EPCA
THE EUROPEAN PETROCHEMICAL ASSOCIATION

VLERICK BUSINESS SCHOOL

INNOVATION & DIGITISATION IN THE PETROCHEMICAL SUPPLY CHAIN

DIGITISATION AS AN ENABLER FOR A SUSTAINABLE FUTURE

Report of the EPCA Digital Café Workshop
held on the 8th October 2019 in Berlin

EPCA 53rd Annual Meeting

TABLE OF CONTENTS

The Digital Café workshop was commissioned by EPCA and carried out by Vlerick Business School in close collaboration with EPCA.

Authors:
Ann Vereecke, Joachim Van den Bergh and Alejandra Cabos Rodríguez of Vlerick Business School

FOREWORD

We are pleased to share the results of the latest research study commissioned by the EPCA Supply Chain Programme Committee (SCPC). Entitled "Digitisation as an Enabler for a Sustainable Future", this has been combined with the main insights from the dedicated Digital Café Workshop held in Berlin in October 2019 during the 53rd EPCA Annual Meeting.

EPCA and Vlerick Business School teamed up, for the third time, in 2019, to explore how companies from the petrochemical industry - as well as other sectors - are rethinking and reinventing their supply chain in the light of Industry 4.0 and global sustainable developments challenges.

The year has been marked by growing public expectation on climate change, the circular economy and other sustainability topics. These expectations are being reflected in an increasing awareness and greater leadership within the petrochemical sector on how to shape and lead the change needed to bring about a better future. Almost every month saw news on innovation in chemical recycling and on new partnerships being formed across the value chain to address complex global challenges; in particular plastic waste.

Acknowledging this ongoing transformation, the members of the EPCA SCPC wanted to explore how digital technologies and platforms can leverage supply chains and logistics to advance the circular economy and help mitigate against climate change.

Digitisation within the petrochemical supply chain has been gaining momentum since early 2017, when EPCA embarked on its digitisation journey with Vlerick Business School. It now seemed the right time to examine how approaches and activities within the industry are changing and how digitisation is proving an enabler of greater sustainability in supply chains and logistics.

As with all EPCA research projects, we wanted this study to be grounded on case studies, not only from EPCA member companies but also from other sectors. We hope these case studies will inspire you in your own digitisation and sustainability journeys, helping you formulate and execute sustainable supply chain and logistics strategies as part of an industry-wide transformation.

We wish to thank everyone who contributed to this report. First, we want to express our gratitude to the EPCA Supply Chain Programme Committee members and the Chair, Dirk Verstraeten, for their enthusiastic participation and support throughout the process and especially during the Digital Café Workshop. We also want to thank those experts who dedicated their time and effort to the interviews conducted by Vlerick Business School. In addition, there are the 90 or so EPCA member company representatives who shared their views and insights during the Digital Cafe Workshop. Finally, we extend our sincere gratitude to Professor Ann Vereecke, Professor of Operations and Supply Chain Management and Partner at Vlerick Business School, along with her team, for their invaluable professionalism, dedication and academic rigour in conducting this research and for moderating the Digital Café.

Caroline Ciuciu
EPCA CEO
December 2019

INTRODUCTION

About two years ago, EPCA and Vlerick Business School studied the impact of digital technologies on the petrochemical supply chain. The report, which can be consulted on the EPCA website (www.epca.eu), concluded that the petrochemical supply chain was in the starting blocks of its journey to digitisation: there was a clear sense of urgency, a lot of ambition, and high expectations on how digitisation could impact the supply chain and even change business models. Companies that had embarked on this journey already reported a positive impact on efficiency, productivity and customer service.

We are now two years later. A lot has happened since. It is our impression that digital technologies have found their way into the petrochemical supply chain, with high speed.

At the same time, we see a growing awareness – among consumers as well as managers – that supply chains should become more sustainable, from a social as well as environmental perspective.

These two observations – the trend towards digitisation and the need for sustainable solutions – have motivated EPCA and its Supply Chain Programme Committee (SCPC) to organise a "Digital Café" workshop at EPCA's Annual Meeting in Berlin, on the 8th October 2019, exploring how digitisation can be an enabler for a sustainable petrochemical supply chain, focusing in particular on how digitisation can minimise the ecological footprint of the supply chain.

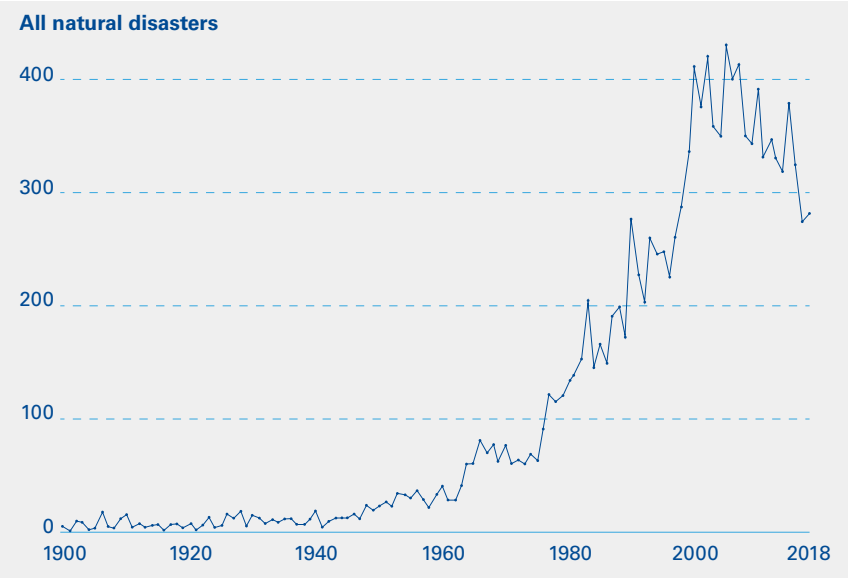
In this report, we summarise the lessons learned from desk research and from the interviews we conducted with experts in the field, in preparation for the workshop, as well as the conclusions from the roundtable discussions at the Digital Café. We hope it will stimulate and inspire you to embark on a digital transformation journey, making your supply chain more sustainable.

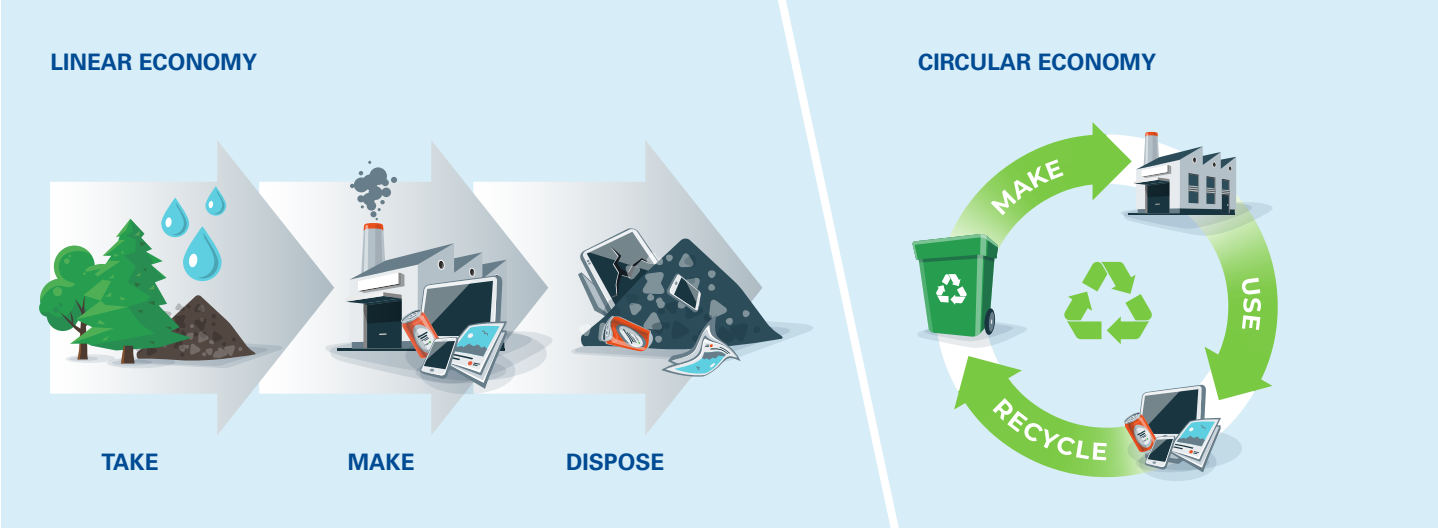
CLIMATE CHANGE, TIME FOR ACTION

Our climate is changing: ice is melting, entire communities are hit by serious drought, natural disasters have become more and more frequent (see Figure 1). This has an impact on the lives of people, which should be our first concern. It also impacts our jobs and our business, since such disasters cause supply chain disruptions. There's a human as well as an economic cost.

There is a common understanding that we have a responsibility towards future generations to preserve our planet and that we need to act. If the emissions gap is not closed by 2030, it is very unlikely that the 2°C temperature goal can be reached, potentially leading to disastrous consequences for our planet. As climate change is one of the biggest threats of the 21st century, businesses will have to adapt the way they currently operate.

Figure 1. Frequency of natural disasters (source: ourworldindata.org)





Manufacturing and logistics companies can contribute by introducing innovative practices in their supply chain, from sourcing raw materials, over production steps, to distributing products to the customer, as well as in return flows.

DIGITISATION, AN ENABLER FOR SUSTAINABILITY IN THE SUPPLY CHAIN.

The growing digitisation of supply chains creates a wide range of opportunities for businesses to become more sustainable and contribute to mitigating climate change. The primary objective of digitisation projects for many companies, including those in the petrochemical supply chain, is often to boost productivity and efficiency. We also increasingly see the implementation of digital tools to offer innovative products and services to existing and new customers. More recently, there seems to be an increased awareness that digital technologies can act as an enabler for more environmental-friendly practices and for the introduction of principles of the circular economy, thus improving the sustainability of the supply chain. Through enhanced coordination of material and information flows, digitisation can successfully lead to more efficient and effective use of resources, which helps to minimise the ecological footprint of the supply chain.

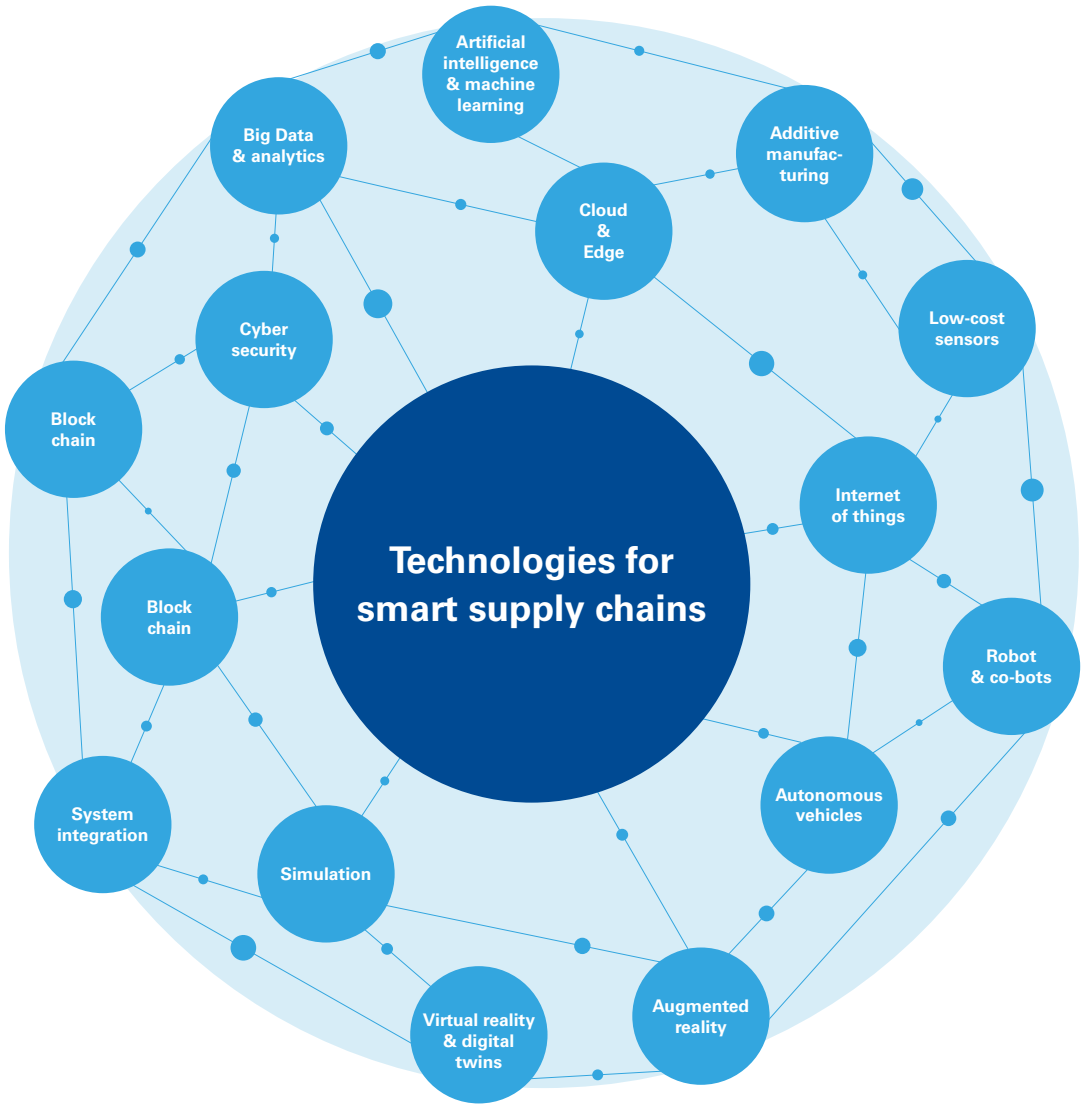
The intersection between digitisation and sustainability is present in several aspects of the supply chain: changes in product design to allow for a reduced ecological footprint in production and/or transportation, efficient waste management, stakeholder involvement and partnership, engaging customers into more sustainable consumption patterns, …

These are just a few examples of areas in which digital technologies can facilitate the necessary change. Digital transformation can also lead to new business models, drastically changing the structure of the supply chain.

REDUCING THE ECOLOGICAL FOOTPRINT OF THE SUPPLY CHAIN

We typically have a linear, step-wise view of the supply chain: companies tap into natural resources as a source of raw materials, they process them (which consumes energy and emits CO_2), they deliver the products by ship, truck, train, plane (which again generates CO_2 emissions), they sell them, and consumers use and finally dispose them. From the raw material to the final consumer, from the crude oil to the user of plastic, a lot of energy and material is consumed and material is wasted. There is clearly room for improvement.

We can approach the change that is needed in the supply chain from two perspectives that are not mutually exclusive: The first question we should ask ourselves is whether we can make each step in the supply chain more efficient from an ecological perspective, reducing waste and energy consumption in each step. The second, more fundamental question is whether we can change the structure of the supply chain, from being linear to circular.



The concept of the circular economy decouples economic growth from resource consumption. It is based on three principles: (1) preserving and enhancing natural resources, (2) keeping products in use, and (3) avoiding negative externalities such as waste and pollution. The circular economy relies on new types of business models, some of which are digital-by-design. It raises the question whether these business models are impacting the petrochemical supply chain, and whether they present opportunities for companies active in this supply chain.

This could be considered a threat: if we recycle more, we produce less, so this will hurt profitability. However, we can also look at it as an opportunity: the principle of the circular economy can be an engine for growth. It stimulates us to develop new products that are recyclable, it pushes us to think about new ways of production and new modes of transportation, it motivates us to optimise the supply chain, not only from the perspective of cost and service, but also from the perspective of its impact on the environment. It makes us even think about new business models that could totally change our way of working and allow us to tap into new markets.

TECHNOLOGIES FOR THE SMART, DIGITISED SUPPLY CHAIN

It is widely accepted that digital technologies such as IoT, sensors, cloud computing, autonomous vehicles or artificial intelligence can make the supply chain smarter and more efficient. Can digital technologies also help to reduce the ecological footprint of our supply chain?

The answer is "yes", but this will require creativity and innovative thinking. And it does require stakeholder involvement, in particular by customers and suppliers, as partners in the supply chain. This is not about who wins and who loses, but about how to create win-wins.

OUR FRAMEWORK FOR DEVELOPING A DIGITISED, SUSTAINABLE SUPPLY CHAIN

The framework shown in **Figure 2*** helps to structure our thinking about the impact of digital technologies on sustainability in the supply chain. It reads from right to left:

DIGITAL TECHNOLOGIES, such as IoT, cloud computing, blockchain or artificial intelligence

IMPLEMENTED IN SUPPLY CHAIN PROCESSES, that is, in planning, sourcing, production, delivery and/or the return flow

ENABLE THE COMPANY TO INTRODUCE INNOVATIVE SUPPLY CHAIN PRACTICES, such as optimising the flow, reducing waste, or re-using or recycling materials

THUS DELIVERING VALUE. in terms of extended life of assets, maximised utilisation of assets, looped materials and minimised CO_2 emission, making the supply chain more eco-efficient and sustainable.

THERE ARE BARRIERS TO CONQUER, BUT ULTIMATELY THIS CONTRIBUTES TO THE ACCOMPLISHMENT OF SUSTAINABLE DEVELOPMENT GOALS, WHICH HELPS TO MITIGATE CLIMATE CHANGE AND LEADS TO A MORE SUSTAINABLE WORLD.

***Figure 2.** Framework for developing a digitised, sustainable supply chain.

SUSTAINABILITY AND BUSINESS GOALS

VALUE

- Extended useful life of assets
- Maximised utilisation of assets
- Looped materials
- Eco-efficiency

SUPPLY CHAIN PRACTICES

- Increasing supply chain visibility
- Optimising the flow
- Recycling waste streams
- Shifting the business model to products-as-a-service
- Reducing waste
- …

SUPPLY CHAIN PROCESSES

- Plan
- Source
- Make
- Deliver
- Return

DIGITAL TECHNOLOGIES

- IoT, sensors
- 3D printing
- Blockchain
- AI, Machine Learning
- Robotics
- Autonomous vehicles
- Big Data & analytics
- Cloud computing
- Virtual/Augmented Reality
- Digital twin
- …

BARRIERS AND SUCCESS FACTORS

- Need to overcome reluctance to change in a traditional industry
- For the project to have real impact, behavioral change needed from all parties involved towards working with new data-based system
- Good mix of partners in the project
- An open mindset from the different parties involved

In what follows, we present a set of cases, collected through desk research and through interviews with experts in the petrochemical supply chain as well as in other sectors. Each case is analysed using the above framework. We hope the cases will be a source of inspiration for those who embark on the journey of creating a more sustainable supply chain through digitisation.

PRACTICES OF DIGITISATION FOR A MORE SUSTAINABLE SUPPLY CHAIN

The cases illustrate how companies active in the petrochemical supply chain, as well as in other sectors, are adopting digital technologies to make their supply chain more sustainable, often in addition to increasing its efficiency and improving customer service. Among the companies introducing practices of digitisation, we see manufacturing companies, as well as logistic service providers and port authorities. The cases were defined through interviews with the concerned companies' experts and desk research.

The list of digital technologies that find their application in the petrochemical supply chain is extensive: our cases mention the creation of data platforms and the use of cloud computing; the development of digital twins; the adoption of sensors to connect people, assets, equipment and resources in the IoT; the use of big data, data analytics, artificial intelligence and machine learning; the implementation of blockchain digitising the document flow; the introduction of autonomous vehicles and robots, the development of mobile apps; as well as one example of additive manufacturing.

As table 1 shows, almost all cases discussed in this report have a positive impact on eco-efficiency. The reduction of energy consumption and as a consequence the reduction of CO_2 emission is clearly top-of-mind for most companies when they introduce digital technologies in the supply chain.

Many of the cases illustrate how digitisation increases the utilisation rate of assets and/or resources. Clearly, digital technologies improves supply chain visibility, which offers the opportunity to improve scheduling, to eliminate activities that are not adding value, and to optimise the use of the assets and the resources. In one of the cases, it was explicitly mentioned that the visibility digital technologies offer on the use of the product in the field opens new opportunities. It allows to offer more service to the customer, and even to shift to new business models, offering "PaaS" (Products as a Service). The wealth of data collected on the performance of the product in the field allows for prescriptive maintenance, which can extend the life of the product.

The report also includes some cases of companies active in recycling and re-using material. These cases illustrate how digital technologies help to optimise the return flow of products and material, to optimise the quality of recycled material and to integrate processes across companies. The optimised use of by-products in a "Verbund" is another example of how digitisation transforms the supply chain towards a circular model.

Table 1. Sustainability goals of the digitisation practices in the case companies.

CASES	ECO EFFICIENCY	INCREASED UTILISATION OF ASSETS/ RESOURCES	EXTENDED LIFE OF ASSETS	LOOPED MATERIALS
Vopak & Port of Rotterdam				
Designing Low Impact Supply Chain Solutions at Agility				
CO_2 Emissions as a Parameter in Supply Chain Optimisation at Dow				
Dow's Smart Containers				
Nxtport & Port of Antwerp				
TruckTracer App at Bertschi				
Blockchain Enabled Global Trade Platform by Maersk and IBM				
The electronic European Cleaning Document				
Aurubis optimising the reverse flow of copper				
Verbund Optimisation at BASF				
The adidas shoe made to be remade				
Atlas Copco's smart air compressors				

DIGITAL CAFÉ CASES

VOPAK AND THE PORT OF ROTTERDAM

Every year, 30,000 vessels enter the port of Rotterdam. Each one of these vessels needs to be loaded and/or discharged, a complex logistic operation. It often gets very busy in the port, which causes long waiting times for the vessels and delays in loading or discharging.

Today, vessels sail full speed to the port, where they then have to wait because of the congestion, sometimes for several days. Vopak has partnered with TNO to make this process run more efficiently. By calculating the ETA (Estimated Time of Arrival) more accurately, Vopak will now be able to optimise the scheduling of the loading and/or discharging of vessels and barges. Hence, these vessels and barges do not have to rush to the port and can sail slower, leading to a reduction in CO_2 emissions, less waiting times for the vessels and a less overcrowded port.

SUSTAINABILITY AND BUSINESS GOALS

VALUE

-Reduced CO_2 emissions by reduced fuel consumption

SUPPLY CHAIN PRACTICES

- More accurately estimating ETA
- Improving scheduling of vessels allowing them to sail slower, reducing their fuel consumption

SUPPLY CHAIN PROCESSES

- Journey into the ports

DIGITAL TECHNOLOGIES

- Data platform

BARRIERS AND SUCCESS FACTORS

- Need to overcome reluctance to change in a traditional industry
- For the project to have real impact, behavioral change needed from all parties involved towards working with new data-based system
- Good mix of partners in the project
- An open mindset from the different parties involved

DESIGNING LOW IMPACT SUPPLY CHAIN SOLUTIONS AT AGILITY

In 2018, the global freight and third-party logistics (3PL) provider Agility developed SolutionGenius, an online application that enables the company to design low environmental impact and efficient supply chain solutions for its clients.

By engaging with customers and the Third-Party Logistics' (3PLs) own supply chain experts, Agility designs each segment of the planned supply chain, from packaging to loading and transportation. The app analyses the different alternative solutions and provides a comparison between the suggested solutions in terms of efficiency and environmental impact, allowing customers to choose for their preferred alternative. It shows in great detail the cost and environmental impact for each segment, mode of transportation, location, platform, inventory, etc.

The CO_2 reports provided through the app gives Agility's customers a deeper understanding of their supply chain and its environmental footprint.

SUSTAINABILITY AND BUSINESS GOALS

VALUE

- Reduced carbon footprint

SUPPLY CHAIN PRACTICES

- Optimising transportation
- Increasing supply chain visibility
- Estimating CO_2 emissions

SUPPLY CHAIN PROCESSES

- Logistics

DIGITAL TECHNOLOGIES

- Mobile app

BARRIERS AND SUCCESS FACTORS

- High sophistication: supply chain expertise required from client in order to use the app
- Understanding correlation between CO_2 emissions and cost creates value for clients

CO_2 EMISSIONS AS A PARAMETER IN SUPPLY CHAIN OPTIMISATION AT DOW

To increase visibility on the sustainability impact of Supply Chain decisions, Dow has embedded CO_2 emissions caused by transportation as a parameter in its network optimisation models.

Traditionally, Dow's network optimisation models were focused on optimising the cost, service level and utilisation rates in the supply chain. The volume of CO_2 emissions caused by transportation was calculated and reported separately.

Dow has now incorporated the carbon emissions from transportation as a variable in its network optimisation model. The emissions used in the model are estimated based on a dataset from Ecoinvent, a Swiss not-for-profit organisation providing databases that can be used for several types of environmental assessments, such as carbon footprint assessments. The model allows Dow to report on the environmental impact of different supply chain scenarios and to take this impact into account in its decision making. This increased visibility of the impact of the supply chain on the company's carbon footprint will in itself already drive the reduction of carbon emissions. Whilst today's model is still formulated in terms of minimising cost, it is Dow's intention to use the sustainability aspect as a parameter in the optimisation in the future, reducing the CO_2 emissions from transportation even more.

SUSTAINABILITY AND BUSINESS GOALS

VALUE	SUPPLY CHAIN PRACTICES	SUPPLY CHAIN PROCESSES	DIGITAL TECHNOLOGIES
- Reduced carbon footprint	- Supply Chain optimisation - Increasing carbon emissions visibility	- Transportation - Logistics	- Data modelling

BARRIERS AND SUCCESS FACTORS

- Complexity to estimate CO_2 emissions

DOW'S SMART CONTAINERS

Dow is working on a pilot project to introduce SMART containers in order to reduce transportation incidents across the industry and make better use of the transportation capacity.

An example is the application of the smart container for products for which monitoring the temperature during transportation is important. The SMART containers are equipped with sensors that measure temperature and location data, among other aspects. This data is shared with the Logistics Service Provider (LSP), who receives notifications and alerts about the temperature in the container, allowing the LSP to proactively take action in case of risk. While previously the truck drivers had to stop with a certain frequency in order to manually check the temperature of a container, the new technology now monitors the temperature in near real-time. This reduces the number of stops for the driver, and it minimises the number of times a product needs to be reheated. Besides helping to increase safety and visibility and to mitigate risks before an incident might occur, the increased efficiency in the transportation of temperature-sensitive materials helps reduce CO_2 emissions and waste.

SUSTAINABILITY AND BUSINESS GOALS

VALUE	SUPPLY CHAIN PRACTICES	SUPPLY CHAIN PROCESSES	DIGITAL TECHNOLOGIES
- Reduced CO_2 emissions - Reduced waste	- Mitigating risks before there is an incident - Increasing supply chain visibility - Avoiding unnecessary reheating	- Transportation	- Sensors, IoT

BARRIERS AND SUCCESS FACTORS

NXTPORT AND THE PORT OF ANTWERP

The Port of Antwerp has the mission to become a "safe haven" for a sustainable future. It is the Port of Antwerp's ambition to be a place of and for people, a port that the next generations can also be proud of. Sustainability is therefore a key area of attention in many of the port's investment projects. The aim is to accomplish growth in harmony with society and the environment in which it operates.

This mission translates into a set of initiatives and projects, such as achieving a significant modal shift, the transition to a circular economy with plans in the Churchill zone (a multimodal industrial project zone in the Churchill dock in the Port of Antwerp), a transition to a low carbon economy with, for example, a power to methanol demo plant, CO_2 capture and storage and the first hydrogen tug on the planet.

Digitisation is considered an important lever to reach the port's sustainability goals. In the first place, digitisation improves supply chain visibility. This allows the different partners in the port to make better use of the infrastructure and assets, to operate more efficiently and to reduce CO_2 emissions. Less obvious maybe, yet important, is that this visibility gives insights into how the supply chain can be improved, which may lead to even better utilisation of assets, even more efficiency, and long-term positive environmental impact.

An interesting example of how digitisation is changing the port is NxtPort, the data platform connecting the stakeholders in the logistics chain. NxtPort was founded in 2017 by companies active in the port, in order to facilitate the exchange of data. Gradually, more stakeholders, data sources and platforms are connected, and more applications are available, thus streamlining port processes. This leads to better scheduling, optimisation of transport into and from the port, reduction of congestion in the port, elimination of unnecessary trips of vessels and trucks, etc. ultimately leading to reduction of CO_2 emissions.

What will the future bring? The ambition is to bring all data together into the port's "digital twin", the digital representation of the actual port. The twin will provide deep insight in what is happening in the port, allowing to act accordingly. It will – over time – be able to correlate data sets (from cameras, sensors, drones, …), using algorithms and Artificial Intelligence. As such, it becomes a virtual assistant of the port's staff.

For more information:
www.nxtport.com;
www.thebeacon.eu;
www.portXL.be

SUSTAINABILITY AND BUSINESS GOALS

VALUE

- Increased utilisation of assets and infrastructure
- Reduced CO_2 emissions

SUPPLY CHAIN PRACTICES

- Increasing supply chain visibility for relevant stakeholders
- Optimising scheduling of arrival and departure of vessels

SUPPLY CHAIN PROCESSES

- Journey to and within the port

DIGITAL TECHNOLOGIES

- Data platform
- Sensors, cameras, drones
- Big data & analytics
- Digital twin

BARRIERS AND SUCCESS FACTORS

- Alignment between all the stakeholders driven by joined goals (private sector, government, academia) – triple helix model
- Development of start-up community in the region to accelerate implementation of digital solutions (PortXL and The Beacon are two examples)

TRUCKTRACER APP AT BERTSCHI

Bertschi has launched the TruckTracer App for its drivers and subcontractors. The company is in the process of installing sensors on its containers, keeping track of – for example – position and temperature of the loaded chemical product.

The smartphone app enables the company to digitally process and monitor road transportation. Real-time data is gathered at every step in transportation. A built-in ETA function provides Bertschi's planners and its customers with information about the location of the shipment and the expected arrival time. This transparency leads to a significant reduction of planning inefficiencies, for example at the cleaning stations that can improve their scheduling based on the information they receive. It also allows Bertschi to avoid unnecessary mileages. For example, with accurate data on the temperature of the goods, an unnecessary trip to the heating station can be avoided. The app also has a scanning feature allowing the drivers to directly scan all transportation documents. This avoids trips to hand-over places and extra stops.

The elimination of these unnecessary, non-value adding steps in transportation not only reduces the cost of the supply chain, it also makes it more environmentally sustainable. Moreover, having more accurate information has a positive impact on the drivers' job satisfaction.

SUSTAINABILITY AND BUSINESS GOALS

VALUE

- Eco-efficiency
- Increased utilisation of assets

SUPPLY CHAIN PRACTICES

- Increasing supply chain visibility
- Reducing planning inefficiencies, avoiding un-necessary mileages

SUPPLY CHAIN PROCESSES

- Logistics, transportation

DIGITAL TECHNOLOGIES

- IoT, sensors
- Smartphone app

BARRIERS AND SUCCESS FACTORS

Resistance from companies to optimisation initiatives across companies: fear of loss of data and control

BLOCKCHAIN ENABLED GLOBAL TRADE PLATFORM BY MAERSK AND IBM

IBM and Maersk have jointly launched TradeLens, a blockchain-enabled global logistics solution that increases efficiency and information security across the supply chain. This trade platform brings together the different parties involved in the shipping process (exporters and importers, ports and terminals, shipping lines, freight forwarders, customs authorities, etc.) and allows the different parties within the ecosystem to interact more efficiently thanks to real-time access to shipping data and documents, having a clear overview of the shipping process at any moment.

TradeLens aims to digitise documentation flows, increase supply chain visibility, eliminate waste and reduce costs. By connecting different transport modes in one platform and consolidating CO_2 emission levels for each shipment, TradeLens will be able to provide a true and complete carbon footprint for all goods shipped through the platform.

The success of the solution relies on the ability to bring the entire ecosystem together under a common network.

SUSTAINABILITY AND BUSINESS GOALS

VALUE

- Eco-efficiency, reduced carbon footprint
- Increased utilisation of assets

SUPPLY CHAIN PRACTICES

- Increasing supply chain visibility and information security
- Reducing waste
- Reducing complexity

SUPPLY CHAIN PROCESSES

- Logistics
- Inventory management

DIGITAL TECHNOLOGIES

- Blockchain and smart contracts
- IOT and sensor data

BARRIERS AND SUCCESS FACTORS

- Success of the solution depends on ability to bring the ecosystem together
- Initial resistance from competing companies to join platform; questions raised about intellectual property
- Increased number of memberships from different parties across the entire ecosystem, including onboarding of rival companies

THE ELECTRONIC EUROPEAN CLEANING DOCUMENT

Every year, 3 million European Cleaning Documents (ECDs) are printed on paper, in fourfold. In an effort to digitise this document, essenscia (the Belgian federation for chemistry and life sciences industries), EFTCO (the European Federation of Tank Cleaning Organisations), ECTA (the European Chemical Transport Association) and CEFIC (the European Chemical Industry Council) joined forces to develop and introduce the e-ECD, that is, the electronic ECD. As a consortium, these organisations represent over 600 companies that are stakeholders in the European petrochemical supply chain. What emerged was a true community of chemical producers, tank cleaning operators, tank storage operators and transportation companies, sharing data on this first multi-company, cross-functional, transactional supply chain platform.

The digitised cleaning document offers many advantages: no more loss of documents, reduced waiting times for trucks, improved supply chain visibility, accurate data sharing,... making the process more efficient. Moreover, it offers several advantages from a sustainability perspective. Firstly, the more transparent the cleaning cycle is, the faster the equipment rotates across the supply chain. Hence, the utilisation of the assets is optimised. Secondly, an e-ECD leads to a faster and more reliable process, with fewer errors, less rework and rejects, and a reduced risk of contaminations. This translates into a higher level of operational sustainability.

As the e-ECD has now proven its success, other existing logistic paper documents used along the process will follow, leading to even more positive impact on sustainability in the chemical supply chain.

SUSTAINABILITY AND BUSINESS GOALS

VALUE

- Eco-efficiency
- Maximised utilisation of assets

SUPPLY CHAIN PRACTICES

- Increasing supply chain visibility
- Reducing waste
- Harmonising data chain

SUPPLY CHAIN PROCESSES

- Logistics

DIGITAL TECHNOLOGIES

- Blockchain and smart contracts
- IOT and sensor data

BARRIERS AND SUCCESS FACTORS

- Pilots are set up (in Antwerp) to build experience
- Continuous improvement of IT process

AURUBIS OPTIMISING THE REVERSE FLOW OF COPPER

Aurubis Metals for Progress

Aurubis is a leading worldwide provider of non-ferrous metals. The company's main area of expertise is the processing and optimal recovery of concentrates and raw recycling materials with complex qualities. It is the global leader for copper recycling.

Copper that is wasted in the production process of Aurubis' customers is typically of high quality and can be recycled into new copper rods in a zero-waste loop. However, for the copper rod to be an excellent conductor, it should be made from copper that has excellent purity (above 99.9%), which is not guaranteed since the processing at customers' production sites affects the purity of the copper. This prevents Aurubis from immediately reusing the material to produce new copper rods; instead, the returned copper needs to be reprocessed. However, putting the returned material through the entire refining process is very time and energy consuming. This is where digitisation can play an important role.

Aurubis Belgium has recently developed a model that allows the company to optimise the reverse logistics and the recycling of waste from the production process of its customers. By using real-time data modelling, Aurubis can avoid copper scrap from going through the entire refining process while still producing the required quality. This results in significant savings in terms of cost, utilisation of the process, energy consumption and lead time.

The model includes data such as the quality currently being produced, the existing customer orders, and the quality supplied to a customer (which is a good indicator of the quality of the returned copper). It uses this data to predict the production quality. The outcome of the model is integrated in the planning model that steers production, enabling the addition of copper scrap at the end of the production process while meeting quality requirements. The model also helps to improve the logistics of receiving the recyclable material from customers. This is a complex process, since the mix of material in this return flow constantly changes and needs to be closely monitored to ensure swift processing of the material.

Finally, the model has a built-in learning effect to improve the process in the long run. An essential success factor for this project in Aurubis has been the in-house capability for developing the models, thanks to its strong team of data scientists.

SUSTAINABILITY AND BUSINESS GOALS

VALUE

- Reduced energy consumption
- Reduced waste, looped material
- Improved utilisation of assets

SUPPLY CHAIN PRACTICES

- Recycling of copper scrap
- Capturing and monitoring data about the returned quality

SUPPLY CHAIN PROCESSES

- Return flow of customers' scrap products

DIGITAL TECHNOLOGIES

- Data modelling
- Sensors

BARRIERS AND SUCCESS FACTORS

- Difficulty to upscale
- Challenge to receive necessary data from all parties
- In-house capacity to develop the models; having a strong team of data scientists proved essential for success

VERBUND OPTIMISATION AT BASF

The concept of the Verbund has been around for quite some time and could be considered as an example of circular economy "avant la lettre". The digital technologies that we have available today offer new opportunities and allow for Verbund optimisation, a concept introduced at BASF.

The concept of the Verbund is that it connects manufacturing processes on chemical production plants, where the by-product of one process feeds into the next one, generating barely any waste and using resources and energy more efficiently. At BASF's Verbund sites, production plants, logistics and infrastructure are integrated, creating an efficient value chain and reducing carbon emissions.

To optimise the Verbund even further, BASF is incorporating digital technologies like artificial intelligence and machine learning. For instance, algorithms, artificial intelligence, machine learning and neural networks are combined to better identify which ingredient should go upstream or downstream to another part of the process, creating additional value. This leads to better utilisation of the assets, better use of materials, as well as reduced carbon emission.

Another example is the adoption of predictive maintenance in BASF's Ludwigshafen plant. Sensors collect data on the operating conditions of the assets; this data is then combined with historical data in order to predict the optimal time for the assets to undergo maintenance. The integration of these technologies helps run the Verbund more efficiently, reducing both waste and CO_2 emissions.

SUSTAINABILITY AND BUSINESS GOALS

VALUE	SUPPLY CHAIN PRACTICES	SUPPLY CHAIN PROCESSES	DIGITAL TECHNOLOGIES
- Reduced CO_2 emissions - Maximised utilisation of assets - Reduced waste	- Predictive maintenance - Process optimisation	- Manufacturing - Maintenance	- AI and Machine Learning - Sensors, IoT - Big data analytics

BARRIERS AND SUCCESS FACTORS

THE ADIDAS SHOE MADE TO BE REMADE

Adidas has taken a leap towards a circular future with FutureCraft Loop – the company's new, fully-recyclable, high-performance running shoe made solely from one material, that is, reusable Thermoplastic Polyurethane (TPU) developed in collaboration with BASF.

When the shoe is returned to adidas at the end of its life cycle, it is recycled and transformed into components for new pairs of shoes. The shoe can be recycled over and over, in a fully circular process, repurposing the raw materials without creating any waste.

The fact that the shoe is made of a single material and the production process avoids the use of adhesives is key for this circular concept. Developed in adidas' Speedfactory, a new fusion process enabled adidas to create the FutureCraft Loop that allows to bond the sole unit to the upper without the use of glue.

However, the successful design of the new business model around this circular shoe concept went beyond the implementation of technology. It required a shift in mindset along the value chain, with a strong focus on stakeholder involvement and increased visibility. This also included incentivising the users to return the shoes.

The beta launch of this product took place in April 2019, with 200 ambassadors testing the shoes for a period of time. The next step will be to collect the shoes and recycle them into new pairs.

SUSTAINABILITY AND BUSINESS GOALS

VALUE

- Looped materials

SUPPLY CHAIN PRACTICES

- Increasing value chain visibility
- Recycling materials and reducing waste
- Transformation into circular business model

SUPPLY CHAIN PROCESSES

- Manufacturing and product design
- Sourcing and return

DIGITAL TECHNOLOGIES

- adidas' Speedfactory technology: automation, robotics, 3D printing

BARRIERS AND SUCCESS FACTORS

- Complexity of designing the shoe with only one material and reaching a successful prototype
- Idea of fully circular business model far off the traditional adidas supply chain
- Building strategy of interaction and transparency across entire value chain was fundamental for success

ATLAS COPCO'S SMART AIR COMPRESSORS

This case is based on desk research only.

Atlas Copco focuses on remanufacturing air compressors through its daughter company 'OriginAir'. At the end of their first life, the air compressors are being remanufactured into new products with the same functionality. They are sold on the second-hand market with the guarantee that the same standards apply for quality, delivery time and services as for Atlas Copco's new products. Each air compressor can be adjusted in a way that optimally fits the new owner's requirements. It is a double win for the customers: they pay less, and they get a product with guaranteed performance.

The remanufactured compressors do not cannibalise the demand for new products from Atlas Copco as they are complementary, meaning that they allow Atlas Copco to tap into a broader customer base by accessing the second-hand market. For instance, some customers combine both new and remanufactured air compressors in order to reduce costs; others want to purchase high-quality equipment from a top brand despite having a limited budget.

Furthermore, digital technologies such as sensors and edge computing have been introduced to make the air compressors smart. This has allowed Atlas Copco to launch several pilot projects to implement its 'Product-as-a-Service' business model: customers pay for cubic metres of compressed air, rather than for the compressor. All costs are to be borne by Atlas Copco, including energy cost which accounts for about 70% of the total cost of ownership of a compressor. Moreover, Atlas Copco can also advise customers on the optimal use of the equipment, to ensure that the compressors consume less energy and last longer.

INSIGHTS FROM THE DIGITAL CAFÉ WORKSHOP

The digital café workshop at the EPCA's Annual Meeting in Berlin on October 8th 2019 gathered a group of 86 supply chain professionals and managers. Welcoming the participants, the Chairperson of the EPCA Supply Chain Program Committee (SCPC) Dirk Verstraeten reminded them of EPCA's competition compliance policy and invited all present to comply with the EPCA Do's and Don'ts card distributed during the Annual Meeting and available on the Meeting's App. Prof Dr Ann Vereecke then set the stage for the roundtables discussions, which were kindly moderated by SCPC representatives. The goal of the roundtable discussion was to build on the collective wisdom in the room, gathering opinions on and examples of the power of digitisation to improve sustainability in the supply chain. The energy in the room was tangible as the digital whiteboard filled up with thoughts and comments. Vlerick Business School's facilitating team gathered all input and summarised the insights emerging from the discussions. The main observations are presented here, and may form a stepping stone for the Members of EPCA to continue and scale its efforts in digitally enabled sustainability.

One round of discussions focused on a set of statements that emerged from the preparatory interviews and research (see green box above). These statements offered dilemmas or trade-offs, triggering the debate at the tables. The other round of discussions focused on sharing examples of successful practices that combine digital technologies with sustainability. The 12 cases presented in the previous section of the report served as a source of inspiration for the participants.

The richness of experience, ideas and practices from the audience led to an interesting set of conclusions on whether and – more importantly - how digital transformation and sustainability go hand in hand in the petrochemical supply chain.

STATEMENTS TRIGGERING THE ROUND TABLE DEBATE: "TRUE OR FALSE?"

"The main objective of digitisation in the supply chain has been to increase operational efficiency; its impact on sustainability is typically considered as indirect and secondary. However, times are changing. Sustainability is increasingly becoming a driver for digitisation in the supply chain."

"Without digitisation, a fully circular economy is impossible. You need digitisation as an enabler to really make things happen in the supply chain."

"People are not willing to pay more for the same products. Sustainability in the supply chain is nice, and digital technologies can make it happen, but it is just going to cost extra without direct benefits."

"Start-ups are very valuable in the process of digitisation and reaching sustainable goals. It works both ways: Established companies can join start-up companies in pilot projects and learn from them. Start-ups can learn from established companies who can support them and help them to get their ideas into a direction that brings value."

"Visibility is the new green. Measuring emission performance along the supply chain and sharing the results with the supply chain partners is the first step to taking sustainability seriously. Digitisation and data sharing are needed to create this visibility along the supply chain."

SUSTAINABILITY DRIVING DIGITISATION

- Many participants acknowledged that sustainability is increasingly becoming a driver for digitisation in the supply chain, but they added nuance to it, stating that it rarely is the only driver. The main goal of digitisation projects is and remains to increase efficiency and effectiveness, or to improve business performance. It is promising nonetheless, to see an increasing number of implementations of digital technologies in the supply chain that include sustainability goals in the business case, and that mention sustainability as a source of shareholder value creation.

DIGITISATION, AN ENABLER FOR CIRCULARITY

- The discussion groups agreed that digitisation is an enabler for circularity. However, in order to succeed, digital transformation should go beyond optimising the existing process and bring structural change to the supply chain. Breakthrough ideas are needed to make the shift from the traditional, linear supply chain to a more circular one.

- Standardisation is a key condition for success. Circular economy practices rely heavily on partnerships and input from partner companies, requiring data collection, storage and exchange in a standardised format

- For this to happen, trust is critical. Trust can be introduced, for example, by relying on a neutral data broker party for the exchange of data and information.

B2B VS B2C EXPECTATIONS

- The pressure to act on sustainability through digitisation often comes from the consumer. Participants noted that, in B2C markets, the transformation is already taking place and that the pressure now finds its way upstream, towards B2B companies. They reported that the willingness to pay for sustainable products supported by digital technologies is increasing, but it remains a struggle.

FROM VISIBILITY TO OPTIMISATION

- It is striking that many of the practices shared (in the interviews as well as in the workshop) focus on increasing visibility along the supply chain. As a next step, this visibility allows the companies to optimise the supply chain, for example by reducing the distance over which products need to be transported, by increasing the fill rate of trucks, or by shifting to intermodal transportation. This then results in a more eco-efficient supply chain.

ACCELERATING THE CHANGE TOWARDS A MORE SUSTAINABLE SUPPLY CHAIN

- The importance of stakeholder involvement and cooperation were stressed by many participants. There was a common agreement that fragmentation hinders efficiency and effectiveness of digitally-enabled sustainability initiatives and that joining forces increases the speed of change and its chances of success. Partners along the supply chain should work together towards this goal.

- Start-ups may offer another acceleration mechanism. Unconstrained by large corporations' innovation barriers, they offer new digital products and services that have game-changing potential, and often put sustainability high on the agenda. A lot can be learned from the start-up mindset, but – participants commented – established companies in the petrochemical supply chain should not wait for start-ups to save the day.

SUSTAINABILITY AS A STRATEGIC CHOICE

- Some participants questioned whether economy and ecology truly represent a trade-off or whether it is more a matter of strategic belief. They argued that it takes vision and courage to move away from the traditional focus on the operational performance of the supply chain, balancing cost and service, towards a focus on designing the supply chain that serves the world best in terms of long-term, sustainable performance. This, we believe, remains food for thought.

Professor Ann Vereecke, Partner at Vlerick Business School

CLOSING NOTE

The workshop overall response was very positive, as evidenced by the results of a satisfaction survey circulated after the event. Since digital transformation is mostly associated with operational efficiency, Delegates appreciated that the Digital Café shifted the attention of the industry on the link between digitisation and sustainability and enjoyed the interaction with other players of the supply chain, taking advantage of each other's expertise and experience.

Participants approached the workshop with different expectations - to check the status quo, to understand the objective and vision of key players in the sector, to know the industry expectations – but they all agreed that continuing to share best practices and showcasing breakthrough innovations will support them in taking steps in the right direction when facing challenges such as collaboration and trust, digital technology, scaling-up, interoperability, standardisation, sustainability targets, etc. This edition of the Digital Café, and the 2018 EPCA workshop before it, proved to be a real enabler for further discussion on digitisation and highlighted the industry's need to be inspired by frontrunners, being them established companies or start-ups, who can present effective solutions and explain what digitisation means for them. Sharing best practices and lessons learned remain critical to achieve a more sustainable supply chain.

Based on these considerations, EPCA will continue to look at the Petrochemical's supply chain digitisation journey toward sustainability from an holistic perspective (including, but not limited to, climate change and circular economy). In doing so, EPCA will serve both as a platform for exchanging innovative experiences and a catalyst for new, disruptive ideas.

REFERENCES

REFERENCES ON DIGITISATION AND SUSTAINABILITY:

- "Digitisation in the Petrochemical Supply Chain - Report", Report of the joint EPCA and Vlerick Business School Research, 2018 https://newsroom.epca.eu/wp-content/uploads/2018/03/494491a2732736c46b1a1705bc3dbdbb.pdf
- EM – DAT https://www.emdat.be/
- "The Internet of Things: How the Next Evolution of the Internet Is Changing Everything", Dave Evans, Cisco IBSG, April 2011 https://www.cisco.com/c/dam/en_us/about/ac79/docs/innov/IoT_IBSG_0411FINAL.pdf
- "Closing The Loop: An Ambitious EU Circular Economy Package", European Commission report, 2015 https://ec.europa.eu/commission/sites/beta-political/files/circular-economy-factsheet-general_en.pdf
- "Towards The Circular Economy", Ellen McArthur Foundation report, 2013 https://www.ellenmacarthurfoundation.org/assets/downloads/publications/Ellen-MacArthur-Foundation-Towards-the-Circular-Economy-vol.1.pdf
- "Growth within: A Circular economy vision for a competitive Europe", Ellen MacArthur Foundation and the McKinsey Center for Business and Environment report, 2015
- "Europe's Circular-Economy Opportunity", McKinsey report, 2015
- UN Sustainable Development Goals Programme https://www.un.org/sustainabledevelopment/climate-facts-and-figures/
- "Economic losses, poverty & disasters: 1998-2017", UNDRR – United Nations Office for Disaster Risk Reduction report, 2018 https://www.unisdr.org/we/inform/publications/61119
- "The Digital Twin Concept Explained", SAFETY4SEA, 2019 https://safety4sea.com/cm-the-digital-twin-concept-explained/
- World Economic Forum Reporting
  - "Delivering Change: Digital Transformation In Logistics", 2016 http://reports.weforum.org/digital-transformation/delivering-change-digital-transformation-in-logistics/?doing_wp_cron=1566908295.0356180667877197265625
  - "How Heavy Transport Can Reduce Emissions And Save Money", 2019 https://www.weforum.org/agenda/2019/07/how-heavy-transport-can-reduce-emissions-and-save-money/

REFERENCES FOR THE CASES:

VOPAK AND THE PORT OF ROTTERDAM
- Interview with Leo Brand, CIO Vopak, August 2019
- "Efficiëntie In De Haven Vraagt Om Meer Dan Datatechnologie", TNO, July 15, 2019 https://www.tno.nl/nl/tno-insights/artikelen/efficientie-in-de-haven-vraagt-om-meer-dan-datatechnologie/

DESIGNING LOW IMPACT SUPPLY CHAIN SOLUTIONS AT AGILITY
- Interview with Liz Preston, CEO Agility Chemical Logistics, and Frank Clary, Vice President Sustainability Agility, August 2019

SMART CONTAINERS AND CO_2 EMISSIONS AS A PARAMETER IN SUPPLY CHAIN OPTIMISATION AT DOW
- Interview with Peter Van Egerschot, Logistics Director Europe Dow, September 2019
- Interview with Jacqueline Faseler, Global Sustainability Director Dow, September 2019
- Interview with Jeff Tazelaar, Digital Fulfillment Center Director Dow, and Adriana Vazquez, Lead SC Expertise Manager, ISC Innovation Dow, September 2019
- "Sustainability Report 2018", Dow, 2019 https://corporate.dow.com/en-us/science-and-sustainability/reporting

NXTPORT AND THE PORT OF ANTWERP
- Interview with Erwin Verstraelen, CDIO Port of Antwerp, August 2019
- "How the Digital Circular Economy Works: Circular Bytes Casebook", Agoria & Sirris, 2018 https://www.sirris.be/circular-bytes-casebook

TRUCKTRACER APP AT BERTSCHI
- Interview with Hans-Jörg Bertschi, Executive Chairman Bertschi Group, August 2019

BLOCKCHAIN ENABLED GLOBAL TRADE PLATFORM BY MAERSK AND IBM
- Interview Mads Stensen, Senior Sustainability Developer Maersk, September 2019
- "Maersk and IBM Introduce TradeLens Blockchain Shipping Solution", IBM Press Release, August 9, 2018 https://newsroom.ibm.com/2018-08-09-Maersk-and-IBM-Introduce-TradeLens-Blockchain-Shipping-Solution

- "New Members Set Stage for Next Wave of TradeLens Growth", TradeLens, May 28, 2019 https://blog.tradelens.com/news/tradelens-ecosystem-update/
- "Digitizing Global Trade with Maersk and IBM", Michael White, IBM Blockchain Blog, January 16, 2018 https://www.ibm.com/blogs/blockchain/2018/01/digitizing-global-trade-maersk-ibm/
- "The Paper Trail of a Shipping Container", IBM and Maersk Infographic, 2017 https://www.ibm.com/downloads/cas/VOAPQGWX
- "IBM, Maersk Finally Sign Up 2 Big Carriers for Shipping Blockchain", Ian Allison, Coindesk, May 28, 2019 https://www.coindesk.com/ibm-maersk-finally-sign-up-2-big-carriers-for-shipping-blockchain

THE ELECTRONIC EUROPEAN CLEANING DOCUMENT

- Conversations with Peter Devos, Managing Director ECTA, August 2019
- "Digitisation in the Petrochemical Supply Chain Report", Report of the joint EPCA and Vlerick Business School Research, 2018
- Designing Low Impact Supply Chain Solutions at AgilityInterview with Liz Preston, CEO Agility Chemical Logistics, and Frank Clary, Vice President Sustainability Agility, August 2019

AURUBIS OPTIMING THE REVERSE FLOW OF COPPER

- Interview with Jo Rogiers, Senior Vice President Technology Aurubis Belgium, September 2019
- "How the Digital Circular Economy Works: Circular Bytes Casebook", Agoria & Sirris, 2018 https://www.sirris.be/circular-bytes-casebook

VERBUND OPTIMISATION AT BASF

- Interview with Dr. Carsten Linz, Senior Vice President Digitalization of Businesses & Functions (G-FDB) BASF, September 2019
- BASF Global Website
  "Smart Manufacturing", BASF Global https://www.basf.com/global/en/who-we-are/digitalization/smart-manufacturing.html
  "Strategy – Verbund", BASF Global https://www.basf.com/global/en/who-we-are/strategy/verbund.html

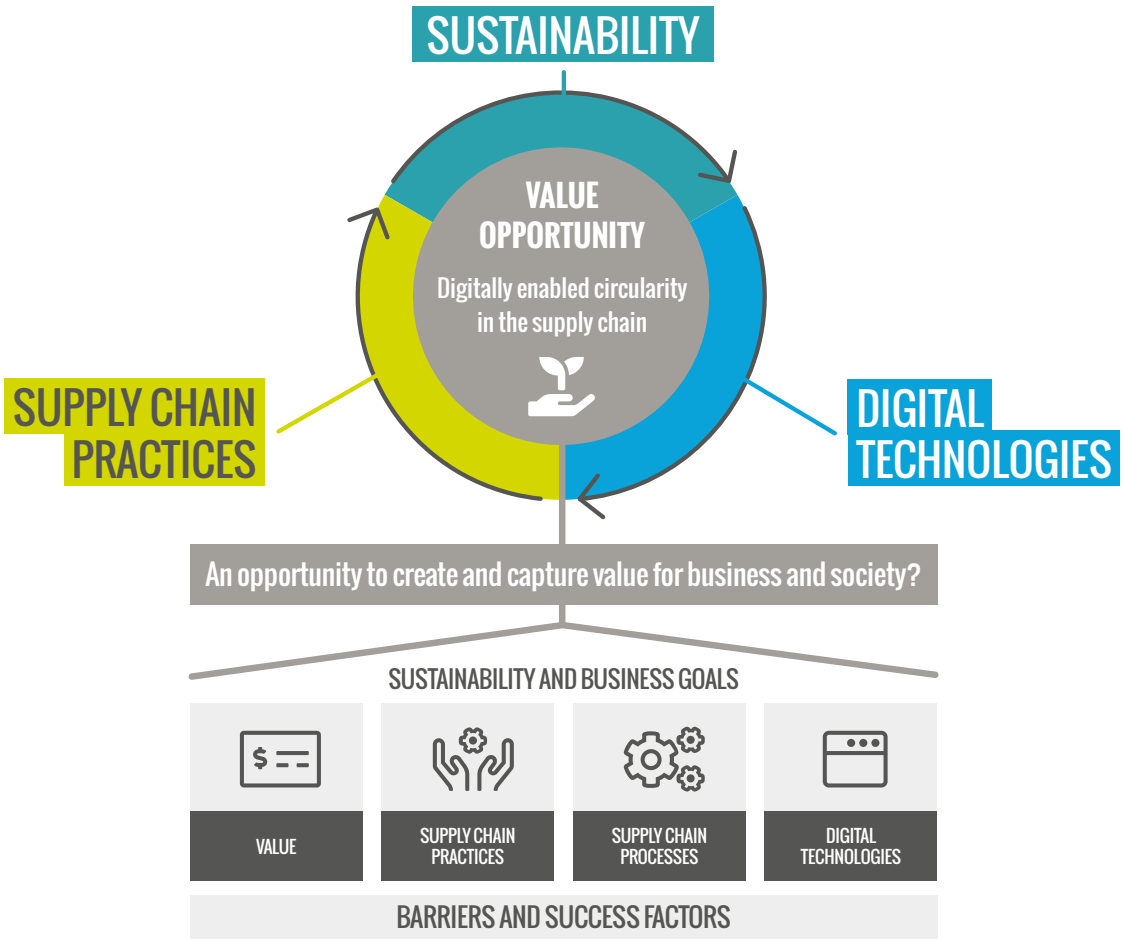
THE ADIDAS SHOE MADE TO BE REMADE

- Interview with Tanyaradzwa Sahanga, former Technology Innovation Manager Adidas, September 2019
- "Adidas Unlocks A Circular Future For Sports With Futurecraft.loop", Adidas Press Release, April 17, 2019 https://news.adidas.com/running/adidas-unlocks-a-circular-future-for-sports-with-futurecraft.loop--a-performance-running-shoe-made-t/s/c2c22316-0c3e-4e7b-8c32-408ad3178865
- "Adidas Futurecraft Performance Sneakers 'Made To Be Remade'", Tim Newcomb, Forbes, April 18, 2019 https://www.forbes.com/sites/timnewcomb/2019/04/18/adidas-futurecraft-performance-sneakers-made-to-be-remade/#50471b52258d
- "Inside Adidas' Robot-Powered, On-Demand Sneaker Factory", Anna Wiener, Wired magazine, November 29, 2017 https://www.wired.com/story/inside-speedfactory-adidas-robot-powered-sneaker-factory/
- "Adidas' FutureCraft Loop Sneaker Talks a Big Recycling Game", Sam Rutherford, Gizmodo, April 17, 2019 https://gizmodo.com/adidas-futurecraft-loop-sneaker-talks-a-big-recycling-1834086618

ATLAS COPCO'S SMART AIR COMPRESSORS (CASE BASED ON DESK RESEARCH)

- "How the Digital Circular Economy Works: Circular Bytes Casebook", Agoria & Sirris, 2018 https://www.sirris.be/circular-bytes-casebook
- "SDG Industry Matrix Report – Industrial Manufacturing", United Nations Global Compact & KPMG, 2015

FACTS AND FIGURES



DIGITAL TECHNOLOGIES

The Petrochemical Supply Chain is increasingly powered and transformed by digital technologies, creating new opportunities for process, product and business model innovation.

25-50 BILLION
connected devices by 2020

$3.9-11.1 TRILLION
per year economic impact of IoT by 2025

$2.4 TRILLION
worth of societal benefits

$4 TRILLION
opportunity over the period 2016-2025

$1.5 TRILLION
of value for logistics players

FACTS

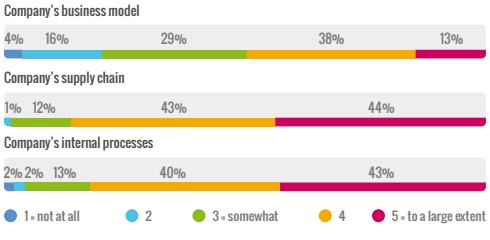
80% of EPCA membership expects moderate to high impact of digitisation on their business.

The large majority of EPCA membership invests in short and long term digital technologies.

Digital alone has the opportunity to reduce emissions from logistics by as much as 10 to 12% by 2025.

Society benefits coming primarily from three initiatives: crowdsourcing, digitally enhanced cross-border platforms, and shared warehouse agreements.

DIGITISATION WILL IMPACT



SUPPLY CHAIN PRACTICES

Digitally enabled circularity in the supply chain helps companies and society reduce or avoid waste, increase efficiency and reclaim value.

By implementing circular economy practices, the European Commission hopes to provide 580,000 new jobs, reduce greenhouse gas emissions by 450 million tonnes until 2030, and cut costs of 600 million euros for European companies, which would be around 8% of its annual turnover and create new and lasting competitive advantages for Europe.

RESOLVE FRAMEWORK

SIX CIRCULAR-ECONOMY ACTIVITIES HAVE THE POTENTIAL TO IMPROVE PERFORMANCE AND REDUCE COSTS FOR A NUMBER OF INDUSTRIES.

–

OUT OF 28 INDUSTRIES STUDIED...

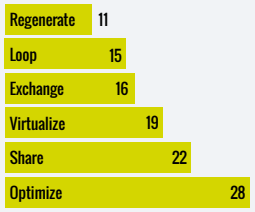
... all of them can benefit by adopting at least 3 or 4 activities

... 10 can profitably adopt 5 or 6

NUMBER OF INDUSTRIES WITH THE POTENTIAL TO ADOPT SPECIFIC ACTIVITIES PROFITABLY

–

SIX CIRCULAR-ECONOMY ACTIVITIES



Source: Growth within: A Circular economy vision for a competitive Europe, Ellen MacArthur Foundation and the McKinsey Center for Business and Environment, June 2015

"AN ECONOMIC OPPORTUNITY WORTH BILLIONS"

82 BILLION TONNES
expected growth of global resources extraction in 2020

60% OF TOTAL WASTE
is not recycled, composted or reused

€600 BILLION / YEAR
of cost savings will be generated

3% BY 2020
of Europe's resource productivity could be boosted by Circular Economy

SUSTAINABILITY

Climate awareness and sustainable growth top the agenda of business and political leaders, and global consumers.

+2° To achieve the goal of limiting climate change to 2°C, countries need to triple the level of their commitments made under the Paris Agreement.

+44% Since 2000, an average of 341 climate-related disasters per annum was recorded, up 44% from the 1994-2000 average, and well over twice the level in 1980-1989. (source EM-DAT)

$3 TRILLION GLOBALLY
direct economic losses from climate related disasters from 1998 to 2017

13% OF GLOBAL
greenhouse gas emissions is accounted by heavy duty transport - WEF 2019

53.5 GtCO2e
is the historic level that the global emissions have reached

$26 TRILLION
in economic benefits could be delivered by bold climate action through 2030

SUSTAINABLE DEVELOPMENT GOALS

- INDUSTRY, INNOVATION AND INFRASTRUCTURE
- RESPONSIBLE CONSUMPTION AND PRODUCTION
- CLIMATE ACTION

https://sustainabledevelopment.un.org

VLERICK BUSINESS SCHOOL

EPCA THE EUROPEAN PETROCHEMICAL ASSOCIATION

SOURCES

- World Economic Forum reporting
- UN Sustainable Development Goals Programme
- Joint EPCA and Vlerick Business School research

This infographic has been developed based on desk research. It shows some key facts and figures related to the accomplishment of sustainability goals, the implementation of digital technologies, and the introduction of the principles of circularity in the supply chain. It illustrates strengths as well as weaknesses, and threats as well as opportunities, for supply chains in general and for the petrochemical supply chain in particular. For the list of references see page 27.

EPCA

THE EUROPEAN PETROCHEMICAL ASSOCIATION

CHEMISTRY FOR YOU

Based in Brussels, EPCA is the **primary European Business Network** for the global petrochemical business community consisting of chemical producers, their suppliers, customers and service providers. It operates for and through more than 700-member companies from 54 different countries that represent an aggregate turnover of over €4.7 trillion and employing over 6.2 million people. EPCA **organises conferences and events** in Europe offering members all over the world the opportunity to meet industry leaders and selected external stakeholders and stay abreast of international market developments as well as technological and societal trends. EPCA also **supports** members on **specific topics** that underpin the sustainable development of the global petrochemical industry by developing knowledge via research projects with external partners (e.g. academic institutions and consultancies).

EPCA – The European Petrochemical Association A.I.S.B.L./I.V.Z.W.
Avenue de Tervueren 270 Tervurenlaan
1150 Brussels / Belgium
T: +32 2 741 86 60 / F: +32 2 741 86 80

www.epca.eu

Belgian Crossroads Bank for Enterprises
n° 0408.299.922