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WHITE PAPER

3rd EDITION

PHARMA LOGISTICS MASTERCLASS

4 – 8 SEPTEMBER, SINGAPORE

PLMC™

WHERE BUSINESS MEETS ACADEMICS

Executive Summary

Convening at the Singapore University of Technology and Design, the third edition of the Pharma Logistics Masterclass (PLMCTM) brought together 136 academics, industry experts and life science leaders, from 24 countries, to address the most challenging and important aspects of today's life science logistics and supply chain.

Building upon pivotal insights gleaned from prior editions, the 2023 PLMC meticulously aligned past decisions with prevailing industry trends. The resultant program fostered a dynamic environment wherein instructors and participants could distill critical future strategies for the life science supply chain and logistics.

Key focal areas encompass advanced automation and digitalization, the transformative impact of emerging technologies on the industry, groundbreaking medical innovations, strategic advancements in business, applied scientific research, considerations related to the environment and sustainability, as well as the promotion of cross-industry collaboration and exchange of ideas.

These key considerations were scrutinized in-depth through diverse workshops, facilitating smaller group discussions that yielded pivotal strategic takeaways. This progressive understanding will play a pivotal role in shaping the forthcoming PLMC 2024 program.

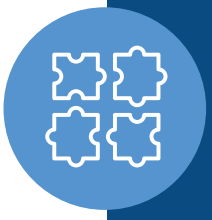
The most important conclusions of the PLMC 2023

Regulation and ethics are key themes in future pharma logistics developments

Pharmalogistics have an increasingly important role in the pharmaceuticals value chain

How can a control tower be upgraded to a command tower and what is the role of powerful e-commerce companies controlling supply chain and logistics data

From unimodality to multimodality, to synchromodality and the need to decarbonize the supply chain



R&D, pharmalogistics and hospital logistics, how can we boost our skills to learn from cross-pollination?

The successful conclusion of the third Pharma Logistics Masterclass underscores the initial objective of this intensive training, demonstrating an absolute and immediate need for very specific training that not only strengthens skills and knowledge but also exemplifies the efficacy of collaborative efforts between academia and industry. A meticulously crafted and focused program, blending analytical rigor with solution-oriented content, culminates in an evidence-based training experience. Anticipation is high for the PLMC24™ in Dallas - Fort Worth, Texas, USA, next year.

Prof. Dr. Roel Gevaers, Chair of the PLMC™ *Frank Van Gelder, Co-Chair of the PLMC™*

Organizing Committee

Prof. Dr. Roel Gevaers, Chair
Mr. Frank Van Gelder, Co-Chair
Prof. Dr. Wouter Dewulf
Mr. Trevor Caswell
Assoc. Prof. Lynette Cheah
Prof. Dr. Koen Vandenbempt
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Prof. Dr. Christa Sys

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DAY 1

EMULSIONS OR SOLUTIONS:
HOW COLLABORATION CREATES THE FUEL TO SUPPLY CHAIN INNOVATION

Day Chair: Prof. Dr. Wouter Dewulf, University of Antwerp

Day 1 Learning Objectives

What is the place of the ASEAN pharma market in the global pharma market?

What are the key ingredients for applied research in pharma logistics?

How to integrate research in your industry and business performance?

Where are we heading with the new trends in healthcare developments and possible impact on the supply chain?

Day 1 Lectures and Presentations

Applied research in pharma logistics: a far-fetched ambition or a necessary evolution
Prof. Dr. Wouter Dewulf, University of Antwerp

The distribution of the COVID-19 vaccine has ignited a surge in academic interest surrounding pharmaceutical logistics. Notable instances of successful applied research in this domain include the University of Florida's contribution to the development of Gatorade and the active involvement of various universities in the early-stage development of entities such as Google, Mosaic, plasma screens, and Allegra Allergy.

Collaboration within this realm is shaped by a confluence of external and internal factors. External factors, such as public funding, and internal factors, including company size and age, play pivotal roles in influencing these partnerships. Both national and international agencies have instituted collaborative programs aimed at bolstering such partnerships.

The nexus between the academic and industrial spheres, fortified by enhanced collaboration, serves as a catalyst for innovation within the supply chain. This Masterclass stands as a significant contribution toward fostering increased collaboration, thereby advancing the overarching goal of bridging academia and industry for the betterment of life science and MedTech logistics.

The interconnected global pharma supply chain: the bald and the beautiful

Mr. Vincent Van Bockstaele, University of Antwerp

While Europe stands as the primary exporter of finished pharmaceuticals via air, South Asia is steadily emerging as a prominent market.The pharmaceutical industry is expected to grow substantially in emerging markets due to increased healthcare investment, a growing middle class, and urbanisation.

Developed countries will grow moderately while emerging countries will experience significant expansion.

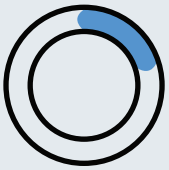
ANNUAL GROWTH RATE

6.56%

The global pharmaceutical market is projected to reach a value of 1.5 trillion USD by 2023, with a compound annual growth rate of 6.56% over the past 20 years.

GLOBAL EXPENDITURE

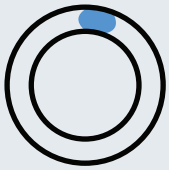
27%



The United States, China, India, Japan, and Germany contribute to half of the global pharmaceutical expenditures, with the US alone accounting for 27%.

USA

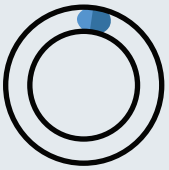
7%



Within the intricate web of pharmaceutical costs, logistics expenses, encompassing last-mile delivery, picking, and storage, constitute a significant 7% of the global expenditure.

TRANSPORTATION

3.59% & 5.58%



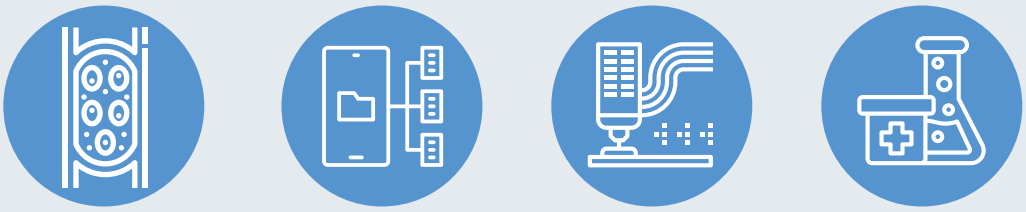
The aviation industry plays a crucial role in long-distance transportation expenses, where pharmaceuticals command a notable 3.59% of air cargo, contributing 5.58% to airline revenue.

The permeability of innovation changes the landscape of pharmaceutical logistics

Mr. Frank Van Gelder, Pharma.Aero

By 2031, individualised medicine and gene therapy will be the main treatments for major diseases like cancer, diabetes, and heart diseases. The demand for healthcare will increase by 70% by 2031. AI-driven clinical research will become the new standard. However, there is still an imbalance in healthcare across regions.

Exciting advancements in medicine include mRNA technology, cell and gene therapies, telehealth, data integration, AI, healthcare data protection, new pharmaceutical products, wearables, in-home tests, augmented and virtual reality, and 3D printing.



There is a shift towards person-centred products and services, brand-driven value propositions, platform-enabled business models, and digital-enabled operating models. Clinical trials are increasing due to increased technological advancements and innovations within medical science.

The prominent accelerators or showstoppers will be the regulatory frameworks and the related complex logistics. This is already resulting in significantly increased R&D work in the US, where Europe is either stabilising or even decreasing.
Clinical trial management is transitioning to a "to-door" service through a connected patient hub principle.

Data analytics and AI are driving personalised treatment and evidence-based decision-making. Integrated and seamless data integration is crucial for leveraging the potential of these advancements and creating interconnected data ecosystems.

The ASEAN supply chain: an aromatic recipe of growth, learning and resilience

Mr. Jamie Bloomfield, SUTD

The current lack of collaboration hinders establishing a reliable interconnected ecosystem. Scaling up inter-company operations for future healthcare treatment logistics presents a challenge.

Let us take a closer look at the pharmaceutical trade in Southeast Asia. This region poses difficulties for logistics due to its numerous mountains, islands, and a mix of highly urbanised and sparsely populated rural areas.

Asia's major pharmaceutical trade lines are from China to India, followed by Singapore to South Korea and Japan to South Korea.
Regarding value, the most significant trade lines are from China to Indonesia, Hong Kong to China, Singapore to China, Japan to China, and Singapore to Japan.
It is worth noting that China and India have the most significant number of pharmaceutical manufacturers in the region, while the number of manufacturers in other regions is significantly smaller.

Figure 1 The pharmaceutical trade in South East Asia

In order to ensure that Public Health Centres have the necessary conditions and infrastructure for pharmaceutical transport, one opportunity is to invest in intermodal transport connectivity and logistics systems. This would provide the right environment for the transportation of pharmaceuticals.

Additionally, the ASEAN Free Trade Agreement, established in 1992, allows for tariff-free import of pharmaceutical products between member states and promotes harmonised drug registration and inspection policies. There is also an ongoing push for harmonisation of ASEAN pharmaceutical registration.

The ASEAN region primarily exports pharmaceuticals to Switzerland and the United States while importing from Europe, the United States, and India.

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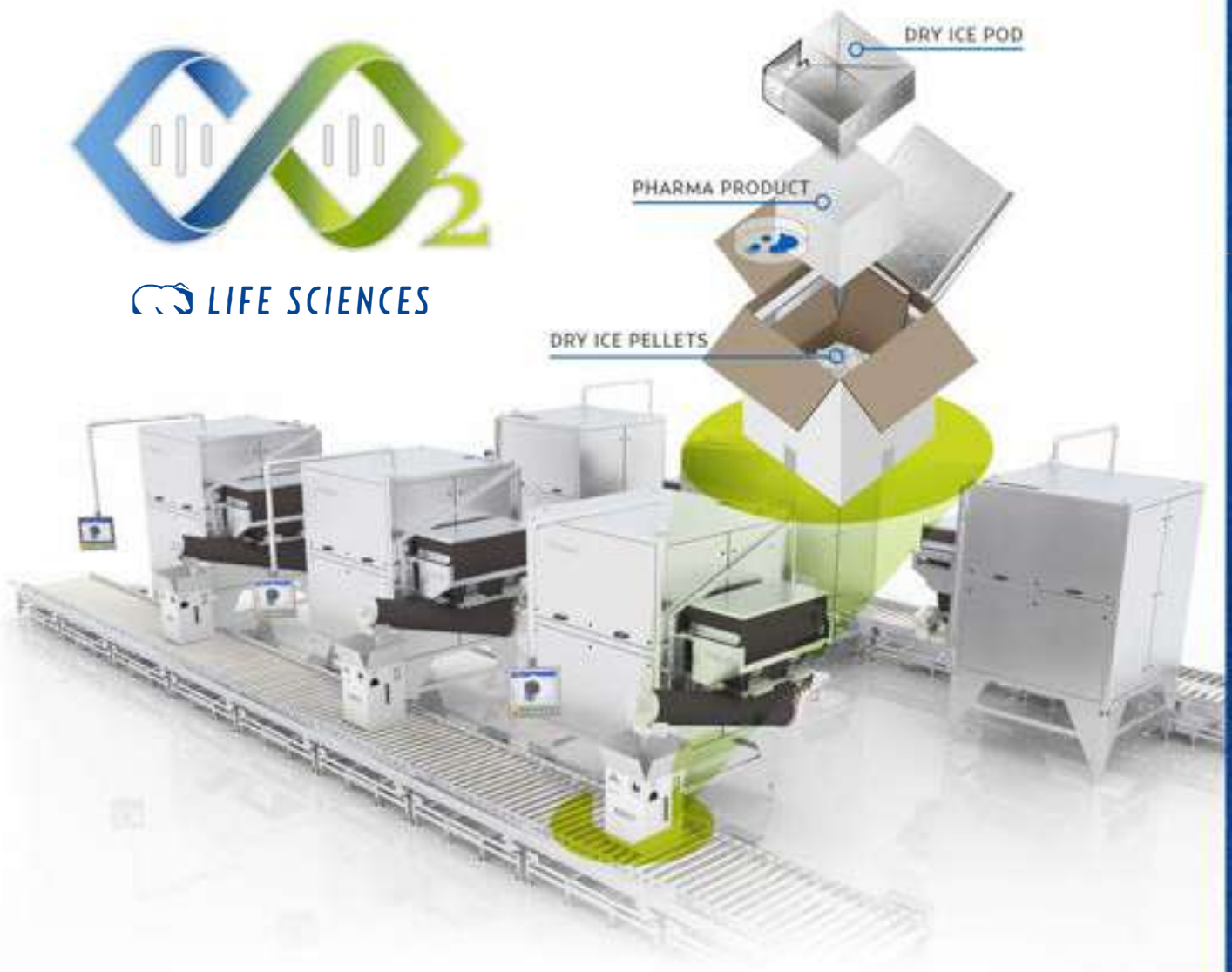

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PANEL | Safeguarding and Anticipating Healthcare Supply Chain Resiliency in Practice: Perspectives from Singapore and Flanders, Belgium

Moderator: Kim Demeyer (Science & Technology Counselor, Flanders Investment & Trade)

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Day 1 Main Takeaways

01

Pharmaceutical companies and universities have always been working together. However, there is currently a shift from a more unilateral collaboration towards a **bilateral mode of collaboration** resulting in a stronger position for the universities.

02

Collaborations on pharma research between the industry and universities are well established, while collaborations on **pharma logistics** are just taking off. Reluctance to collaborate in this field is often blocking the development of a reliable interconnected ecosystem.

03

While the pharmaceutical industry is an established industry in developed countries, there is still a **large potential in emerging and developing countries.** While moderate pharmaceuticals consumption growth is expected in developed countries (+-5% CAGR), a larger double-digit growth is expected in Asian countries like India, Indonesia, Vietnam and Malaysia.

04

Logistic costs constitute about 7% of the pharmaceutical market revenues with the last mile delivery, picking and storage as its major contributors. While the **airport-to-airport transport constitutes only about 3.5% of the supply chain costs, air transport remains a crucial and indispensable element in the pharma logistics supply chain costs.**

05

A pharma logistics strategy should contain **Technology, Regulatory Compliance and Sustainability** as basic pillars. This strategy should be supported by a focus on **Product** (through integrity, value and complexity), **Process** (through on demand, always-on digital and interoperability) and **People** (through skills, collaboration and cross-industry).

DAY 2

STRATEGY TO ACCOMMODATE NEW TECHNOLOGY:
EMBEDDED COMPANY LEADERSHIP WILL CARVE OR END THE FUTURE OF TODAY'S COMPANIES

Day Chairs: Prof. Dr. Lynette Cheah, SUTD | Ruud van der Geer, MSD

Day 2 Learning Objectives

Which innovations and data trends can help increasing efficiency and effectivity in pharma logistics?

Which is a suitable strategy to deal with fast moving pharma supply chains?

What are key success factors to implement the fast evolving technology trends in pharma supply chain digitization?

How to match the permanent need of acceleration of business strategy?

Day 2 Lectures, Presentations and Workshops

Inside the data world: digital design and manufacturing
Assoc. Prof. Pablo Valdivia y Alvarado, SUTD

The presentation focuses on the digital design and manufacturing world, and we learn about some truly innovative concepts that will significantly impact the industry. One of the most exciting ideas is rethinking the life cycle of products. Typically, a product's life cycle lasts only a few weeks to a year and involves recycling components and waste.
However, the team at the SUTD University is working on an alternative life cycle that will reduce waste even further. Another impressive development is the creation of new robotic arms through 3D printing components that can grasp objects like humans can and even reach behind them. This technology has many potential applications in the supply chain, such as packaging. After the presentation, we were given a guided tour of the university labs, which was an excellent opportunity to see some of these technologies in action.

Pre-flight Safety briefing: Navigating comfortably risks by identifying, analysing and finally predicting them

Chonchol Gupta, University of Antwerp

Later in the day, we attended a talk on pre-flight safety briefing, which focuses on navigating risks by identifying, analysing, and predicting them. Where risks come from and what generates them is crucial. However, the problem is that risks are often approached in a silo manner, with individual reports for insurance, the supply chain, and each supplier. This approach leads to overwhelming data lakes for managers to sort through and analyse. Risks cannot be viewed from a silo perspective but need a more holistic approach. It was a thought-provoking talk that left us all with a lot to consider. In his PhD, the researcher is delving into the complexities of risk interconnectedness and how it can cause a plethora of problems for businesses. Shockingly, only a measly 2% of companies have visibility into the risks their tier 3 suppliers pose, yet a whopping 75% of issues arise from there. It's high time for companies to expand their geospatial systems and create a comprehensive risk management system. Take, for instance, the catastrophic hurricane that hit Puerto Rico, where 95% of US post paper originated from, leaving companies stranded for weeks.

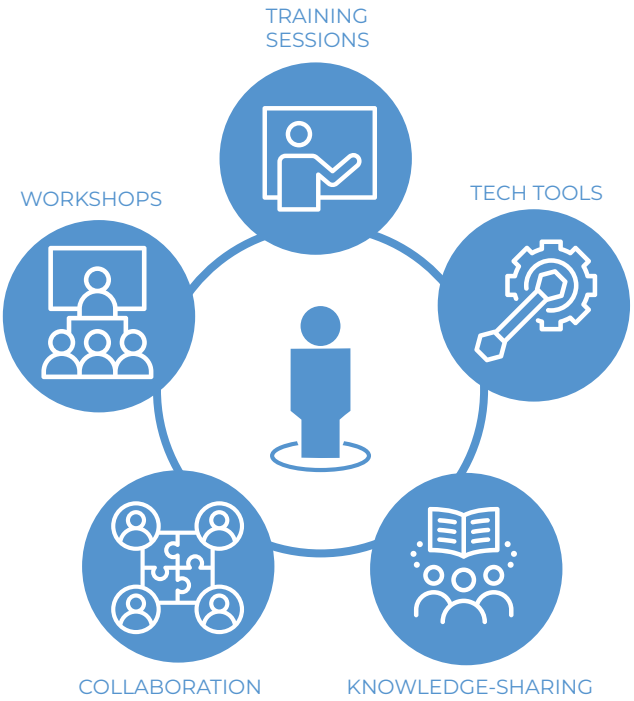
Interestingly, there is a dearth of research on interconnectedness and risk, even though we can observe correlations in the financial sector, particularly what we learned during the 2009 crisis. It is time to explore this crucial subject matter from an academic perspective and ensure that businesses are equipped to handle any potential risks.

How skill velocity can serve as an accelerator to pharma logistics internal company digital transformation

Mr. Miguel Rodríguez, Qatar Airways

Companies must adapt to stay relevant and competitive in today's fast-paced digital world. One of the ways to achieve this is through skill velocity, which involves quickly acquiring and applying new skills necessary to thrive in a changing environment. This involves being agile, adaptive, and continuously learning. In pharma logistics, embracing skill velocity is vital for continually enabling people to upskill and adapt to technological advancements. By embracing this approach, companies can drive their internal digital transformation and stay ahead of the curve. Companies must prioritise continuous learning and technological advancement to keep up with the fast-paced world of business and technology. This means embedding a culture that values skill velocity and facilitates digital transformation.

One way to achieve this is through upskilling initiatives. These can be training sessions, workshops, and online courses that boost confidence, equip employees with the tools to adapt to new technologies, improve decision-making, and enable faster response times. Another critical factor is collaboration and knowledge sharing. Companies can foster a culture of continuous learning and mutual growth by promoting cross-functional collaboration and creating knowledge-sharing platforms. Employees can acquire new skills from their colleagues and benefit from ongoing professional development.



Ultimately, it's essential to cultivate a growth mindset. Encouraging employees to embrace change and view challenges as opportunities for growth can help them to willingly engage in upskilling initiatives and stay ahead of the curve.

The hunt for true value add of digital transformation in pharma logistics: The art of data sharing

Mr. Ruud van der Geer, MSD

So why should companies digitalise their transport planning? By embracing new technologies and digital tools, they can streamline operations, improve efficiency, and stay competitive in a rapidly evolving market. It's a crucial step towards future-proofing the business and ensuring long-term success.

The supply chain industry is experiencing a shift in its processes due to several conditions that require adaptation. One such condition is sustainability. Shockingly, up to 30 per cent of healthcare products are lost or damaged during the supply chain process, contributing to 1.3 per cent of global emissions and a significant carbon footprint. To reduce costs and free up funds for new therapies, managing waste streams throughout the entire supply chain is crucial. Other factors that disrupt the industry include supply chain resilience, big data, competition between supply chains, and supply chain integration. These factors enable end-to-end visibility of all products in the supply chain, ultimately reducing waste.

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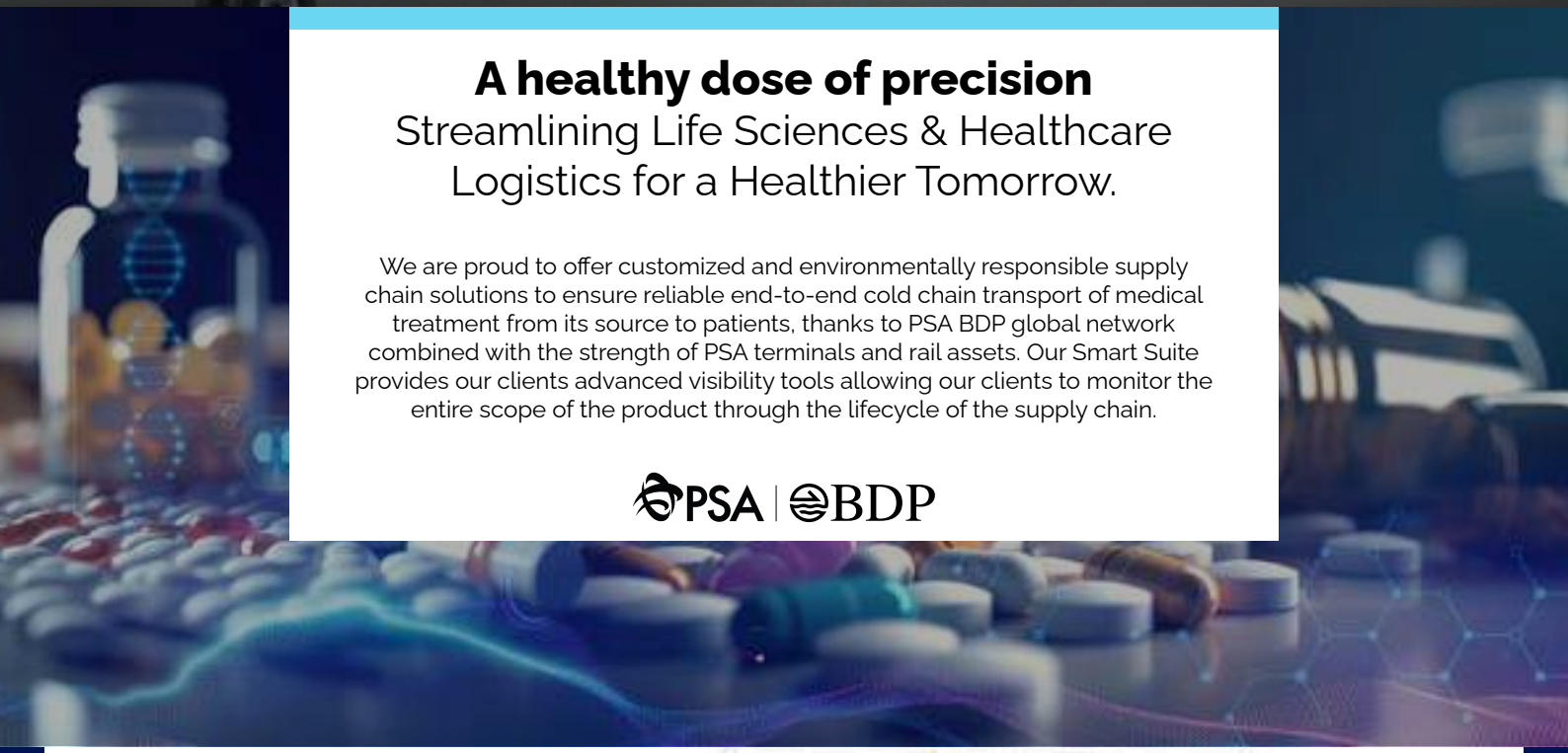

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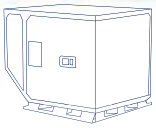

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Innovation in Motion: Harnessing Digital Technology to Predict, Optimise, and Secure the Pharma Logistics Supply Chain – Pharma.Aero Project & Industry Use-Case

Irene S L Lau, Hong Kong Airport

“Innovation in Motion” is a project by Pharma.Aero that aims to offer comprehensive insights into the practical application of next-generation digital technologies throughout the life science and MedTech logistics ecosystem, to enhance the predictability and visibility of the supply chain. Companies face challenges regarding visibility and real-time tracking throughout the product lifecycle, hindering their ability to identify bottlenecks and delays. By harnessing these technologies, businesses seek to minimise risks, optimise processes, and ensure the quality of shipments. By prioritising end-to-end visibility and investing in tools and technologies, businesses can achieve greater efficiency, reduce costs, and improve customer satisfaction. Collaboration throughout the supply chain is crucial to creating a sustainable and efficient system.

WORKSHOP

Pharma logistics digitalisation: digital good looks and fancy hypes or a true digital mindset

The workshop on pharma logistics digitalisation discussed the different phases of supply chain visibility, including the analytics phase, decision support phase, and decision automation phase. Attendees expressed their desire to progress towards the decision automation phase in the next two to three years. The most needed aspects of accurate supply chain visibility include temperature, location, sustainability, chain of events, shipment milestones, product integrity, and damage security. Barriers to digitalisation include a silo mindset, lack of collaboration, data security concerns, and the need for resources. Enablers for digitalisation include strategic planning, training, partnerships, and supplier collaboration.

WORKSHOP

Business strategy on change: robust structures or effective responsiveness: The Red Queen Effect

Prof. Dr. Koen Vandenbempt, University of Antwerp

The workshop, led by Prof. Dr. Koen Vandenbempt, who also serves as the Dean of the Faculty of Business and Economics at the University of Antwerp, provided profound insights into the Red Queen effect. Originally studied in biology, this concept underscores the significance of evolution, adaptation, and proliferation. Translated into the business realm, it emphasizes the constant need for learning and improvement. However, external factors can sometimes yield negative consequences, potentially mistaken for evolutionary shifts. In response, participants were prompted to engage in brainstorming sessions, evaluating their organizations' skills and capabilities. The central question posed: in the face of pervasive change, can their organizations not only adapt but thrive?

WORKSHOP

Amplifying your business innovation on the foundations of applied research

Prof. Dr. Wouter Dewulf & Prof. Dr. Roel Gevaers, University of Antwerp
Frank Van Gelder, Pharma.Aero
Prof. Dr. Elena Pessot, University of Sienna

This workshop emphasised that having the right tools to track and monitor information can be a game-changer for companies. However, they also posed some critical questions that must be addressed before implementing an end-to-end control tower. For instance, what challenges may arise internally or externally, and how extensive can the visibility be?

Prof. Dr. Elena Pessot of the University of Siena focused how digital technologies can enhance various aspects of the pharma supply chain management. Visibility, traceability, cold chain, quality control, and end-to-end integration are just some elements that require automation and flexibility. These technologies must be embraced and implemented at the operational level to ensure an efficient and effective supply chain.

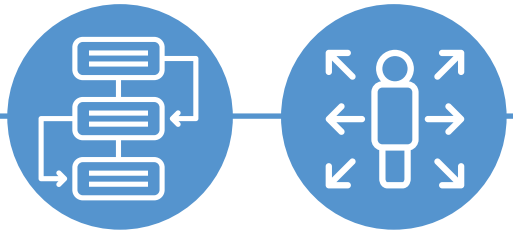
Aligning the company's operational strategy with the fast-growing technology challenges in pharma logistics

Andreas Behnke, Swissport

Andreas Behnke from Swissport shared valuable insights on aligning operational strategies with the latest technological advancements in pharma logistics. Achieving success in business requires two crucial elements: a well-defined standard operating procedure (SOP) and a customer visibility agreement that everyone agrees on. However, it is not easy to transform a company into a digital-savvy organisation. It takes dedication and commitment from all team members to adopt a digital mindset and stay up-to-date with the latest technology trends. It is a challenging yet rewarding journey that requires everyone to be on board.

Andreas advocated for companies to cultivate ideas organically from the grassroots, maintain a vigilant stance on market trends, standardize processes, and ensure scalability for global implementations. Furthermore, he underscored the significance of collaborative engagement with key stakeholders to attain mutually beneficial solutions.

STANDARD OPERATING PROCEDURE



CUSTOMER VISIBILITY AGREEMENT

Andreas advocated for companies to cultivate ideas organically from the grassroots, maintain a vigilant stance on market trends, standardize processes, and ensure scalability for global implementations. Furthermore, he underscored the significance of collaborative engagement with key stakeholders to attain mutually beneficial solutions.

Day 2 Main Takeaways

01

Especially in volatile markets, we have to move from **KISS** (Keep It Simple, Stupid) to **KISIS** (Keeping It Simple Is Stupid).

02

Revolutions do not happen overnight… they incubate over years. We need to learn to identify weak signals and **'look around the corners'**. Hint: Begin seeing around the corner at the edges of your organisation, where you engage with the markets.

03

3D printing technology is moving at a fast pace. However, it is still mainly relevant for niche markets as the applicability to mainstream solutions is limited. The future will tell in which direction this technology will progress, both from cost as from applicability point of view.

04

Digitalization and control of the supply chain up to tier 3 suppliers are key to a complete risk assessment as 75% of the incidents happen with tier 3 suppliers. Everyone knows that risks are interconnected but academic research in this area is limited.

05

Proven and tested new technologies can improve logistics operations to **predict, optimise and secure the pharma logistics supply chain**. Applications can be in lane risk operations, CO2 calculations, cold chain management and product stability during transport, track and trace visibility,… (Big) Data driven and inter-company applications are most suitable for a successful roll out. This is a first, yet crucial step to migrate towards an ecosystem.

06

The trade-off between automation versus flexibility drives **digital innovation** in the pharma supply chain. Factors like data availability, collaboration between the actors, data security, SOP's and agreed customer visibility are key to success. Creating a **digital mindset** in a company is challenging and requires the entire company's commitment.

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DAY 3

THE WORLD 2.0:
THE NEW TECHNOLOGY TRANSLATION THROUGH INDUSTRY CROSS-POLLINATION

Day Chairs: Frank Van Gelder, Pharma.Aero | Cesar Gil-Martinez, Bayer

Day 3 Learning Objectives

What are the newest trends in vaccine medicine developments and what are the impacts on supply chains?

How applied research can help to apply evidence based results in future business strategy choices?

What will be the newest trends in cool chain technology developments and packaging?

How to align business strategies and match bilateral requirements of the two worlds 2.0?

Day 3 Lectures and Industry Site Visits

The new kid on the block: was mRNA a mayfly or will it be the bread and butter of future vaccines

Prof. Dr. Pierre Van Damme, University of Antwerp

Day 3 of the Masterclass kicked off with a bang as Prof. Dr. Pierre Van Damme from the University of Antwerp offered participants fascinating insights into the world of vaccines. The topic was particularly intriguing. Creating vaccines is a complex process that often involves sourcing materials from all over the world. In the fight against COVID-19, we have employed various techniques, including the revolutionary mRNA vaccines. These vaccines work by producing antigens directly within the individual, but the main challenge is that they require cold storage. However, researchers are working on transforming them into a powder form that will offer better temperature stability.

We are continuously making advancements to enhance these vaccines. For example, we can add substances that strengthen the immune response. Additionally, we are seeing a trend towards needle-free vaccines. Some nasal vaccines activate our body's mucosal immunity, while others use skin-based delivery devices.

In light of the global challenges we face, such as climate change, population growth and movement, and scepticism towards medicine, we must be ready for future pandemics. Streamlining vaccine development is crucial, and we are moving towards the "human challenge" approach, which is faster and requires fewer resources. Furthermore, leveraging

AI technology offers the exciting possibility of creating personalised vaccines, which could lead to future treatments for diseases like cancer.

Professor Van Damme's presentation was both illuminating and thought-provoking. It underscores the imperative to continually push the boundaries of vaccine technology, a crucial endeavor for safeguarding ourselves against potential future health crises.

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Fly small but with accurate precision: how drones reshape the future healthcare logistics landscape

Assoc. Prof. Shaohui Foong, SUTD

Unmanned Aircraft Systems, commonly known as drones, have come a long way since their inception. Drones have found various applications in different sectors, from specialised tasks to consumer-friendly technologies. The entertainment industry increasingly uses drones for recreational purposes and professional content creation. In agriculture, drones have proved to be useful in crop monitoring, while in structural inspections, they can access hard-to-reach areas. The research and education sectors have also adopted drones for data collection opportunities and unique aerial perspectives. The potential of drones in ship-to-shore transportation is currently being explored. However, there is still a gap in the market for drones that can perform intricate close-up tasks while flying indefinitely. One solution being examined is the tethered drone, which remains connected through a tight line, ensuring continuous power and stability.

Safety remains paramount as drones become more widely adopted and their functionalities expand. Comprehensive regulations must be implemented to ensure the responsible use of these unmanned aircraft systems. Let us continue to explore the endless possibilities of drones while keeping safety and ethical considerations at the forefront of our minds.

Renewed insights in using the recycled greenhouse gas C02: reconsidering old habits for optimal cold chain outcomes

Mr. Diego Loaiza, Cold Jet

Elena Prozorova, University of Antwerp

Mr. Loaiza delivered an insightful presentation focusing on the sustainability of CO2 in dry ice production and how its recycled nature makes it a viable option. He also introduced a new recapturing technology that boosts dry ice production output by 70% using the same amount of liquified CO2.

The session delved deeper into the use of dry ice, particularly in pharma logistics, highlighting its pros and cons. In a discussion titled "Applied Research in Cold Chain Analytics and Research: From the Black Duckling to a New Sustainable Cool Chain Possibility," the academic perspective on the subject was presented. It was revealed that the current cold chain market is less efficient and sustainable than future demands might require, leading to 13% of food products and 20% of temperature-sensitive biopharma items getting spoiled or damaged during transportation.

Spoilt for choice: How to select the perfect TempChain packaging

Christopher J. Storch, va-Q-tec

However, reassessing dry ice from a fresh viewpoint reveals its potential as a more sustainable and efficient choice for the cold supply chain. Dry ice represents stored, deferred energy consumption, making it an attractive option. Christopher J. Storch from va-Q-tec explained that cold chain users have many choices when selecting the perfect TempChain packaging, but with dry ice's potential, it could be a game-changer in the industry.

Passive thermal packaging is a crucial consideration for businesses, and identifying the most effective solutions requires careful evaluation of various factors. Companies face deciding whether to purchase or rent these packaging solutions, with clients looking for suitable options worldwide when they opt for the latter. We must also prioritise environmental impact, considering emissions and the lifecycle of packaging solutions to make informed choices. In particular, distinguishing between variable and fixed emissions is essential for sustainability. Moreover, traceability is becoming increasingly vital in thermal packaging, providing insights into the entire supply chain process.

Buckle up for future challenges: the future and direction of digitalisation in the pharma supply chain

Mohamed Nouh, SkyCell

Stakeholders must thoroughly identify solutions that align with their requirements while prioritising sustainability and efficiency. In the pharmaceutical supply chain, digital transformation is critical for future success, as Mohamed Nouh from SkyCell highlighted in a session titled "Buckle up for future challenges: the future and direction of digitalisation in the pharma supply chain." As the industry undergoes continuous change, resilience is critical, with "track and trace" systems ensuring pharmaceutical goods' secure and transparent movement. However, the backbone of this resilience is having the correct data accessible precisely when needed.

The pharmaceutical industry heavily relies on data to manage and predict future scenarios, with operating systems playing a crucial role in processing and managing this information. However, the vision for the future goes beyond just offering insights into day-to-day operations; it also provides a comprehensive outlook that ensures the industry remains efficient and prepared for any challenges that may arise.

Innovative Medicine – Novartis Radioligand Therapy (RLT) and the Future of Nuclear Medicine: Opportunities vs Challenges

Dr. Roland Yap, Novartis

Dr. Roland Yap from Novartis presented an intriguing session on "Innovative Medicine - Novartis Radioligand Therapy (RLT) and the Future of Nuclear Medicine: Opportunities vs Challenges." Sustainability in healthcare is gaining momentum, particularly in using radiotherapy for cancer treatment. While radiotherapy has been a reliable treatment option, there are now opportunities to explore alternatives. One potential solution is nuclear medicine, but it comes with its own set of challenges. For instance, it is an expensive option requiring significant collaboration with hospitals to allocate dedicated spaces for treatments. Additionally, the use of nuclear medicine demands stringent licensing and regulations, with concerns over the disposal of nuclear waste and the current shortage of radioisotopes. Moreover, transportation poses a significant hurdle, with a dearth of transporters willing or prepared to handle these materials, highlighting the need for professionals specially trained in this area.

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WORKSHOP

Tight-rope walking between the regulator and the executor: How dangerous goods become the basics of new healthcare treatments

Moderators: Pfizer, Hazgo, Dangerous Goods Training Association and Novartis

This interactive workshop explored the complex relationship between regulators and executors in the healthcare industry. The discussion focused on the role of dangerous goods in developing new healthcare treatments and the importance of consistent labelling and documentation in communicating the associated risks.

One of the key takeaways was the significant challenges posed by transporting dangerous goods to hard-to-reach places like Africa. The lack of local authorisation and appropriate infrastructure makes it difficult to ensure these critical medical supplies' safe and efficient delivery. However, the participants identified potential solutions, including better preparation in customs and security, as well as collaboration with local partners and major corporations to effect changes in regulations and infrastructure.

Dueling on the edge of the World 2.0: "cross pollination" a buzzword or a verb? Business and scientific healthcare challenges aligned.

Prof. Dr. Koen Vandenbempt & Prof. Dr. Pierre Van Damme, University of Antwerp
Ms. Veerle Vermeiren, Pfizer

The afternoon of Day 3 saw an engaging discussion on the topic of cross-pollination, exploring the intersections between business, science, and healthcare challenges, highlighting the need for innovative solutions and cross-disciplinary collaboration to drive progress in the field.

From a public health perspective, we are caught in a recurring cycle of panic followed by neglect. There is a dire need to foster trust and encourage investment in health sectors to break this cycle. We must shift from reactive measures to a more proactive approach. The keys to success in this realm include the ability to provide holistic solutions, which requires a deep understanding and intimacy with customers.
Furthermore, it is imperative to consistently demonstrate value to customers and always be prepared to adapt to change.

In summary, the session provided valuable insights into the complex landscape of healthcare regulation and execution, emphasising the importance of consistency, collaboration, and innovation in addressing the challenges of developing and delivering life-saving treatments worldwide.

Industry Site Visits

PSA Horizons & Innovation Center, dnata Pharma Center, DSV Healthcare Distribution Center








Healthcare Logistics

Our facilities, services and transport networks adhere to relevant healthcare regulations and quality standards. Our customised and integrated supply chain solutions handle raw materials to finished products using specialised cold chain logistics.

Four reasons to choose DSV for your pharmaceutical & healthcare cold chain logistics:

Licensed capacity
Our extensive network and GDP trained employees, along with our HealthcareQMS and GDP certified facilities, ensures proper handling, management, and storage of your temperature-sensitive products.

End-to-end control
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Global Transport and Logistics

Day 3 Main Takeaways

01

m-RNA technology is maturing, is not a mayfly and will have a significant impact on future vaccine/pharmaceutical developments and logistics. Thermostability remains important, yet increasingly less critical for many mature products. Lyophilized pharmaceutical products show high potential to reduce volumes and ease required transport conditions. The impact on pharma logistics is yet to be seen!

02

The future of oncology treatment through the promising innovative medicine Radioligand Therapy (nuclear medicine) is a multi-disciplinary combinatorial which includes biology, chemistry and physics, operations research and some biomedical engineering in each steps. Watch this space!

03

Drone technology and applications are moving beyond the early-stage trials, yet multi-rotor drones are still mainly used in **niche applications** like remote and complicated locations delivery, inspections, … **Fixed wing cargo** drones might have a higher potential to become a mainstream transport mode as the range and speed are superior to multi-rotor drones.

04

Dry ice can serve as a 'battery' for circular and sustainable cold supply chain ecosystems. Academic research on the efficiency of potential sustainability improvements is ongoing.

05

Resilient supply chains have three commonalities to **achieve end-to-end transparency**: predictive capabilities + ability to optimize and scale + preventative capabilities = end-to-end transparency.

06

We launched a new buzzword in pharma logistics: 'cross pollination'. Look it up!

DAY 4

ECOSYSTEMS UNDER THE SUSTAINABILITY MICROSCOPE

Day 4 Learning Objectives

Pharma, ecosystems and ecommerce. Where do they intertwine?

Is the modal shift in pharma logistics really going to take place?

How value and volume will drive the preferred choice of the mode of transport for healthcare products?

How last mile sustainability challenges drive new strategies to integrate e-commerce in pharma logistics?

Day 4 Lectures and Presentations

Peeling off the boundaries: the importance of cross-border ecosystems

Mr. Stijn Michielsen, University of Antwerp

On Day 4 of the Pharma Logistics Masterclass, there was a lot of excitement and anticipation as the day began. The previous day included site visits that gave attendees a better understanding of the pharmaceutical industry's logistics. This led to a day focused on sustainability within this complex industry.

Stijn Michielsen talked about how companies are trying to become ecosystems and how this is important, using examples from Amazon and Alibaba. Attendees learned that companies now compete against each other as ecosystems rather than as single enterprises.

How healthcare science drives new logistics delivery models: introduction to the value driven ecosystem

Prof. Dr. Roel Gevaers, University of Antwerp

Dr. Roel Gevaers from the University of Antwerp talked about how e-commerce giants are changing the pharmaceutical market. He discussed how the supply chain is changing from traditional B2B to D2D. Control towers are becoming more critical in managing supply chains. Dr. Gevaers talked about how e-commerce giants are like wolves in sheep's clothing when it comes to pharmaceutical logistics, and described how e-commerce giants like Amazon, JD.com, and Lazada are changing the logistics industry. As a result, only a few ecosystems would become global contenders in the long run.

Pandemic response: efficient and effective large-scale vaccine distribution
Prof. Peter L. Jackson, SUTD

Professor Peter L. Jackson offered valuable insights into efficient and effective large-scale vaccine distribution, highlighting the importance of policy questions about vaccine distribution influencing the current global context. The professor began his exploration with a question about how to allocate vaccine production to maximise vaccinated person-days. He explained the complexity of vaccine distribution using a checklist and visualising the vaccine supply chain. He also analysed how box size affects distribution performance and concluded that larger-scale dispensing locations are more efficient. His insights are essential in a world where vaccine allocation is critical. Professor Peter L. Jackson provided a roadmap for policymakers and stakeholders to improve vaccine allocation and distribution.

The phoenix of the airline model: adaptation to new medical therapies
Fabrice Panza, Etihad

Fabrice Panza, the GDP Manager and Pharma Responsible Person for Etihad Cargo, discussed how airlines must continuously reinvent themselves to adapt to the evolving landscape of medical therapies. He highlighted the challenges of transporting time-sensitive medical cargo and the need for creative solutions. Fabrice also discussed recent advancements in medical therapies, such as virtual reality and artificial intelligence. The urgency to swiftly get medical cargo to its destination is crucial for patient care.

Fabrice Panza talked about how airlines are not prepared to transport advanced medical therapies, and need to work together and share their knowledge to solve the problems that arise. He emphasized on the need to be innovative and agile to adapt to this new way of transportation.

Collaborative strategies on sustainability
Laetitia Chery, JAS

Collaboration is crucial in driving sustainability initiatives. Laetitia Chery spoke passionately about the importance of unity in solving sustainability issues. Global emissions are a reminder of the environmental impact of logistics. Sustainable practices are urgently needed. Case studies can offer practical insights into sustainable logistics strategies. Green logistics can save costs and align with sustainability goals.

The power of turning in sustainable circles: we can't recycle our way out of trouble
Lucas van der Schalk, Corplex

Lucas van der Schalk discussed the circular economy and its importance in the pharmaceutical industry. The circular model preserves product value and finite resources.

We must change our mindset and approach to resource usage to achieve sustainability. Lucas spoke about the upcoming PPWR regulation that applies to all packaging in the EU. This regulation demands eco-friendly packaging practices from industry players. Lucas gave examples of reusable transport packaging that aligns with circular economy principles and reduces CO2 emissions. Christa Sys then presented healthcare logistics in the maritime industry and its impact on sustainability. She shared important facts and figures about the seaborne trade.

Sailing the seas of healthcare: modal shift or intermodal ecosystems

Prof. Dr. Christa Sys, University of Antwerp

Maritime logistics is essential in global trade. She talked about healthcare's growing role in the industry. She explained how pharmaceutical logistics is crucial for delivering healthcare products on time. "Low-hanging fruit" solutions like reducing vessel speed can make the industry more sustainable. Legislation is also vital for change. Prof. Sys emphasised ecosystem thinking, intermodality, and eliminating barriers to sustainable healthcare logistics. Four speakers presented on sustainable multimodality in pharma logistics. Desmond Pan started with a quiz on vaccine history.

The speaker stressed the importance of legislation as a catalyst for change in the industry. Professor Sys advocated for an ecosystem approach, promoting intermodality, and eliminating barriers to sustainable healthcare logistics. The subsequent segment featured four speakers delving into the realm of sustainable multimodality in pharmaceutical logistics, with Desmond Pan initiating the session by engaging the audience in a quiz on vaccine history.

The orchestration of sustainable multimodality in pharma logistics

Darrel Chong, Jimmy Suroto, Simona Ravera, PSA BDP & Desmond Pan, Singapore Airlines

Desmond delved into the THRUCOOL Quality Corridor and Singapore Airlines' commitment to sustainability. Jimmy Suroto provided insights into sustainability trends and the influence of government policies on shaping sustainability initiatives. Following this, Darrel Chong and Simona Ravera from PSA BDP led engaging discussions, incorporating live polling questions. They discussed critical trade-offs in determining the suitability of intermodal transport, including sustainability, budget constraints, temperature tolerance, lead time, and routing options.

Challenges to keep high-quality logistics in line with future and changed life science ways of manufacturing

Erik van Wunnik, Nouzha Ouaamar & Torge Koehnke, DSV

The DSV team used an engaging format with a moderator and two speakers who answered questions from the audience. This kept the audience engaged and fostered lively discussions. The questions catalysed discourse and encouraged attendees to contemplate the challenges faced by high-quality logistics. The moderator introduced two discussion statements on corporate sustainability to conclude the presentation, which spurred active participation from the audience.

Will steamers win from wings: how life science industry looks at adaptive production processes in relation to transport modes

Lila Ridouh, GSK

As Manager of Quality for Supply Chain at GSK, Lila delved into the imperative of leveraging diverse modes of transport and minimizing packaging waste to achieve cost savings while contributing to environmental conservation. She articulated the challenges associated with utilizing sea freight in cold chain logistics, shedding light on the intricacies of navigating temperature-sensitive pharmaceuticals through maritime routes. In addressing these challenges, Lila shared insightful strategies for success, underlining the significance of meticulous thermal mapping. Ensuring that pharmaceutical products are maintained at the optimal temperature emerged as a critical element in preserving their integrity and efficacy throughout the logistics journey. Her emphasis on these key considerations highlighted the intersection of operational efficiency, sustainability, and quality assurance in pharmaceutical supply chains.

Day 4 Main Takeaways

01 There is a **paradigm shift** in the distribution ongoing: 'from push to pull', 'from pallet to parcel' and from 'B2B to D2D'. Data and control towers are key, hence Amazonisation, JD-isation, Ali Baba-isation... which might lead to an oligopoly. These ecosystems are now also entering the pharmaceutical B2C market

02 Airlines and other actors in the value chain are increasingly taking up **sustainability engagements,** also due the increased pressure from pharma and health care companies. However, there is work to be done on regulation, and uniformity and consistency of measurements, but also by cooperation with pharmaceutical producers. **Rethinking the packaging of pharmaceuticals** can already be a great start.

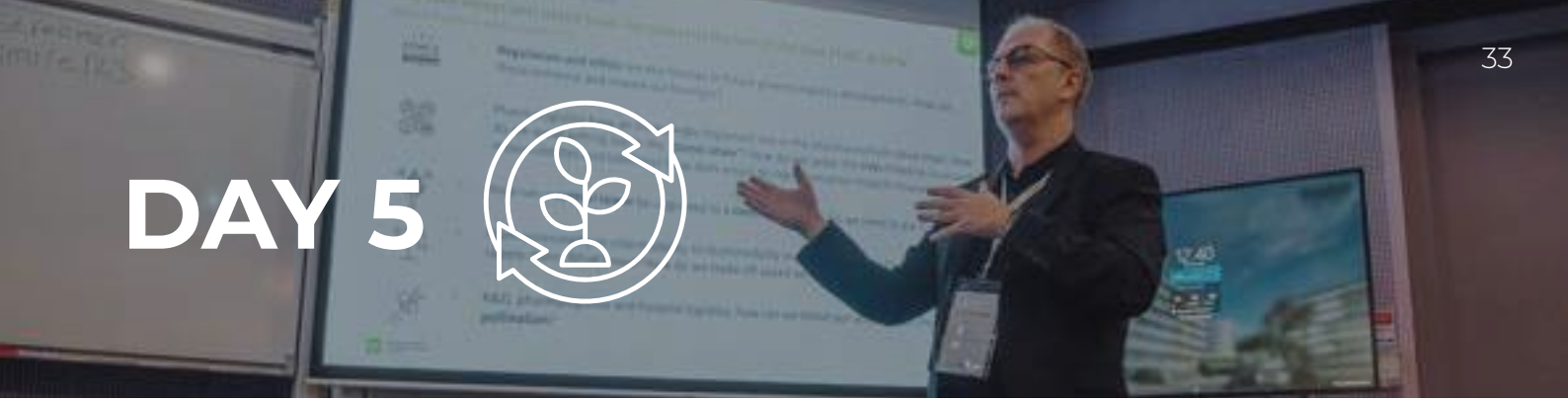
03 The shift towards **more sustainable world trade** is taking place, we strive to accelerate the shift and help supply chain stakeholders achieve more agile, resilient and sustainable ecosystem.

04 **Think ecosystem.** There is a need to focus on hyper connected maritime and air transport ecosystems. Eliminate the barriers such as data, regulation, standardization.

05 One of the main **greening drivers** for shipping companies is **regulation.** Reducing speed is a 'low hanging fruit' solution to reduce CO2; that proved to be already effective.

06 As the **modal shift** already started, the growing demand for healthcare will result in an increase in seaborne trade (powder vaccins, primary/secondary/tertiary innovative packing) Work still needs to be done on the **mental shift** by collaborating with alternative transport modes!

07 Using several transport modes within the same intermodal supply chain might be challenging. There are a lot of requirements and factors, making it a **trade-off game** between sustainability, costs, lead time, and routing options.



DAY 5

ACADEMIC AND BUSINESS COLLABORATION AS THE BEDROCK FOR A SUSTAINABLE FUTURE

Day 5 Learning Objectives

What is the art of cross industry collaboration and how it can fuel to achieve future sustainability goals?

How to create sustainable logistics models?

How multi-stakeholder approach can tackle the biggest sustainability challenges in pharma logistics?

The 5-day takeaway roadmap: what did we learn?

Modelling basics: Bridging the gap between strategic network design and operational last-mile

Rafael Arevalo MSC, University of Antwerp

On the concluding day of PLMC23, the focus shifted to a captivating theme: sustainability in pharmaceutical supply chains. Rafael Arevalo, a PhD researcher affiliated with the University of Antwerp, took the stage to provide valuable insights into the principles of conceptual modeling as applied to designing supply chains, specifically utilizing CO2 emissions calculation models. Arevalo underscored the complexity inherent in integrating operational and strategic decision-making levels, emphasizing its reflection in the modeling process.

In addressing the intricacies of this complex environment, Arevalo proposed a reimagined approach for the last mile of the supply chain. His suggestion aimed at extracting meaningful information that could serve as a foundation for making informed and sustainable long-term decisions. This nuanced perspective highlighted the intersection of sustainability, operational efficiency, and strategic decision-making within the pharmaceutical supply chain, offering a thought-provoking conclusion to the masterclass.

Decarbonising road freight transport: climate mitigation options in the transport sector

Assoc. Prof. Lynette Cheah, SUTD

Professor Dr. Lynette Cheah, representing the Singapore University of Technology and Design, took the stage to delve into strategies aimed at decarbonizing road freight transport. Recognizing that the transportation sector stands as a significant contributor to global emissions, especially as its outlook indicates potential growth, she highlighted the pressing need for emissions reduction.

Within complex supply chains, such as those prevalent in the pharmaceutical industry, efficiency tends to be compromised, resulting in a higher carbon footprint. However, Cheah conveyed a sense of optimism by shedding light on opportunities for the decarbonization of urban freight transportation. Operational improvements, targeted impact reduction, the emergence of new technologies and innovations, and a growing user interest in low-carbon transport were identified as promising avenues.

While acknowledging the considerable work ahead, the strategies outlined by Cheah offer a pathway towards a more sustainable future, reinforcing the importance of concerted efforts in reshaping the landscape of freight transport.

WORKSHOP

Pharma.Aero Green Air Pharma Logistics Project

3CeL, Bayer, Brussels Airport, Changi Airport Group, Zoetis

The PLMC23 participants were offered exclusive access to the preliminary findings of the Green Air Pharma Logistics Project conducted by Pharma.Aero, as a starting point for the workshop to further advance in identifying the qualitative and quantitative standards and measurements for a pharma green air lane.

Collaboration is critical, and we must work together across the industry to get the relevant "How Might We," or 'HMW,' in developing and measuring a Green Air Pharma Lane. Finally, we learned that a device-independent control tower is crucial to guarantee full and secure visibility. With these takeaways in mind, we are excited to see what the future holds for the Green Air Pharma Logistics Project - focus on Green Lane!

Integrating packaging in a broader model of end-to-end pharma logistics visibility

Emma Wong, SkyCell

Emma Wong from SkyCell presented how packaging solutions can help achieve end-to-end pharma logistics visibility. Supply chain visibility gaps can be closed by combining hardware and software; case studies illustrate how this can be done.

Day 5 Main Takeaways

01 **Synchromodality** as a tool for decarbonization and optimization of logistics? We are talking about intermodality and multimodality, but synchromodality (vertical and horizontal collaboration) is the next step to understand the complexity of timely modal shift.

02 Freight greenhouse gas emissions are growing but can be reduced by adopting technologies, but also by improving the system and trip efficiencies. **Influencing consumer behaviour** can be very impactful for that purpose.

03 **Collaborative insights** across industry stakeholders is the key to get the relevant "How Might We", 'HMW' in developing and measuring a Green Air Pharma Lane.

04 A **device independent control** tower is crucial to guarantee full and secure visibility.

2023 PLMC Major Takeaways and Leads for the 2024 PLMC

Regulation and ethics are key themes in future pharma logistics developments. How can these enhance and impact our business?

Pharmalogistics have an increasingly important role in the pharmaceuticals value chain. How do we avoid getting lost in the **'blame chain'**? How do we tackle the risks linked to increased responsibilities and liabilities? How does access to **risk** information impacts insurance?

How can a **control tower** be upgraded to a **command tower**? Do we need to ask Amazon?

From unimodality to intermodality, to multimodality to **synchromodality** to decarbonize our supply chain. What's next? How do we trade off speed versus planning?

R&D, pharmalogistics and hospital logistics, how can we boost our skills to learn from **cross pollination?**

Preparing the 2024 Pharma Logistics Masterclass in Dallas Fort Worth, USA

"Building on the momentum of the past 3 editions of the Pharma Logistics Masterclass, it is essential to unite the rapid growth of the life science market in North America and capitalize on it in the PLMC24 program.
The choice of Dallas Fort Worth is driven by the exponential growth of this emerging market within the US, the presence of excellent universities, the development of bio incubators such as BioNorth Texas and last but not least, DFW Airport, the driving force behind this edition. This combination ticks the decisive boxes for making this edition the next success."

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

"As the pharmaceutical industry continues to evolve, efficient and reliable logistics play a pivotal role in ensuring the timely and secure delivery of life-saving pharma products to those who need them.
Dallas Fort Worth provides an ideal backdrop for this Masterclass, with its central location, world-class facilities, and a thriving business community. By convening in such a dynamic region, we aim to bring together industry leaders, innovators, experts, and scientists to explore cutting-edge solutions, foster collaboration, and address the challenges shaping the future of pharma logistics.
I look forward to create with all stakeholders an immersive and insightful Masterclass that will drive advancements in pharmaceutical logistics and supply chains and ultimately contribute to the well-being of patients worldwide."

Prof. Dr. Roel Gevaers
University of Antwerp
PLMC™ Chairman

> Bringing the Pharma Logistics Masterclass to North America marks a significant milestone, as we expand our Pharma.Aero footprint in the region. We extend our sincere gratitude to Dallas Fort Worth Airport and our academic partners for their invaluable contributions. Together, we look forward to the impactful discussions and outcomes that will undoubtedly shape the future of the life science and MedTech logistics industry."

Trevor Caswell
Chairman of Pharma.Aero

> The Dallas Fort Worth region has emerged as a strategic logistics hub due to its central location, strong infrastructure and connectivity, making it an ideal venue for the 4th edition of the Pharma Logistics Masterclass. Additionally, the region hosts world class universities and key players in the healthcare and logistics industries, offering an excellent environment for learning and networking."

Prof. Dr. Wouter Dewulf
Academic Director C-MAT

As the Dean of the Faculty of Business and Economics at the University of Antwerp in Belgium, it is always a pleasure to put the spotlight on our Pharma Logistics Masterclass. This pioneering Masterclass format, which we have collaboratively developed with Pharma.Aero, is rapidly evolving into an important platform for knowledge exchange within the Pharma Logistics industry. And it is getting more global. I'm honored that we can organize the Pharma Logistic Masterclass in such an important pharma hub!

Prof. Dr. Koen Vandenbempt
Dean of Faculty of Business and Economics
University of Antwerp

2023 PLMC Class, Singapore