PLMC

WHITE PAPER

4th EDITION

PHARMA LOGISTICS MASTERCLASS

29 September – 3 October 2024
Dallas Fort Worth

PHARMA AERO WE CONNECT PHARMA

University of Antwerp

DFW DALLAS FORT WORTH INTERNATIONAL AIRPORT

UTA THE UNIVERSITY OF TEXAS AT ARLINGTON

UNT UNIVERSITY OF NORTH TEXAS

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EXECUTIVE SUMMARY

After three successful editions in Europe, Middle East and South-East Asia, the 2024 Pharma Logistics Masterclass was the first-ever to take place in North America. The 4th PLMC™, held in Dallas-Fort Worth, brought together global industry leaders, academics, and policymakers to explore the latest advancements and challenges in pharmaceutical logistics. Organized by Pharma.Aero, the University of Antwerp, Dallas Fort Worth International Airport (DFW), the University of Texas at Arlington (UTA), and the University of North Texas (UNT), this year's edition focused on emerging market dynamics, sustainability, digital transformation, regulatory challenges, and innovative supply chain solutions.

With participation from top logistics and pharmaceutical companies, the PLMC™ provided an in-depth look at the evolving landscape of pharma logistics. Through expert lectures, industry panels, interactive workshops and site visits, attendees engaged in real-world problem-solving, discussing cold chain logistics advancements, drone delivery applications, and strategies to strengthen pharma supply chain resilience. The insights gained will serve as a foundation for future industry standards and best practices.

Looking ahead to PLMC™ 2025, the event will be hosted in Osaka and Kyoto, Japan, from 16 to 19 September, aligning with the World Expo 2025. This move highlights the growing global footprint of the Pharma Logistics Masterclass and reinforces the industry's commitment to advancing pharmaceutical logistics through collaboration and innovation.

Organizing Committee

Scientific Committee

Prof. Dr. Roel Gevaers (Chair)
Prof. Dr. Wouter Dewulf

Business Committee

Mr. Frank Van Gelder (Co-chair)
Mr. Trevor Caswell

Hosts

Pegasus Park, Dallas, TX, USA
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The Organizing Committee extends its heartfelt gratitude to the generous sponsors of the 2024 Pharma Logistics Masterclass.

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PROGRAM HIGHLIGHTS AND KEY TAKEAWAYS

DAY CHAIRS | *Prof. Dr. Roel Gevaers, University of Antwerp* | *Frank Van Gelder, Pharma.Aero*

KEY TOPICS OF THE DAY

Global Life Sciences: Mapping Global Market Dynamics

Learning Objectives

- Explore key trends in the pharma logistics landscape
- Identify major pharma flows and hotspots in 2023-2024
- Discover emerging players and innovations transforming the industry

Sustainable Syncromodality: Evolution, Efficiency and Efficacy in Life Science Product Deliveries

Learning Objectives

- Assess the long-term viability of ocean freight in pharma logistics—trend or lasting solution
- Explore strategies for synchronizing and optimizing pharma supply chains
- Examine key business, digital, sustainable, and go-to-market strategies (in alignment with Day 2 session)

Summaries of Lectures, Presentations & Workshops

Trend Spotters: Cutting-Edge Evolutions Shaping the Global Healthcare Landscape

Frank Van Gelder, Pharma.Aero
Roel Gevaers, University of Antwerp

At the opening of PLMC 2024, Roel Gevaers and Frank Van Gelder highlighted key trends in Pharma Logistics, setting the stage for discussions throughout the Masterclass.

Personalized medicine takes off - Personalized profiling of patients becomes more prevalent.

Amazonization - The shift from pallet to parcel logistics introduces greater challenges. Amazon has leveraged its position to enter healthcare logistics and emphasized patient-centric services. With trends like hospital-at-home, online prescriptions, and digital connectivity with patients, the gap between healthcare providers and patients is closing. Real-world evidence will be integrated with digital tracking. Logistics will increasingly move toward home delivery, posing challenges if patients do not adhere to treatment.

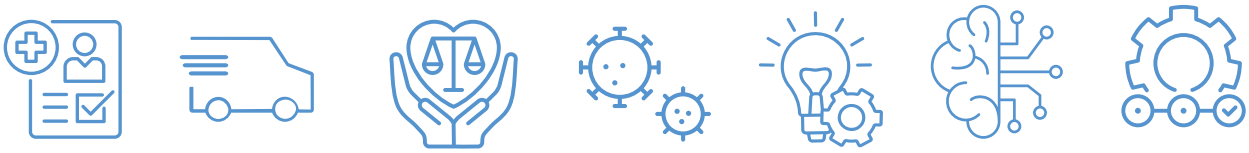
Regulation and ethics will increasingly affect the power dynamics between continents and countries.

A new pandemic will come - The rise in chronic zoonotic pandemics, like bird-related diseases, and the threat of antibiotic-resistant bacteria (the "silent pandemic") will continue. While vaccine production is not the primary issue, last-mile logistics pose significant challenges.

Innovation acceleration - Aging populations, pollution, and political conflicts are placing increased pressure on healthcare systems.

AI-driven digital acceleration and transformation - Technology will have an immediate impact on the bottom line and workflow optimization.

From healthcare innovation to supply chain innovation - Innovations in healthcare will drive advancements in supply chain management.



Progress by Measuring: Unpacking the Pharma Logistics and Supply Chain Statistics

Vincent Van Bockstaele, University of Antwerp

The global pharmaceutical market is expected to reach 2.8 trillion USD by 2033. With a compound annual growth rate (CAGR) of 6.15% over the next ten years, the pharmaceutical market is projected to outperform many other sectors.
The US accounts for 27% of global pharmaceutical expenditure, with revenues totaling 423 billion USD. The five largest countries by GDP—the United States, China, Japan, Germany, and the United Kingdom—account for half of the world's pharmaceutical spending.

Analyzing pharmaceutical expenditures by country in 2023 reveals three major trends among developed, emerging, and developing countries. The figures suggest that the largest potential for future growth lies in emerging and developing markets.

In terms of the pharma logistics market, the global pharmaceutical trade continues to rise, with a trade value exceeding 880 billion USD. Cross-border pharmaceutical trade has grown steadily over the past 20 years, driven by innovation and global demand.
Europe remains an export hub, fueled by its advanced manufacturing capabilities, while the USA, Japan, and China are primarily import regions.

The US pharmaceutical market is primarily driven by imports, with import volumes nearly double those of exports as of 2023. The U.S. East Coast dominates accounting for nearly 90% of imports and 75% of exports. Notable growth has been observed in regions like Norfolk and Pembina for imports, while Savannah, Norfolk, and Detroit have shown significant gains in exports

Globally, import trends indicate rapid growth from countries such as the Netherlands and Singapore, while exports to China and Belgium have surged.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Regarding transportation modes, road transport carries the majority of goods, while air transport accounts for a significant portion of the costs (see Figure 1). Despite lower volumes, air freight costs reflect the high value and urgency of pharmaceutical shipments.

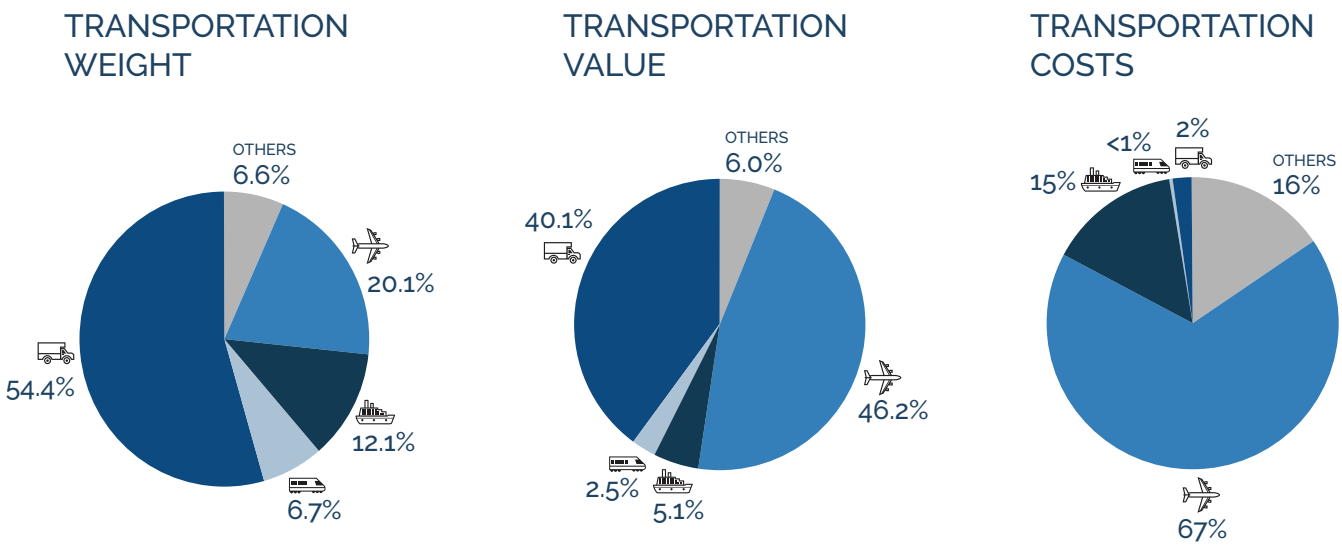


Figure 1. Pharma logistics transport modes

From Emerging Market to Key Strategic Hub: Dallas Fort Worth's Pharma Logistics Key Asset

Kelly Cloud, Dallas Regional Chamber of Commerce

The Dallas-Fort Worth (DFW) region is the fourth largest by population in the United States as of 2023 and is projected to become the third largest by 2045. Since 2010, DFW has added more jobs than the total current number of jobs in cities like New Orleans, Jacksonville, Raleigh, or Oklahoma City. Additionally, it was the top major metro area in terms of the fastest return to pre-pandemic employment levels. DFW has become a hub for corporate headquarters, with 254 HQ listings since 2010.

In terms of the logistics market, DFW is the largest inland port and one of the most significant potential bottlenecks in the U.S. freight system. Preventing disruptions in this area requires transformative logistics and supply chain innovations to ensure long-term sustainability, resilience, reliability, efficiency, safety, and equitable economic activity. The region is also well-positioned to attract electric vehicle, truck, aircraft, and related industries, given its strong presence in the auto and aircraft sectors.

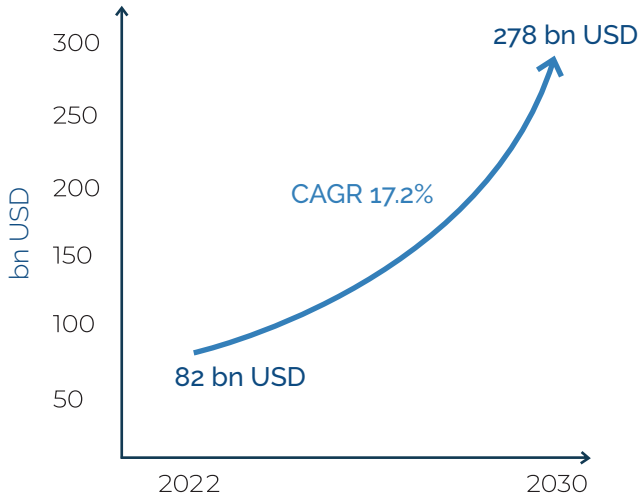
According to the International Trade Administration, DFW was the 8th largest export market in the U.S. in 2022, with merchandise shipments totaling 50.6 billion USD. This represents 10.4% of Texas's total goods exports.

Regarding pharmaceutical logistics capabilities, a 50,000-square-foot cold-chain shipping facility at Dallas Fort Worth International Airport opened in 2017 to handle temperature-sensitive products, ranging from fish to pharmaceuticals. Since then, medical and pharma-related shipments have increased by 20%. The facility has become one of only two in the U.S. certified by the International Air Transport Association's Center of Excellence for Independent Validators (CEIV). To obtain this certification, DFW partnered with logistics specialists in ground handling, trucking, cold storage/warehousing, and freight forwarding. The cold-chain facility operates 24/7 to ensure the preservation of temperature- and time-sensitive pharmaceutical freight.

Integrators or Innovators: New Faces Joining the Industry

Stijn Michielsen & Serhat Yüksel, University of Antwerp

The pharma logistics market has witnessed the emergence of new players, referred to as integrators, driven by the sector's evolution in e-commerce. Pharma e-commerce encompasses online platforms where pharmaceutical products, including medicines, are sold and distributed to consumers. This includes online pharmacies that enable customers to purchase medications and other health-related products via websites or apps, with delivery managed through mail or shipping services.



Integrators are actors involved in the entire pharmaceutical supply chain. From temperature-controlled solutions between production, transportation and central storage, to last-mile transportation solutions. More and more companies show interest in including more integrator activities, such as owning aircraft and controlling more of the supply chain.

The global e-commerce market and pharma e-commerce market have grown significantly over the last few years. For example, the pharma e-commerce market was valued at USD 82 billion in 2022 and is projected to grow to USD 278 billion by 2030, at a CAGR of 17.2%.

Two notable examples of new players: Amazon and Cainiao

Amazon has expanded its healthcare services through strategic acquisitions and new offerings. It acquired PillPack for $753 million, gaining licenses to sell and ship prescription drugs across 49 states, and launched Amazon Pharmacy to provide home delivery of medications, including refrigerated and next-day options, via various logistics channels.
As a new offering, Amazon introduced Amazon Clinic, a tele-health service offering virtual care for ordinary health issues. Also, Amazon later acquired One Medical for $3.9 billion, integrating its brick-and-mortar clinics and virtual care services. The rebranded Amazon One Medical now offers pay-per-visit telehealth for over 30 conditions and a membership for on-demand care at clinics or virtually.

Cainiao, founded by Alibaba Group in 2013, is the world's largest cross-border e-commerce logistics company, providing warehousing, fulfillment, last-mile delivery, and reverse logistics services, primarily to Taobao and Tmall customers in China. Alibaba expanded its Tmall platform with Tmall Global, enabling overseas brands to sell directly to Chinese consumers, including health-related products. The company further entered the healthcare industry with a pharmaceutical sales platform on Tmall and acquired a local delivery service to enhance last-mile delivery for healthcare products. In early 2023, Alibaba Health launched a campaign in collaboration with major pharmaceutical brands to address the needs of China's nearly 300 million chronic disease patients, especially during times like the Spring Festival.

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WORKSHOP

Pharma.Aero Project on Sustainability (GAPL 2 - Packaging)

Moderator: Céline Crahay (3CeL)

Pharma.Aero's GAPL 2 project aims to assess the environmental impact of tertiary packaging used in pharmaceutical air cargo transport, focusing on two categories: active/passive temperature-controlled systems (Shipper & FF), and air cargo consumables and additional protection, such as thermal blanket (Airlines).

Workshop Objectives

- Brainstorm on solutions to 4 pre-identified challenges
- Identify ways to improve the sustainability of the value chain by applying the principles of the circular economy.





The workshop was structured around four strategic "How Might We" questions, driving focused and innovative discussions.

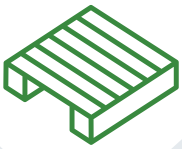
How might we...

rethink single use packaging materials, to meet 100% recycling targets, and to avoid landfill waste?

How might we...

rethink repositioning strategies, to meet our goal of lowering CO2 emissions, and to avoid transporting empty containers by airfreight?

How might we...



reduce the cost of reverse logistics for reusable pallet shippers, to meet our cost-saving targets, and to avoid new production cycle?

How might we...

reuse 100% of thermal blankets, to minimize waste, and to avoid additional costs?

Synchromodality, a Buzz Word or a True Harmonizing Sustainability Strategy in Logistics?

Tom O'Brien, California State University, Long Beach

Synchromodality can be defined as an evolution from intermodality and multimodality, emphasizing mode-neutral or mode-free booking, and highlights the importance of real-time decision-making, data tracking, and visibility for logistics. Synchromodality is presented as a system that integrates technology-driven decisions, responding to economic and environmental factors such as fuel costs, infrastructure limitations, and sustainability policies. Key benefits include optimizing greener transportation options, avoiding infrastructure bottlenecks, and contributing to decarbonization efforts.

WORKSHOPS

Workshop A - Business Strategy

Navigate Your Business Success: "Don't Fail to Prepare as You Will Prepare to Fail"

Koen Vandenbempt, University of Antwerp

Using a reference to both the mantis shrimp and the bald eagle, Professor Vandenbempt highlights the importance of vision—both long-term and peripheral (around-the-corners)—when preparing for the future.

Disruptions don't happen overnight; they are the result of gradual evolution. Companies must be ready to detect early warning signs and plan for change. Understanding both internal weaknesses and strengths is essential to facing the challenges that the future may bring.

The workshop introduces a practical quick-scan tool that participants can apply within their organizations to identify the key areas where they should focus their efforts.

Workshop B - Digital Strategy

Digital Mastery - Shaping Your Strategy: "Adapt or Fall Behind"

Wim Vanhaverbeke, University of Antwerp

Wim Vanhaverbeke addressed the necessity for companies to adapt their business models in the face of digital transformation. Using examples from various industries, he emphasized that organisations risk falling behind if they fail to evolve.
One case study highlighted the challenges faced by traditional retailers, such as Best Buy, which struggled to compete with Amazon due to high operational costs and a conventional sales model. Vanhaverbeke argued that businesses must reassess their value proposition to remain relevant, posing the question, "If we go bankrupt, who would miss us?" This kind of introspection, he suggested, can help companies better understand their customers' needs.

To succeed in a digital landscape, businesses may need to shift from product-centric to service-oriented models. Examples included Booster Fuels, which offers mobile refueling services to eliminate the need for consumers to visit gas stations. This approach leverages technology to address customer pain points more effectively.

To thrive in a digital landscape, businesses must consider shifting from product-centric to service-oriented models. Examples included Booster Fuels, which offers mobile refuelling services to eliminate the need for consumers to visit gas stations. This innovative approach leverages technology to address customer pain points more effectively.

The workshop also covered the growing importance of digitalization and data-driven business models. By integrating sensors and analytics, companies can transition from traditional sales to subscription-based services, fostering ongoing customer engagement. The transformation of Phillips into a provider of lighting-as-a-service was cited as an example of how digital technologies can enhance customer value.

Collaboration within ecosystems was another key theme. John Deere's platform, which extends beyond selling tractors to offering data-driven farming optimization services, illustrates how companies can create value through ecosystem partnerships. Successful collaboration, however, requires alignment among stakeholders, including businesses, regulators, and end users.

In conclusion, the workshop underscored the importance of adapting business models and leveraging digital technologies in today's market. Companies that prioritize customer-centric solutions, embrace data-driven strategies, and foster collaboration within ecosystems will be better positioned to thrive in an increasingly competitive environment.

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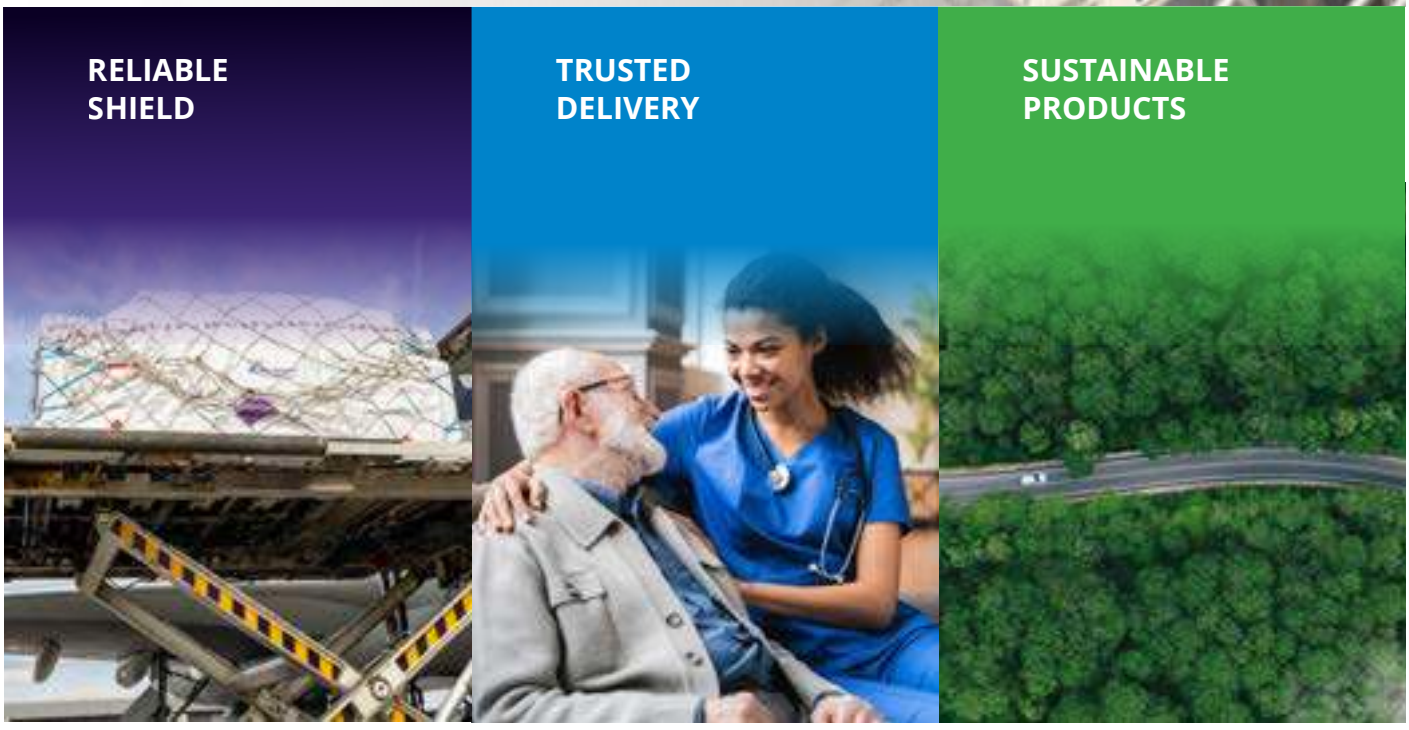

Workshop C - Sustainable Supply Chain Strategy

Does Our Supply Chain Future Belong to the “Green-Strategy” Generation?

Katrien Storms, University of Antwerp

A sustainable supply chain strategy involves optimizing supply chain processes. To this end, researcher Storms presented a model for calculating costs in the supply chain, with a particular emphasis on maritime transport. By optimizing costs, the supply network often optimizes its environmental impacts as well.

The tool, provided to participants for modeling scenarios in their organizations, includes information on a range of ports and maritime platforms in key regions around the world, along with a wide variety of ships and their characteristics. The optimization of transport costs also considers emissions quotas, which companies must pay to operate and generate emissions in certain regions.

Workshop D - Go-to-market Strategy

Innovative Life Science Edge: How to Craft Your Go-To-Market and IP

Gabby Everett, BioLabs Pegasus Park
Jade Verrept, Province of Antwerp, Science Park University of Antwerp

In their workshop, Gabby Everett and Jade Verrept emphasised the importance of innovative strategies for biotech startups navigating the complexities of the pharmaceutical landscape. They discussed how these companies can effectively position themselves in the market and protect their intellectual property (IP).

Everett highlighted that biotech startups often lack the commercial knowledge required to succeed. Large pharmaceutical companies are increasingly shutting down their research and development divisions, preferring to acquire smaller firms with innovative therapies. This shift necessitates a robust entrepreneurial ecosystem, providing startups with access to essential resources, including lab space and funding.

The speakers pointed out the substantial costs involved in establishing a lab, which can run into millions before any research is conducted. Instead, startups can leverage incubators, which offer affordable access to high-quality facilities and equipment, enabling them to advance their research without incurring crippling initial costs.

Verrept stressed the importance of understanding the regulatory environment when crafting a go-to-market strategy. Startups must be aware of the requirements for environmental permits and regulatory approvals, which can be time-consuming and complex. They advocated for the establishment of networks connecting entrepreneurs with experts who can assist in navigating these challenges.

Both speakers discussed the critical role of IP in protecting innovations. Everett explained the patenting process and the significant costs involved, particularly for international filings. She noted the importance of securing patents early in the development process to maximise the time available for market exclusivity.

Everett and Verrept's insights underscore the need for biotech startups to embrace collaborative ecosystems, leverage shared resources, and understand the intricacies of regulatory frameworks and IP management. By doing so, these companies can enhance their chances of success in a competitive and rapidly evolving market.

How to Synchronize the Pharmaceutical Cold Chain with Maximum Efficiency

Paul Della Villa, Cold Chain Technologies

Beyond the role of synchromodality between modes of transport, it is equally important to understand synchronization to optimize cold chain logistics for temperature-sensitive materials. The need for synchronization in the supply chain, particularly the distinction between shipper-designed and partner-integrated systems, is emphasized. The key to efficiency lies in selecting the right technologies that can support connectivity across different partners and segments of the supply chain. Additionally, it is crucial to break free from outdated supply chain limitations in order to implement new technologies effectively.

Technology plays a central role in achieving synchronization through tools such as IoT hardware, digital twins, machine learning, and real-time sensors. However, traditional pharmaceutical supply chain safeguards can hinder innovation, slowing the adoption of these technologies. To overcome this, a shift from reactive to predictive decision-making is necessary, integrating external data signals and fostering a culture that encourages iterative testing and evaluation. This forward-looking approach is essential for addressing future trends such as autonomous logistics and drone-based supply chains.

DAY 1 MAIN TAKEAWAYS

01 While the United States is the largest pharmaceutical market, it primarily relies on imports. In contrast, Europe plays a significant role as a major exporter of high-value pharmaceuticals. Other notable import markets include Canada, China, Japan, and South Korea. Air transport remains the dominant mode of pharmaceutical transportation in terms of both value and cost.

02 The Northeastern USA is the central hub for pharmaceutical trade, accounting for nearly 90% of imports and 75% of exports. Growth is also evident in regions such as Norfolk and Pembina for imports, while Savannah, Norfolk, and Detroit are seeing increased export activity.

03 Dallas Fort Worth, a key economic center in Texas—ranked as the world's 8th largest economy—has embarked on an ambitious investment initiative to develop its life sciences sector as a major growth-driver for the future.

04 Traditional logistics providers focus on the transportation and handling of pharmaceutical products. However, emerging players such as Prime Air (Amazon) and Cainiao (Alibaba) are integrating pharmaceutical logistics into expansive ecosystems that connect directly with the entire patient-facing healthcare value chain.

05 Synchromodality, though still a buzzword, is increasingly shaping the supply chain landscape. By integrating road, maritime, air, and rail transport, this approach optimizes transport costs, duration, and environmental impact while enhancing sustainability metrics.

06 Current technology trends — such as digital twins, real-time sensors, generative AI, and machine learning — hold the potential to revolutionize pharma logistics. In the future, we may see a shift from information management to validated decision-making within generative AI environments, along with adoption of drone logistics, which could transform the pharma logistics sector.

DAY CHAIRS | *Dr. Bill Eisele*
Texas A&M Transportation Institute | *Victoria Wilmore*
J&J Innovative Medicine

KEY TOPICS OF THE DAY

Balancing Act: Regulator-Patient Dynamics in Healthcare Innovation

Learning Objectives

- Analyze the impact of regulation and ethics on the pharmaceutical logistics market
- Identify key strategies for building resilient supply chains
- Explore the role of innovation in shaping the future of pharma logistics

Revolutionizing Healthcare: The Impact of New Business Models

Learning Objectives

- Managing pharmaceutical logistics during future pandemics

Summaries of Lectures, Presentations & Workshops

Regulatory Landscape in Supply Chain: The US Pharma Case

Seckin Ozkul, University of South Florida Muma College of Business

The FDA is central to ensuring that drugs are safe, effective, and high-quality. Its staff at the Center for Drug Evaluation and Research utilise scientific data to assess whether new drugs meet safety standards and whether their benefits outweigh any potential risks. After approval, the FDA continues to monitor drug safety for years, ensuring healthcare providers and patients have accurate information to make informed decisions.

Key responsibilities of the FDA include overseeing clinical trials, although the FDA does not conduct these trials. Importantly, it does not regulate drug prices or directly manage patient interactions. The FDA also enforces regulations related to drug storage and distribution. For instance, wholesalers must register with relevant enforcement agencies to ensure safety and accountability.

The Drug Enforcement Administration (DEA) plays a crucial role in regulating controlled substances. This includes monitoring the distribution of potentially dangerous counterfeit drugs, which have increasingly infiltrated the market. Recent statistics indicate that counterfeit pills containing fentanyl pose significant risks, highlighting the critical need for stringent safety measures in pharmacies.

Additionally, the Centers for Medicare and Medicaid Services (CMS) regulate drug pricing, ensuring access for vulnerable populations such as the elderly and individuals with disabilities. Each state also has unique regulations governing pharmaceuticals, necessitating awareness among businesses operating in multiple jurisdictions.

Regulatory frameworks like the Current Good Manufacturing Practice (CGMP) and the Drug Supply Chain Security Act (DSCSA) ensure that all entities in the pharmaceutical supply chain maintain high standards and share transaction data to combat counterfeiting.

Emerging technologies, such as blockchain and RFID tracking, offer solutions to enhance compliance and traceability, ensuring that drugs remain safe from manufacture to distribution.

Case Studies illustrate the consequences of non-compliance, such as costly recalls and tarnished reputations for major pharmaceutical companies.

In summary, the U.S. pharmaceutical supply chain is governed by a complex web of regulations aimed at safeguarding public health. As global efforts for regulatory harmonization progress, maintaining a culture of proactive compliance within companies will be essential to adapt to ever-evolving rules and ensure drug safety for all.

Preserving Innovation and Fostering Progress: Boosting the New mRNA Vaccine Technologies as Value-add Medicines and the Role of the Regulator

Peter Delputte, University of Antwerp
Dr. Hans Hammers, UT Southwestern

The rapid evolution of mRNA vaccine technology is transforming healthcare, particularly after the COVID-19 pandemic. Peter Delputte and Dr. Hans Hammers highlighted key advancements and regulatory considerations surrounding these vaccines.

Peter Delputte emphasised that traditional vaccines aim to protect against disease rather than infection. He explained the complexities of vaccine development, particularly in the context of stability and logistics. The effectiveness of vaccines is heavily dependent on the integrity of their components during production and transport, which can be challenging due to their sensitive nature.

Delputte traced the historical development of vaccines, noting the logistical challenges faced even in early vaccination efforts, such as the transportation of cowpox. He underscored the importance of stabilising vaccine antigens to eliminate the need for stringent cold chain logistics. Advances in structural vaccinology and synthetic vaccinology were discussed as critical pathways toward achieving this goal.

Both speakers illustrated the potential for self-administration and personalised vaccines. Delputte mentioned innovations like needle-free technologies and the promise of synthetic vaccinology, which could enable decentralised vaccine production based on individual genetic information.

Dr. Hammers focused on the application of mRNA vaccines in oncology. He outlined the evolution of cancer treatment, particularly combining immunotherapy with vaccination strategies. Hammers highlighted that while traditional therapies aim to prolong life, recent advancements focus on curing cancer by enhancing the immune response to tumour-specific antigens.

The speakers presented recent clinical trials demonstrating the efficacy of personalised mRNA vaccines in treating melanoma and other cancers. Hammers described analysing patient tumours to develop tailored vaccines, showcasing the shift towards individualised treatment paradigms.

The future of vaccine technology, particularly mRNA vaccines, promises to reshape healthcare delivery. Emphasising stability, personalisation, and innovative delivery methods will enhance patient outcomes and regulatory frameworks. As the industry evolves, it is crucial to maintain a balance between fostering innovation and ensuring safety and efficacy through appropriate regulatory measures.

Fortifying Pharma: Building Resilient Supply Chains Through Risk-Driven Analytics

Chonchol Gupta, University of Antwerp, Rebirth Analytics
Kyle Leone, Esri

The increasing complexity of global supply chains necessitates a proactive approach to risk management. The application of real-time data and advanced analytics offers a pathway from reactive to proactive strategies. Organizations are beginning to share information that has traditionally been limited to specific geographies or unique datasets. This shift is driven by the availability of real-time data that influences and disrupts supply chains across various sectors.

A "control tower" approach enables organizations to aggregate and analyze spatial data, allowing for a comprehensive understanding of risks. By employing sophisticated mapping technologies, businesses can visualize their supply networks and identify potential vulnerabilities. For instance, organizations can examine connections between suppliers and assess risks related to geographic factors. This capability not only enhances situational awareness but also fosters collaboration across different organizational levels.

Real-time monitoring tools allow for the identification of disruptions as they occur. By geofencing locations within supply networks, companies can receive alerts for incidents that might impact their operations. This system facilitates rapid response actions, such as notifying facility managers about relevant events. Additionally, organizations are curating extensive datasets of historical incidents, enabling them to recognize patterns and predict future disruptions. For example, predictive analytics can forecast potential economic risks and labor costs, helping to inform strategic decisions.

The integration of AI and machine learning further enhances predictive capabilities. Organizations can analyze vast amounts of historical data to identify trends and make informed projections. This includes evaluating the likelihood of unexpected events, such as strikes or supply shortages, thus allowing companies to prepare accordingly. Such analytical tools have been successfully implemented across various industries, demonstrating the value of data-driven decision-making in optimizing supply chain operations.

In conclusion, the evolving landscape of supply chain management is characterized by the increasing importance of real-time data and predictive analytics. Organizations that embrace these innovations will be better positioned to navigate the complexities of modern supply chains, ultimately leading to enhanced resilience and operational efficiency.

Stretching Companies' Flexibility to Match Regulations and Potential Related Risks

Laetitia Chery, JAS

Laetitia Chery, Vice President of Pharma and Healthcare for EMEA, emphasised the need for adaptability in the pharmaceutical sector. With the rise of personalised medicine and stringent regulations, companies must be agile to effectively navigate associated risks.

Chery highlighted the shift from traditional business models to direct interaction with patients, introducing the "business-to-patient" (B2P) model. This necessitates tailored approaches, allowing patients to select their treatments. Personalisation is no longer a future prospect but an immediate requirement.

Concerns were also shared regarding the logistical hurdles of advanced therapies, citing a breakthrough treatment for an eye disease with only a two-hour shelf life. The question of how freight forwarders can manage such sensitive shipments was raised, calling for innovative solutions in transportation.

In conclusion, Chery underscored the urgency for the pharmaceutical industry to rethink strategies in light of evolving regulations and the demand for personalised medicine. Collaboration between regulators and industry players offers significant opportunities to enhance patient outcomes while mitigating logistics risks.

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Amsterdam, NL

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RTO Status (Customs Space for Temporary Storage)
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WORKSHOP

Turbulence in the Air: Addressing the Logistics Challenges of Battling the Next Pandemic

Moderator: Samuel Speltdoorn, Brussels Airport

Through a scenario exercise, the workshop focused on the logistics challenges posed by the Triton-24 virus outbreak, necessitating urgent and coordinated efforts among various stakeholders in the aviation supply chain. Participants were tasked with defining key strategies and action plans to facilitate the distribution of the monoclonal antibody therapy, SpectrumAX2.

Stakeholder Action Plans

Pharma Manufacturers highlighted the urgency of obtaining emergency FDA approval and stressed the importance of packaging. They noted the high costs of logistics providers and the necessity for special approvals for transporting dry ice.

Customs representatives emphasised the need for fast-tracked FDA approvals and ensuring no sanctions affect manufacturers. They underscored the importance of having 24/7 personnel available to facilitate shipments and ensure all documentation is in order.

Ground Handlers outlined two primary action plans: one focused on origin operations, requiring collaboration with airlines for slot booking and service level agreements (SLA) for dry-ice machines, and the other on destination activities, emphasising training, setting standards for dry ice, and prioritising relationships with customs and airlines.

Freight Forwarders in group 1 identified time as a critical factor during crises. They established a task force to work with vendors and stakeholders, emphasising the importance of customs compliance and exploring last-mile delivery solutions.

Freight Forwarders in group 2 focused on strategic distribution planning, cold chain management, and real-time tracking. They stressed the importance of regulatory compliance, packaging stability, and developing contingency plans for efficient last-mile delivery.

Airlines committed to ensuring continuous operations, with Airline 1 focusing on agreements with stakeholders for specialised equipment and operational readiness, while Airline 2 concentrated on training personnel and ensuring adequate aircraft capabilities.

Airport authorities planned to establish communication with all stakeholders, invest in storage facilities, and provide training for staff. They emphasised the need for corrective and preventive actions in their quality management system (QMS).

Packaging Providers had distinct, yet complementary approaches. Packaging provider 1 prioritized understanding product size and capabilities, while packaging provider 2 emphasised the importance of temperature requirements and the use of IoT tracking solutions to ensure visibility throughout the supply chain.

Hospitals focused on establishing regional manufacturing sites, ensuring temperature control, and maintaining clear documentation for final mile distribution.

The workshop underscored the critical need for a coordinated approach among all stakeholders to address the logistical challenges of combating the Triton-24 virus. By implementing these action plans, stakeholders can enhance their preparedness for future health crises and ensure efficient distribution of essential medical products.

DAY 2 MAIN TAKEAWAYS

01 For practitioners, it is crucial to strictly comply with FDA regulations, as they govern drug approval, manufacturing, and safety. Non-compliance can lead to penalties, recalls, and risks to public health, making it essential to stay updated and collaborate closely with regulatory agencies.

02 New vaccine development focuses on vaccine stability, avoiding the cold chain. This might result in reduced cold chain pharma logistics volumes in the future. However, the cost component needs to be added to the equation to make a sound business case.

03 The future of vaccines will be in self-administration for the patient, decentralized produced and delivered synthetic vaccinology based on mRNA technology avoiding the bioreactor and vaccines beyond infectious diseases.

04 Research is showing that different risks can indeed be correlated meaningfully, and it is moving closer to finding risk coefficients to help companies predict risk.

05 As personalised medicines become more visible and advanced, B2P/DTP leads to a need for new standardisation in logistics to expedite and safeguard delivery to patients.

06 From chaos, something useful eventually takes form, especially when clear communication with stakeholders helps identify and strengthen weak links in the supply chain.

DAY CHAIRS | *Dr. Gautam Das, Ph.D.* *UTA* | *Ogan Gurel, MD* *UTA* | *Ruud van der Geer* *MSD*

KEY TOPICS OF THE DAY

Unlocking Innovation: Life Science Supply Chain Expertise in the Age of Big Data and AI

Learning Objectives

- What are the types of changes driving AI adoption in the pharmaceutical supply chain, and why is transformational change essential?
- How can AI and machine learning enhance visibility and decision-making in pharmaceutical logistics?
- What challenges does AI face in the pharma industry, particularly in terms of regulation, data security, and validation?
- How can simulation models and agent-based modeling optimize pharmaceutical logistics for efficiency and resilience?
- What role does IoT play in transforming healthcare delivery, particularly in the shift from centralized to remote care models?

Walk The Business Talk - Industry Insights and Industry Visits Learning Objectives

Summaries of Lectures, Presentations & Workshops

AI Pharma Supply Chain - Data-Driven Transformation: Empowering Efficiency, Redefining Logistics

Dave Malenfant, UTA

Dave Malenfant's presentation focuses on transforming the pharmaceutical supply chain through data-driven approaches and the increasing role of AI. He discusses three types of changes: developmental, transitional, and transformational, with transformational change being critical but embraced by only 21% of the industry. This type of change requires a shift in culture, mindset, and operational strategies.
The pharmaceutical industry is lagging in joining the digital ecosystem, with only 13% participating fully. AI is playing a growing role in enhancing supply chain visibility, where 17% of companies are leveraging AI to achieve better operational visibility, leading to more informed and efficient decisions.

Malenfant highlights the importance of transformational change in driving improvements in customer responsiveness, operational efficiency, data-driven decision-making, and innovation. The pharmaceutical supply chain is also impacted by trends such as increasing demand for biopharmaceuticals, advancements in cold chain technology, and the growing focus on sustainability.

Technological trends like IoT, Big Data, AI, and Blockchain drive change within the industry, improving visibility and enabling predictive analysis. However, AI implementation is not without challenges, as issues like data privacy, regulatory hurdles, and the shortage of skilled personnel pose significant barriers.
for all.

Skandi Network is pleased to announce that **Nissin**, with headquartered in Yokohama – Japan, has joined end 2024 Skandi Network as the first Skandi 360° tenant, connecting their global logistics network with the first digital collaboration platform to consolidate "GDP" active temperature- controlled transport and reduce emissions.

Nissin Belgium will be the gateway for Nissin's Life Sciences customers from around the world, offering a unique solution to/from Europe:

Covering all required Transport Network functionalities • Central GDP Quality Auditor for the Network , 1 QTA • Seamless integration

Unique QR code • Fully digital / One view / One access to data • All transport modes, end-to-end, incl. customs

1 single point of access where temperature measurements from different sources are being integrated, together in combination with other date from different systems into 1 Proof of Delivery

End-to-End temperature monitoring • Strategic crossdock placement • Packaging optimization • Dynamic Transport Plan

Cosolidation of flows • Colli – Pallet Groupage - LTL • MarketPlace • Optimisation of logistics networks •

Swift & secure deliveries according GDP regulations • Risk Lane Assessment • Strategic crossdock placement

Improve customer's experience

DEBATE

Balancing Human Intelligence with Artificial Intelligence: Control or Command

Moderator: Ogan Gurel, UTA
Panel: Ruud Van der Geer, MSD
Gergely Szorcsik, Zoetis
Victoria Wilmore, J&J
Carlos Hernandez, Pfizer

The debate centred around whether AI should be controlled or commanded. The panellists discussed several key challenges and opportunities AI presents in the pharmaceutical supply chain.

AI's Role in Decision-Making: AI has the potential to automate route selection for logistics, but collaboration and communication remain vital as teams often work in silos, leading to overprotection and lack of data sharing.
Data Control Issues: One of the critical challenges is the need for complete control over the data, which comes from various sources and lacks proper regulatory oversight.

Waste and Inefficiency: Over 30% of medicines go unused, highlighting the inefficiencies in the current system that AI could help address if implemented effectively.

Validation of AI: A significant concern is the validation of AI, mainly since much of the transport work consists of unique events without clear trends. This raises questions about how AI can genuinely improve operations.
Ethical Challenges: Ethical decisions involving patient data are complex to manage with AI.

Combination with Traditional Methods: The panellists concluded that AI is implemented in small pieces alongside conventional methods. However, they warned of being overly optimistic about its capabilities without addressing validation issues.

The AI Odyssey: Playtime for Interaction

Chengkai Li, UTA

- We can see computation as functions (input -> hidden function -> output)
- Uncovering patterns from past, known examples to act on future, unseen inputs. That's the gist of machine learning.
- Example of GPT-3 in pharma logistics. Jackson et al (2023)
- The paper From Natural Language to Simulations explores how AI, specifically GPT-3 Codex, can automate the development of simulation models in logistics. It uses natural language descriptions to generate queuing and inventory control system models. This approach reduces the need for technical expertise in simulation modelling. The paper also emphasises human-AI collaboration, highlighting the importance of human oversight in verifying the AI-generated simulations to ensure accuracy. Future advancements are expected to address more complex logistics problems with AI-driven automation.
- AI also transforms the pharmaceutical industry by enhancing supply chain management, cold chain logistics, and predictive analytics. In pharma, AI reduces drug shortages, optimises delivery times, and improves overall supply chain efficiency by leveraging technologies like IoT, Big Data, and machine learning.

Optimization for Interdisciplinary Pain Management & Implications for Pharma Logistics

Jay Michael Rosenberger, UTA

Pain causes biological, psychological and social issues. Prediction models to predict what pain levels would be to optimise treatments.
The presentation by Dr. Jay Rosenberger focuses on applying two-stage stochastic optimisation to interdisciplinary pain management and its implications for pharmaceutical logistics.

Pain Management Optimisation: The research aims to develop optimal treatment strategies using statistical and optimisation methods for adaptive pain management.

Pharmaceutical Implications: The findings suggest that pharmaceutical logistics must be agile to adapt to changes in treatment protocols and patient needs.

Treatment Comparisons: The presentation includes case studies comparing treatments across multiple stages and outcomes, such as pain reduction and disability scores, using models for optimising patient care.

From Intra-hospital Rapid Response Teams to Remote "hospital@home" Care Models: How IoT Transforms Rapidly the New Healthcare Models and Supply Chain

Dr. Iain Goodhart, Intensive Care & Anesthesia, Cambridge University Hospital, UK (presentation given by Frank Van Gelder, Pharma.Aero)

Rapid healthcare transformation from traditional in-hospital care to remote "Hospital@home" models, primarily driven by IoT technologies.
There is a looming global shortfall of healthcare workers, with ageing populations, retiring professionals, and burnout among physicians and nurses. A significant shortage is projected for 2024 and 2050.
The old model was centralised with high costs and resource demands. The new model focuses on home-based chronic care and specialised acute hospital care, aiming to distribute costs and resources more efficiently.
Innovations are being implemented at "lightspeed," focusing on technologies like needle-free patch technology for mRNA vaccines, eliminating the need for frozen storage.

Agent-Based Modelling for Assessing and Optimizing the Performance of Pharmaceutical Logistics Systems

Prof. Yuan Zhou, University of Texas at Arlington

Yuan Zhou's presentation provides an in-depth exploration of Agent-Based Modeling (ABM) in pharmaceutical logistics. ABM simulates individual "agents" within a system, making it ideal for modelling complex logistics networks, such as those in the pharmaceutical industry.

Agent-Based Modeling (ABM): ABM is a computational modelling technique that simulates complex systems, such as pharmaceutical logistics, by creating "agents" representing various system components.

ABM Application in Pharma: ABM helps optimise warehousing, distribution, and supply chain management in the pharmaceutical industry, tackling challenges like temperature control, quality assurance, and efficient delivery.

Case Studies: Demonstrated success stories from Cardinal Health and GlaxoSmithKline, where ABM was used to optimise warehouse operations and supply chain design for a vaccine manufacturer.

Benefits of ABM: ABM allows for real-time, dynamic simulations, enhancing performance, agility, and decision-making processes.

Prof. Yuan Zhou's presentation discussed a handful of challenges in pharma logistics:

Visibility and Traceability: Ensuring real-time visibility of shipments to track drug movement and prevent counterfeit products is critical.

Cold Chain Management: Maintaining a reliable cold chain is challenging due to the vulnerability of products to environmental changes.

Regulatory Compliance: Meeting strict regulations on storage and transportation is essential to prevent quality degradation.

Agility and Resiliency: Fast and adaptable supply chains are crucial, especially in responding to unexpected disruptions.

WORKSHOP

Pharma.Aero Project on Security Standards

Moderator: Nicola Caristo, n21 Consulting

Participants were split in different, mixed groups. Based on 6 security measures (security policy and risk assessment, training, auditing, facility security measures, access control and tracking measures, cargo operations and procedures), each group was to define and rank the top 3 measures which should be implemented per category of stakeholder.

Pharmaceutical Manufacturers	**Asset Protection** – Contingency plan for cargo theft – Last mile chain of custody – Pharma certified transport (TAPA)
Freight Forwarders and Trucking	**Data Protection** – Cybersecurity, Training, Deep fake AI **Aviation, Custom, Asset and Data Protection** – Supply chain, Monitoring, Sensors – Qualified Partner Network (QPN) e.g. Network, Partners, Security Agencies
Airlines	**Aviation** – Cargo Screening **Aviation, Custom and Asset Protection** – CCTV **Aviation, Custom, Asset and Data Protection** – Staff Training
Ground Handling Agents	**Data Protection** – Customer data and cargo characteristics **Aviation** – Aircraft, freight, Passengers, Facilities, Compliance **Aviation, Custom, Asset Protection and Data** – Personnel Security (e.g. background check, training) **Asset Protection** – CCTV, Alarms, Warehousing
IT Providers	**Data Protection** – Cybersecurity – data breach – Data Privacy (e.g. GDPR) – System Failure (e.g. having BCP)
Packaging Providers	**Aviation and Asset Protection** – Seals, sensors **Custom Protection** – Cargo Screening, Documents (pouch, data) **Data Protection** – Protection of data loggers, Temperature data

POSTER SESSION

Upon the Scientific Catwalk: Where Business Meets Academics

Through this poster session, students from the University of Antwerp had the opportunity to showcase their research to a business audience of PLMC participants representing all segments of the life sciences and MedTech supply chain. This format allowed each student to present their findings in a visual manner, creating discussions and engagement. The business audience showed a keen interest, asking insightful questions and offering feedback, which not only provided valuable ideas for the students but also facilitated a deeper exchange of ideas between academia and industry. This session provided a warm up before the field trips by establishing a collaborative perspective and the importance of academical knowledge to the industry.

WORKSHOP

Driving Value through Unparalleled Agility in Pharma and E-Commerce Value Chains

Syed Haris Raza, Dnata

In this interactive workshop, Syed Haris Raza from dnata examined the key trends shaping the pharmaceutical and e-commerce logistics, and their impact on interconnected ecosystems.

A central theme of the session was the role of **artificial intelligence (AI) and big data** in enhancing collaboration within logistics networks. The workshop also addressed **critical industry drivers** influencing the future of logistics, including Manufacturing 4.0, Supply Chain Management 2.0 (SCM 2.0), and advancements in AI-driven analytics. These factors are particularly relevant for handling highly specialized products such as **Advanced Therapy Medicinal Products (ATMPs), gene and cell therapies, and vehicle-to-vehicle (V2V) logistics**, which demand precise control and adaptability.

INDUSTRY VISITS

As part of the Pharma Logistics Masterclass, participants visited key industry sites to gain firsthand experience of cutting-edge logistics and supply chain practices. These visits provided valuable insights into cargo operations, cold chain logistics, and air traffic management.

Ameriflight

Dallas Fort Worth International Airport, TX 75261

Ameriflight is US largest PT 135 airline, specializing in small to mid-sized cargo transport, including high-value shipments like live animals. Participants toured the office, training facility, and airplane hangar, learning about the company's expertise and future focus on unmanned aircraft deliveries. A highlight of the visit was stepping inside a cargo plane and testing the flight simulator.

Cold Chain Technologies

Fort Worth, TX 76137

The visit to Cold Chain Technologies showcased the end-to-end cold chain logistics process,from initial packaging design to final delivery. Participants learned about sustainable single-use packaging solutions that have prevented over 102 million pounds (46 million kg) of waste from reaching landfills. The tour covered product design, testing, and manufacturing, highlighting the company's role in ensuring pharmaceutical product integrity while advancing corporate sustainability goals.

Integrated Operations Center (IOC)

Dallas Fort Worth International Airport, TX 75261

While visiting the IOC, participants were granted exclusive behind-the-scenes access to the FAA Control Tower, and insights into its operational complexities. The tour included an in-depth overview of each position within the control room, from air traffic controllers to operations supervisors, and demonstrated their vital roles in ensuring safety and efficiency. Key performance indicators (KPIs) were discussed extensively, highlighting metrics such as on-time arrivals, departure efficiency, and incident response times. Guests observed real-time decision-making processes and the tools used to manage air traffic flows, showcasing the advanced technology and data integration involved.

SCL Cold Chain

Irving, TX 75063

At SCL Cold Chain, participants explored the warehouse facilities designed for cold chain products, especially pharmaceutical and wines. The company's founder shared insights into its growth in the Dallas-Fort Worth region, emphasizing packaging innovations and temperature-controlled transportation. In addition to interacting with various packaging elements and refrigeration units, participants gained valuable insights into the operation, capabilities, and handling of sensitive and valuable deliveries.

DAY 3 MAIN TAKEAWAYS

01 Only 21% of pharmaceutical companies embrace transformational change, crucial for enhancing customer responsiveness, cost-efficiency, and innovation.

02 With just 13% digital ecosystem integration and 17% leveraging AI for visibility, the pharma industry sees major growth potential in supply chain optimization.

03 Technologies like IoT, Big Data, AI, ML, and Blockchain are driving predictive analytics, real-time decision-making, and improvements in cold chain logistics.

04 Ethical issues, data control, and validation remain key obstacles to fully realizing AI's potential in the pharma supply chain.

05 New models like IoT-driven "hospital@home" and Agent-Based Modeling (ABM) are transforming healthcare logistics to improve resilience, traceability, and regulatory compliance.

DAY CHAIRS | *Dr. Brian Sauser, G. Brint Ryan College of Business, UNT* | *Dr. Roland Yap Novartis*

KEY TOPICS OF THE DAY

Future-Proof Strategies: Creating Resilience through Scenario Planning

Learning Objectives

- What role does scenario planning play in building resilience and managing risk in uncertain environments?
- How can organizations identify and prioritize factors in supply chain disruptions to prepare effective response strategies?

Pioneering Last-Mile Delivery for the Healthcare of Tomorrow

Learning Objectives

- How can drones effectively enhance last-mile delivery, particularly in healthcare and remote regions?
- What role does digital integration play in modernizing traditional logistics models like hub-and-spoke?
- What are the key regulatory and logistical challenges in implementing drone and cold chain logistics, and how can industry collaboration address these challenges?
- How can continuous tracking and digital oversight improve flexibility and adaptability in complex supply chain networks?

Summaries of Lectures, Presentations & Workshops

Insights in the UAV Research Testing Facility

University of North Texas

While visiting the UNT drone facility, participants learnt that the aviation industry is moving towards the possibility of autonomous vehicles as a new way of operation. Drones have become vital tools providing essential services like delivering WiFi signals to disaster-stricken areas, where traditional communication infrastructure is not working. For safe and efficient drone operations, the concept of a "highway for drones" is being developed, providing exclusive air corridors. On the other hand, with the growth of autonomous drones the problem of cyber security arises, as theft of deliveries or even terrorist attacks are potential threats that may occur by hacking the drones' system. New approaches, such as non-physical contact charging during the flight, for instance, through beams, enhances the range and efficiency of drone operations. Moreover, collaboration of drones with other stakeholders in the supply chain is crucial to enhance the fit of new technology into the industry and increase its efficiency.

Conquering Uncertainty: Building Business Resilience and Decoding Risk & Crisis Management through Scenario Planning

Milton De La Paz, DFW

Milton De La Paz from DFW kicked-off by presenting an overview of the contemporary leadership concept, with the major emphasis made on the idea of 'looking around the corner,' which means that leaders must consider future issues and prospects in the context of the growing uncertainty of the business environment. In today's world where disruptions are quite common, flexibility is now a must. Milton defined resilience as more than a capacity to cope with the shocks but as an organizational ability to respond quickly, change strategies and make decisions when disruptions occur.

A key part of the session was devoted to scenario planning, a method to prepare for the unknown by making assumptions about possible future conditions. It was clarified that this technique is not about predicting outcomes but rather exploring various plausible scenarios. Scenario planning, Mr. De La Paz explained, is especially effective during periods of uncertainty or internal changes, helping leaders envision potential impacts without needing certainty.

To illustrate the power of this approach, a practical example from DFW was presented. This example underscored how scenario planning enables businesses to consider multiple futures, identify possible impacts, and be better prepared to respond. Throughout the session, it was clear that building resilience through anticipation and structured planning is becoming an essential part of modern leadership.

WORKSHOP

Reality of Unforeseen Disruptions: Supply Chain Preparedness

Moderator: Milton De La Paz, DFW

As part of this workshop, participants were divided into groups and asked to create a scenario designed to address potential supply chain disruptions in various industries, simulating how an organization might identify and respond to unpredictable events.

The first task was to identify 10 key impacts, driving forces and trends that could shape the scenario. This exercise helped participants to think beyond what is seen and considered; factors and trends that are not easily visible but can significantly affect the company performance in case of disruption. Next, attendees filled in an uncertainty matrix, assessing each factor based on its level of uncertainty and critical importance. This approach helped to categorize elements and understand which ones demanded priority planning and which carried less impact. The workshop then shifted to the implication matrix, where participants developed three layers of potential consequences, following an "if this happens, then what follows" model. This layered approach allowed them to map out main effects of risks identified. Finally, the task was to create actionable countermeasures to propose to a hypothetical CEO. Participants evaluated each measure's effectiveness, considering both cost and implementation.

Who Owns the Last Mile Delivery, and Why You Should Care

Brian Sauser & Clinton Purtell, UNT

This session addressed the rapid changes in the supply chain industry, focusing on last-mile delivery and the growing role of drone technology. The speakers highlighted how the logistics landscape is evolving quickly, forcing traditional supply chain models to adapt. Unlike large delivery platforms—planes, trucks, and trains—owned by industry giants, drones are disrupting the market by making last-mile delivery ownership accessible to anyone.

Sauser and Purtell explained that drones, with their autonomous capabilities, have the potential to simplify last-mile delivery. However, regulatory challenges, particularly in the U.S., are slowing progress. Strict regulations have driven some drone innovators to relocate their research overseas, limiting the widespread use of unmanned aircraft in the U.S. The presenters emphasized the need for collaboration and suggested offering drones as a service rather than simply as a technology. This model would involve multiple parties to address both technological and legal obstacles, while also capitalizing on drones' multitasking abilities. For example, drones could gather environmental data on their return trips to base.
The session concluded with a look to the future, suggesting that drones could become independent modes of transport, potentially revolutionizing last-mile delivery if legal frameworks and business models evolve.

Exploring the Reality of Using Drone Transport Services in the Healthcare & Pharma Sectors

Olivier Defawe, VillageReach
Clinton Purtell, UNT

The session explored the potential of drones as a sustainable transport solution, with a focus on their application in the healthcare and pharmaceutical sectors. The speakers highlighted that drones provide distinct advantages for both routine and urgent deliveries, especially in regions where infrastructure is lacking.
Africa was presented as a "testing ground" for drone technology, as the continent has more readily embraced drones compared to other regions, thanks to fewer regulatory restrictions and ongoing infrastructure challenges. This open environment has allowed drones to play a critical role in serving remote and underserved communities.

The presenters shared how cargo drones are already being utilized for a variety of deliveries, ranging from regular medical shipments to time-sensitive emergency supplies. However, they also pointed out several challenges faced by drone operators in Africa, including technical and regulatory obstacles, as well as issues surrounding public acceptance and environmental impact.
In conclusion, while challenges remain, the African experience with drone technology in healthcare and pharmaceuticals offers a hopeful outlook on how drones could be transformative in delivering essential services globally, particularly in areas facing similar logistical difficulties.

Adaptable Cool Chain Solutions for Challenging Last-Mile and Remote Point of Care

Christopher Storch, Envirotainer

Christopher Storch discussed the transformation of the cold chain, driven by increasing complexity in territories, varied parcel sizes, medical advancements, and stringent regulations. Storch emphasized that we are entering a "new age" of last-mile distribution, where "the world gets smaller and colder." This shift is characterized by smaller shipments and the need for colder storage temperatures to accommodate sensitive pharmaceutical products.

The last-mile now extends beyond standard delivery to focus on clinical trials, precision therapies, and commercial distribution. Mr. Storch noted that reverse logistics and robust packaging management are critical for maintaining product integrity in the cold chain. He advocated for collaboration between industry stakeholders to find more standardized solutions across the industry to meet the challenges of a modern cold supply chain.

Reinvention of the Hub-and-Spoke System

Rudy Smets, Skandi Network
Nuno Bento, MixMove

In the final session of the day, Rudy Smets and Nuno Bento discussed the impact of digital transformation on traditional logistics models, emphasizing that while the hub-and-spoke system is efficient in theory, it needs modern digital integration to thrive in today's supply chain environment. Digital systems have become essential for fostering collaboration among partners, ensuring alignment to maintain operational efficiency.

One of the session's key points was the necessity of continuous cargo tracking, which provides real-time visibility into shipments and allows for swift responses to any issues or delays. The speakers noted that this constant digital oversight ensures the system's flexibility and adaptability, creating a synchronized network that can handle complex deliveries and meet evolving customer expectations.

DAY 4 MAIN TAKEAWAYS

01 Drone technology development can rise high cybersecurity concerns together with providing an unlimited variety of utilization ways.

02 Scenario planning can be utilized as a key tool for building resilience, helping leaders anticipate disruptions and respond with adaptable strategies.

03 Mapping of potential supply chain disruptions, prioritization of impacts, and developing of proactive strategies can impact greatly the resilience against unexpected events.

04 Drones have significant potential to disrupt last-mile delivery, but adaptable business models and supportive regulatory frameworks are needed to fully realize this potential.

05 Drones are proving transformative for healthcare logistics in underdeveloped regions, where they fill critical transport gaps for medical deliveries.

06 Innovations in cold chain logistics are essential, with standardized packaging and reverse logistics playing a crucial role in supporting last-mile deliveries for sensitive pharmaceuticals.

07 Digital integration is increasingly necessary to modernize traditional logistics models like hub-and-spoke, enabling real-time tracking and operational flexibility.

08 Collaboration among industry stakeholders is essential for overcoming regulatory, logistical, and technological challenges in today's supply chains.

2024 PLMC MAJOR TAKEAWAYS AND LEADS FOR THE 2025 EDITION

01 The **USA is the largest pharmaceutical market** but depends on imports, followed by **China and Japan**. Key import markets include Canada, China, Japan, and South Korea. Air transport dominates the pharmaceutical trade in terms of both value and cost. Europe (Germany, Switzerland and Belgium) is a major exporter of high-value pharmaceuticals.

02 **The Northeastern USA is the primary hub for pharmaceutical trade**, handling nearly 90% of imports and 75% of exports. Dallas Fort Worth, a key economic centre in Texas, is investing significantly in its life sciences sector to drive future growth, **following the trend observed in other regions globally.**

03 **Traditional logistics providers** focus on transport and handling, while **emerging players** like Amazon's Prime Air and Alibaba's Cainiao integrate pharmaceutical logistics into **broader ecosystems linked to healthcare.**

04 **Synchromodality,** which combines road, maritime, air, and rail transport, is gaining traction. It optimizes costs and transit times and enhances sustainability.

05 **New technologies** like digital twins, real-time sensors, generative AI, and drones are set to transform pharma logistics, moving towards more advanced decision-making and new logistics methods.

06 Traditional pharmaceutical supply chains prioritize safety, often hindering innovation. **Targeted innovations could improve efficiency without compromising safety in less critical areas.**

07 **Strict compliance with FDA regulations** is vital to avoid penalties and ensure drug safety. Staying updated and collaborating with regulatory agencies is key. Embedded regulators in the warehouses are a big plus.

08 Research shows different **risks can be correlated,** moving toward developing risk coefficients for better prediction.

09 **Scenario planning** is the most effective way to mitigate risks and prepare for future events.

10 New vaccines focus on stability, **reducing cold chain dependency**, which could lower logistics volumes, but cost considerations are key.

11 Vaccines will move toward **self-administration, decentralized mRNA-based production**, and applications beyond infectious diseases.

12 **Personalized medicine** advancements will require **new logistics standards** for efficient and secure patient deliveries.

13 **Future healthcare will be patient-centric**, combining home, community, and virtual care, enhancing self-care and supported by efficient, connected healthcare organizations.

Prof. Dr. Roel Gevaers, University of Antwerp
Chair of PLMC™

"Following previous PLMC™ editions in Antwerp, Abu Dhabi, Singapore, and Dallas Fort Worth, this year's Masterclass continues to strengthen our international footprint and to trigger meaningful collaboration in the pharma logistics sector. The 2025 edition will mark an important milestone, being the first-ever to be hosted across two top pharma hotspots in Japan: Osaka and Kyoto. Linking the PLMC™ to the World Expo in Osaka, where life sciences will be a key focus, aligns with our mission to connect business and academia at the intersection of global trends."

Frank Van Gelder, Secretary General of Pharma.Aero
Co-Chair of PLMC™

"Japan, ranking among the top five pharmaceutical markets globally, is an ideal setting for the 2025 Pharma Logistics Masterclass. The country is not only renowned for its cutting-edge research and development in high-value and chronic care medicines but also for its role as a home to major blue-chip pharmaceutical companies. With the World Expo 2025 set to spotlight Japan's forward-thinking contributions to life sciences and healthcare, this Masterclass will provide a unique opportunity to engage with key industry players and explore the innovative logistics solutions shaping the future of pharma supply chains."

Trevor Caswell, Chair of Pharma.Aero

"The Pharma Logistics Masterclass has become a cornerstone of Pharma.Aero's commitment to advancing knowledge and collaboration within the pharmaceutical supply chain. Each year, we bring the Masterclass to a different region of the world, enabling participants to immerse themselves in the unique challenges and opportunities of the local industry. This fifth edition, taking place in the vibrant cities of Osaka and Kyoto, highlights the importance of exploring diverse global perspectives. We are incredibly grateful for the strong partnership and unwavering support from our Pharma.Aero members — Kansai International Airport, All Nippon Airways, and Nippon Express Group — who play a crucial role in making this impactful event in Japan possible."