The Digital Challenge of a Circular Economy:

Accelerating Digital Supply Chains

Circular economy is about more than recycling alone. Predominantly driven by digitalization, the 4th Industrial Revolution supports interconnectivity, automation, and novel circular business models that will greatly benefit scale-up ambitions. Our latest Deep Dive highlights the importance of a twin transition, and the challenges industries are faced with in their metamorphosis towards a digital and circular bioeconomy.

We wanted to explore the digital technologies that are necessary for circular supply chains, and zoomed in on the digitalization of these supply chains against the backdrop of the European policy environment and start-up ecosystem. How can we reduce waste and make supply chains more efficient? What are untapped opportunities for investors and market participants? And where can we establish early-mover advantage?

In this Deep Dive Session, ECBF's market experts and analysts were joined by experts and market leaders from our extensive international network: Annika Hedberg – Senior Policy Analyst at the European Policy Centre (EPC), Lars Börger – VP Renewable Polymers & Chemicals at Neste, Mesbah Sabur – Co-founder at Circularise, DJ Bodden – COO at FarmerConnect, and Wouter Bruins from In Ovo, who provided a practical insight in current and future challenges and implementations.

Twin Transition: Like Peas in a Pod

Verbalizing the pairing of digitalization and the circular economy, twin transition refers to all things green and digital in this space. In other words: The digital tools deployed in the industry that allow us to have a more accurate understanding of resources, waste, materials, and inefficiencies enabling interconnectivity and industrial symbiosis. These tools help unlock new business models, by creating platforms and marketplaces, and selling value instead of material. Digitalization also ensures necessary supply-chain traceability and transparency, and leverages community and consumer engagement by selling a personal experience.

Enabling of the transfer of information across the value chain, through digitalization, is an EU policy-making priority, and helps a great deal, Annika Hedberg from the EPC clearly laid out: “It is important to align the Green and Digital transitions as they will potentially enhance the circular economy, and accelerate the building of a sustainable, climate-neutral, resilient and competitive European economy.”

Digital Twin

A digital replica of physical assets, processes and systems allows a predefined actor to access relevant information at a preset time in a decentralized way. The digital twin market alone is predicted to grow from 3.1 billion dollars in 2020 to 48.2 billion dollars by 2026

(source: Markets and Markets).

Digital Product Passport

The European Commission plans to introduce a “digital product passport” containing information about the composition of goods on the European market to help boost their chances of being reused and recycled. Priority is given to electronics, ICT and textiles but also furniture and high-impact intermediary products such as steel, cement and chemicals

The objective is to accelerate the transition to a circular economy by supporting sustainable production, supply-chain traceability, consumer decision-making, verification by authorities and regulatory bodies, creating new business opportunities, and tackling “greenwashing”.

Drivers and Trends

Startups and existing businesses explore opportunities to reduce waste and losses in the supply chain as well as methods to change consumer needs and increase awareness, preferably simultaneously. Digital Twin is core to digitizing the supply chain transitioning to a circular bioeconomy, while Digital Ledger Technology (DLT) and Artificial Intelligence (AI) are considered equally vital for transparent supply chains and new business models.

Trust and transparency in the supply chain are increasingly high in demand, as is reporting of fraudulent activities. ECBF sees three important digital subsectors for the circular economy: Digital waste management and marketplaces, data analytics & insights, and track & trace. Ultimately, they enable the operational backbone of the European circular bioeconomy.

Digital Waste Management and Marketplaces

Digital waste management platforms and marketplaces are leveraging digital technologies to improve efficiencies in the supply chain through various methods (e.g., waste sorting, dynamic pricing, business matchmaking). Exciting startups in this space are simplifying waste management and selling verified recycled and bio-based materials to support circularity and create value.

Discarded/recycled products and materials can be exchanged between parties in a value-creation network. In turn, this can solve information-related shortcomings of current markets for waste and recycling materials where transaction costs, search costs, information asymmetries, etc. prevent effective market constellations.

Data Analytics & Insights

The scope of data analytics is quite extensive, and most companies operate either agnostically or focus on construction – a key focus area for the EU in terms of the Digital Product Passport. Analytics and insights companies report emission and circularity insights by gathering and processing data and analyzing complex datasets. They identify patterns (life-cycle assessment or LCA), extract information (carbon footprints), discover trends (material evaluation), or calibrate models.

Data analytics enable us to measure circularity and sustainability, identify promising circular economy strategies, and support decision making to improve the environmental performance of products and services. They also facilitate stakeholder engagement and provide industry benchmarks, and help implement material and product passports, carbon credits, sustainability performance ratings, asset grade data, collaborative consumption, product as a service, circularity assessments, and eco design.

Track & Trace

Today, providing insight and transparency of materials and products throughout the supply chain is becoming a crucial element in our endeavor to meet compliance and streamline decision-making. Moreover, consumers are willing to pay up to 10% more for products from companies that provide greater supply chain transparency (Source: MIT).

Trends of transparency and trust flow through pharmaceutical and critical raw-material supply chains, and will increasingly affect every material and commodity. Our speaker from Circularise, Mesbah Sabur, emphasizes that growing trust and circularity creates a positive feedback loop and supports the development of the ecosystem. However, as DJ Bodden from FarmerConnect explained, we need reliable data to unlock the true potential for value creation in circular models, building circularity one block at a time. And, as Lars Börger from Neste indicated, expand our climate commitments to cover the entire value chain, which is no walk in the park considering the complexity of value chains today.

Digital Ledger Technology (DLT)

A digital system used to record the transaction of assets, where details are documented in multiple places at the same time. Crucial information can be made available readily and up-to-date, and transparently displayed and reviewed for accuracy. Applications in the circular economy go far beyond waste management and include supply chain traceability, material passports, end-of-life compliance and automating environmental audits.

Artificial Intelligence (AI)

AI is a catch-all term for a collection of technologies, handling models and systems that perform human-like cognitive functions such as reasoning and learning. These technologies are able to deploy huge datasets to improve on the completion of complex tasks.

Track & trace is a system in which a product or material can be located at any time, including information on when and where and by whom the goods or product parts were obtained, manufactured, processed, stored, transported, used, or disposed. It is already commonly in use in the agri-food sector. Digital track and trace solutions can incentivize circular bioeconomy and bring efficiency in documentation and certification, regulatory audits, tokenization, process automation, and sharing of confidential information.

Startups in this space use blockchain to provide granular visibility into the product sustainability metrics. There is a key opportunity to lead the way and supply more sustainable and innovative products and services. Tracing supply chains can optimize the flow of materials, better manage inventories, and enable stakeholders to quicker identify and react to increasing physical supply-chain risk.

Cradle-to-Grave

A term often used in relation to compliance for Product Stewardship & Regulatory Affairs (PSRA) is cradle-to-grave, which basically refers to monitoring the creation of a product or service until the end of its lifetime. And it's becoming more and more common use in all fields and industries where consumers are involved, as they really want to know what's up and down before they decide to purchase or endorse.

Industry and Investment Interest

Investments in the digital- and supply-chain space are accelerating at a rapid pace, with a strong focus on Europe and North America, where western Europe is the leading hub for digital circular startups. The reason for this is quite simply because of the high quality of available data.

There is a steady increase in capital invested and deal count worldwide, though IPO activity has been low. Funding rounds indicate there is no clear geographical skewing for digital for circular startups. As digital circular technologies are not widespread, many investors/companies may not know about the opportunities, and high initial costs and uncertainty about results may cause a lack of confidence at financial return. However, we are currently seeing a lot of pilot projects, which will attract investor attention in the coming months.

Although the sector is forming and now can be considered a good entry moment, the challenges are real. For instance, regulations have not been finalized to support transparent supply-chain ecosystems. And then, consumer acceptance is still low due to inadvertently high implementation costs, and for the entire supply chain to be transparent, there is a need for all participants to be involved. The market is also generally perceived as unwilling as some companies are reluctant to share data due to sensitivity, IP, and data integrity.

One of the bigger challenges is that delivering is proving difficult. Lack of immediate results discourages investors/companies focused on short-term profitability. Companies are struggling to scale-up, due to intensive energy consumption and the absence of high-quality data.

Developing countries for instance perform poorly in human assets, face high economic vulnerability, and lack connectivity. Data shows us that there is no clear tech leader yet: Public blockchain, private blockchain, cloud-based serialization, etc. all co-exist and interoperate with legacy systems. Support from other technologies could bolster application robustness.

As the first venture fund exclusively focused on circular and bio-based industries in Europe, ECBF believes in the potential of the Twin Transition to reduce carbon emissions while generating favorable financial returns and investment opportunities. We seek to be a significant financial instrument and partner for entrepreneurs looking to unlock and accelerate the economic potential of the circular bioeconomy in Europe, and help create a better and healthier future for everyone.

For questions and comments, please refer to:
Peter Nieuwenhuizen, Founding Partner at ECBF
peter.nieuwenhuizen@ecbf.vc

Hakan Karan, Associate at ECBF
hakan.karan@ecbf.vc

Mridul Pareek, Analyst at ECBF
mridul.pareek@ecbf.vc

Cornelia Mann, Marketing & Communications at ECBF
cornelia.mann@ecbf.vc