefit from a self-sufficient logistics system *(Dr. Thomas Van Asch, Strategic Project Manager, Air Cargo Belgium Mr. Samuel Speltdoorn Business Development Manager Cargo, Brussels Airport Company).*

In the case of airlines, Etihad is an example of the commitment to sustainable operations. With the goal of zero net emissions by 2050 and to reduce the 2019 net emission levels by 50% by 2035, Etihad seeks to demonstrate its commitment. Although there are limitations and challenges regarding the sustainability of the aviation sector, including fuel efficiency over the years, well-defined actions contribute to this objective *(Mr. Fabrice Panza, Manager Global Cool Chain Solutions Etihad Cargo).*

The calculation of emissions is an important step in measuring the impact of transport on the environment. Multiple models have been proposed, with different methodologies and protocols. The Virtual Cold Chain is a digital twin developed by SmartCAE for the analysis and quantification of risk and costs in supply chains. This digital tool has also been used to calculate emissions, comparing the values in different scenarios and network configurations. This procedure uses the methodology of the Greenhouse Gas Protocol and the EN 16258 standard with an activity-based approach *(Mr. Stefan Braun, Managing Director, SmartCAE).*

Traditional models for emissions CO_2 calculations in transportation only consider line haul. The last-mile distribution, properly as it works in urban logistics, has been ignored when calculating emissions. Market trends towards user-centric supply networks, including home care in the pharma sector, highlight the opportunity for their integration. A strategic, multimodal model seeks to calculate emissions from transportation with an activity-based approach, taking last-mile modelling from an operational level to a strategic level through continuous distance estimation *(Mr. Rafael Arevalo-Ascanio, Ph.D. Researcher University of Antwerp).*

DAY 5

Main Takeaways of Day 5

- Sea freight will play an increasingly important role in pharma logistics. However, collaboration and Intermodality are the keys to enhancing sustainability.
- There is an industry-wide need for a standardised, integrated, and objective CO2 calculation model that looks beyond the traditional fragmented 'island-to-island' approach.
- Several airports and airlines are investing heavily in making their operations more sustainable. However, these efforts are scattered.
- There are still a large number of research topics related to sustainability to be further investigated. The industry sits on a mountain of data, the academics can use this data for future research.
- An enhanced collaboration on the selection of the research topics and the supply of big data is requested by the universities.

Workshops

Throughout the 5-day event, lectures and use case presentations were combined with workshops to offer participants the opportunity to work together in groups on various assignments. The groups were carefully designed to have a heterogenic composition and mix participants from diverse segments of the industry, and academic researchers.

The purpose of this applied methodology was to:

At the end of the week, based on a peer review process, the best team was nominated and officially named "the best Pharma Logistics Masterclass Working Group". The Pharma Logistics Masterclass embodies true international collaboration and skill improvement through the exchange of knowledge and experience. The workshops are therefore a vital component of the entire masterclass methodology.

Major Conclusions and Takeaways

The five-day masterclass resulted in some major conclusions and important takeaways based on the combination of lectures, keynote presentations, workshops, industry use cases and industry visits.

Together with the academic and business committee, speakers and attendees, the Pharma Logistics Masterclass 2022 concluded that:

Industry 2.0: Efforts will be required to scale up and upgrade the current Pharma Logistics Industry from 1.2 to 2.0. This transition involves embedding current technology developments into strategic thinking and advancements within the pharma logistics industry.

Vertical and horizontal collaboration are key factors in creating velocity for tomorrow's challenges, including sustainability. Cross-industry collaboration has proven to be a perfect and solid foundation for generating traction and acceleration within the pharma logistics industry.

Strategy and Leadership are a great combination for moving towards the 'top right corner' of adaptive innovation. Vertical collaboration across all layers of a company and industry will further enhance professionalization.

Cross industry curiosity will help organizations observe other industries, question the current organizational model, experiment, and build bridges internally and externally.

New technologies will lead to **new business models**, and it's important to assess whether the pharma logistics industry is ready for these changes.

Linear systems will transform into fully-integrated ecosystems. Players in the pharma logistics supply chains can only survive in an integrated, resilient, responsive, and sustainable ecosystem.

Reverse logistics is a significant challenge that needs attention and resources to solve the last and first mile logistics in the pharma industry.

Personalized medicine, specifically Cell and Gene Therapies, are driving advancements in **packaging, cooling, and related manufacturing models**.

The **passive cooling** and packaging market segment is expected to experience significant future market growth.

Scientific research plays a crucial role in helping the industry address the aforementioned challenges.

PHARMA LOGISTICS MASTERCLASS 2023

4 - 8 SEPTEMBER
SINGAPORE

DAY 1

- Registrations - Welcome/Setting the scene
- Emulsions or solutions: how collaboration creates the fuel to supply chain innovation

DAY 2

- Strategy to accommodate new technology: embedded company leadership will carve the future or end of today's companies

DAY 3

- The world 2.0: the new technology translation through industry cross pollination

DAY 4

- Ecosystems under the sustainability microscope

DAY 5

- Academic and Business collaboration as the bedrock for a sustainable future
- Masterclass Closure

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