



THE CIRCULAR OPPORTUNITY
HARNESSING THE POWER OF
PRODUCT-AS-A-SERVICE



BNP PARIBAS
LEASING SOLUTIONS

Equipment finance for a changing world

ABOUT THIS REPORT

This report has been commissioned by BNP Paribas and BNP Paribas Leasing Solutions. The research was conducted by Do Well Do Good, a purpose-led strategy consultancy. The report aims to contribute to advancing Product-as-a-Service (PaaS) business models, in line with the European Union's efforts to promote the transition towards a circular economy.

The report offers an overview of the role of the PaaS in the circular economy ecosystem. It also explores two key sectors in depth, examining how agricultural equipment and green tech have responded to opportunities and challenges presented by PaaS models. These industries have been identified as core sectors for BNP Paribas Leasing Solutions due to their significant economic impact and the possibility of integrating PaaS models into their operations. Additional insights have also been gathered across four other sectors – heavy vehicles, healthcare, IT, and construction.

While researching this report, interviews were conducted with 28 industry experts across six industries, who were asked to share their comprehensive understanding of how PaaS models are transforming traditional business practices in their field.

Thank you to everyone who shared their time, knowledge, and insights:

Fabien Delolme, Commercial Director for France, Dell Financial Services

Michael Mansard, Chair of the Subscribed Institute EMEA & Principal Director, Zuora

Stéphane Dierick, Director of Cloud Projects, Zuora

Jesus Blasco, Senior Vice President Capital Markets EMEA, GE Healthcare

Florian André, Founder and CEO, P2S Management Consulting

Olivier Bussenot, Vice President for Sales Operations and Enablement, DigitalRoute

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Yann Toutant, Co-Founder and CEO, Black Winch

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Yohann Desalle, Fleet Management Consultant, Thluki Conseils

Peter Lukassen, Director of Sustainability, Bosch

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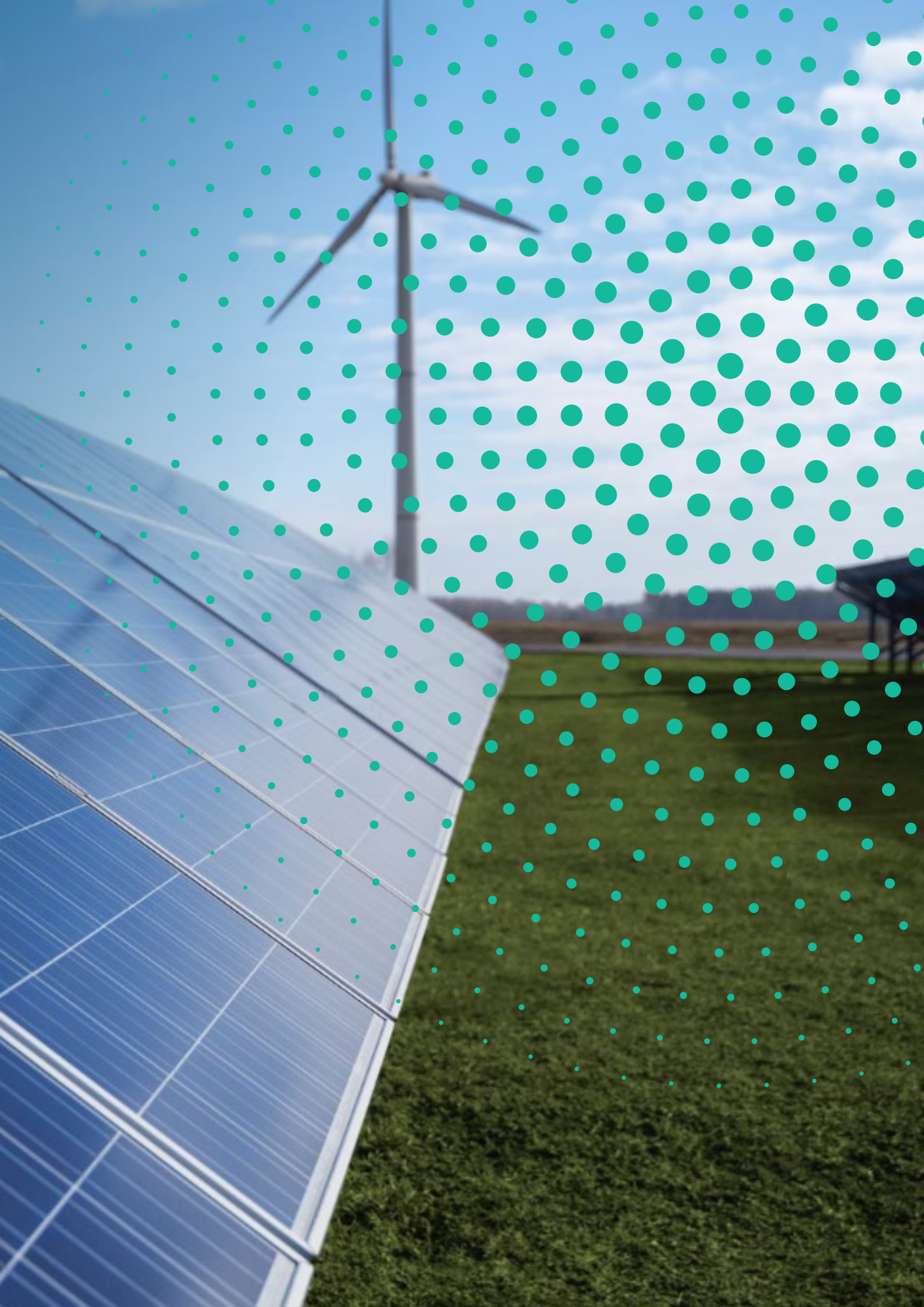
Pierre-Emmanuel Saint Esprit, Circular Economy Director, Manutan Group, and Founder and Executive Director, ESSEC Global Circular Economy Chair

Geoffrey Richard, Circular Economy Director, Schneider Electric

Gwenaëlle Helle, Director of Financing Solutions, Schneider Electric

Jean Philippe Hermine, Director of the Mobility in Transition Institute and Associate Researcher, Institute of Sustainable Development and International Relations

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ANNE POINTET

Head of Company Engagement, BNP Paribas

PRODUCT-AS-A-SERVICE FOR SUSTAINABLE BUSINESS MODELS



We live in a world undergoing constant change, driven largely by technological advances and the urgent need to address climate change. We're witnessing innovation across almost every key economic sector from agriculture to transportation, construction, and healthcare.

However, these technologies, while improving efficiency and productivity, may come with some drawbacks. First, they may demand consequent natural resources despite our global consumption already exceeding Earth's regenerative capacity. Second, they could be more expensive for end-clients, posing a risk to the transition. At BNP Paribas, our role is to inform our clients about these transformations so they can benefit from them, while ensuring their long-term viability, hence calling for more sustainable and accessible consumption models.

Aligning with the European Union's Green Deal, BNP Paribas has identified the Circular Economy as one of five priorities in the Sustainability pillar of its GTS (Growth, Technology, Sustainability) 2025 strategic plan. Our goal is to find solutions that meet our clients' needs while respecting the planet's limits and aiming for carbon neutrality, which is at the core of Circular Economy.

In this study, we aim to explore the role of Product-as-a-Service (PaaS) as a key enabler of the Circular Economy. PaaS shifts the focus from asset ownership to service, usage, and performance. This business model is based on a comprehensive understanding of product lifecycles and grants usage of an asset to a client - but never

outright ownership - through long-term contracts or pay-per-performance schemes. PaaS can help to unlock opportunities for various stakeholders. Businesses, for example, can benefit from lower upfront costs and inclusive services, which is crucial in facilitating access to sustainable technologies. Manufacturers may see a new business model opportunity with recurring, predictable revenue streams and potentially closer relationships with the end-client. But this shift from the traditional sales models will require the value chain to be reconsidered and redeveloped within a wider ecosystem.

These client-focused transformations brought by PaaS represent considerable opportunities for both business and the planet and a significant evolution for BNP Paribas as we strive to support the adoption of more sustainable business practices.





NEIL PEIN

CEO, BNP Paribas Leasing Solutions

EQUIPMENT FINANCE FOR A CHANGING WORLD



Change is the only constant, and today it seems to be happening faster than ever. Technology is advancing, the climate is evolving, and the business environment is transforming. Companies are increasingly aware that their actions resonate far beyond their walls, impacting complex value chains. In this dynamic world, businesses are having to adapt and innovate to grow sustainably.

However, the way organizations procure and manage assets has lagged behind. Many still heavily invest in purchasing equipment, only to face repair costs and inefficiencies as assets age. In this linear economy, these assets often end up discarded, wasting residual value.

The circular economy offers a game-changing alternative. By maximizing the utility of materials through sustainable practices like repair, refurbishment, and recycling, businesses can extend the lifecycle of assets and reduce waste. This approach ensures that resources remain productive, contributing to long-term sustainability.

Sustainable finance and innovative payment models, such as Product-as-a-Service (PaaS), play a crucial role in enabling circularity. These models allow businesses to access essential equipment without owning it outright, reducing upfront costs and enabling investment in green technologies. Ownership remains with the manufacturer or financier, who provides value-added services like warranties, insurance, maintenance, and operational insights. This not only enhances productivity but also encourages responsible use.

For manufacturers, PaaS is transformative. By shifting from selling products to delivering services across the asset lifecycle, they can unlock new revenue streams. Stronger customer relationships emerge through ongoing support, while predictable revenues enable investments in innovation and sustainability.

In transitioning to a circular economy, PaaS empowers businesses to decouple growth from resource consumption. At BNP Paribas Leasing Solutions, we're committed to creating an ecosystem where sustainable finance drives progress, helping companies thrive while safeguarding our planet for future generations.



THE CIRCULAR OPPORTUNITY

Over the last five years the circular economy has gained momentum with the volume of discussions on this topic almost tripling, according to the Circular Economy Foundation.^{iv}

Governments worldwide are insisting on a swift, circular transition. Consumers are demanding change, and businesses are following suit. Organizations big and small are committing to transforming their operations in line with circular economy principles, including hundreds of leading brands from Ikea^v to Adidas^{vi} and the world's largest brewer, AB InBev^{vii}.

The transition to a circular economy has the potential to spark new innovations, supercharge the economy, create jobs, address some of the key causes of climate change, and re-energize local communities. But despite the opportunity it presents, today, the global economy is only 7.2% circular, with the share of secondary materials we consume dropping 21% since 2018.^{viii}

It's clear that to make the circular economy a reality and turn hype into action, governments and businesses need practical ways to implement circularity across their value chain.

But first, what is the circular economy?

The circular economy is an alternative way of thinking about production and consumption that reduces both the consumption of raw material and the production of waste by extending the utilization and lifespan of products and materials. It's the opposite to a linear economy, which is characterized by a take-make-dispose approach to resource consumption.

In a circular economy, products are designed to stay in circulation, with resources being used again and again to extract their maximum value, before becoming waste and being recycled for their component parts. More concretely, as long as the solution reduces negative environmental impact, mechanisms that can achieve circularity can include:

Circular inputs: When virgin material is substituted with secondary or recycled materials in the production process, or single-lifecycle materials are replaced by fully recyclable components.

Circular design: Designing products to reduce material consumption through increased durability, increased modularity for ease of repair and recycling, and methods to avoid premature obsolescence.

Product lifetime extension: Processes that increase product utilization, including reuse, remanufacturing, repairing, refurbishing, repurposing, and the re-sale of second-hand goods.

Sharing business models: Services that optimise utilisation of products to reduce the production of new goods.

Product-as-a-Service: Selling products through use-orientated or result-orientated services such as leasing or pay per service contracts, where ownership of the asset remains with the manufacturer or lessor.

Material / resource recycling: Operations by which waste materials are reprocessed into products, materials, or substances.

Why circular, why now?



90%

of land-based biodiversity loss and water stress are caused by raw material extraction and processing.^{ix}



90%

of the resources consumed worldwide end up in waste.^x



US\$62 billion

worth of recoverable natural resources used in electronics alone is lost every year as waste.



US\$80–120 billion

of plastic packaging material value is lost to the economy after a short first use, equal to about 95% of its total value.^{xi}



US\$4.5 trillion

in additional economic output could be generated by a circular economy by 2030.^{xii}

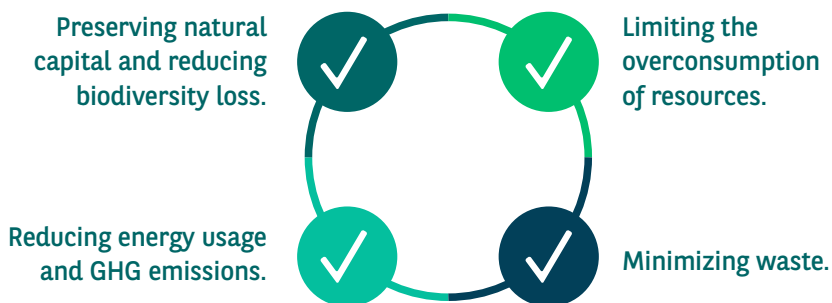


3.9 million

people in Europe are estimated to be employed in jobs directly associated with the circular economy in 2018.^{xiii}

What are the benefits of circularity?

The circular economy is key to the fight against climate change and resource depletion. By reducing the need for new products, increasing product utilization and efficiency, and encouraging reuse, circularity can deliver huge environmental benefits, including:



Shifting away from traditional production and consumption also improves economic stability, relieving pressure on overstretched supply chains, mitigating price fluctuations, and reducing import dependence.^{xiv}



WHAT OUR EXPERTS TOLD US:

Jean Philippe Hermine is Director of the Mobility in Transition Institute and Associate Researcher at the Institute of Sustainable Development and International Relations.

“The circular economy requires us to rethink the product as a set of components, some of which are extremely strategic and do not necessarily have the same life cycle.”

THE CIRCULAR ECONOMY: FROM REGULATION TO REALITY

Europe is striving to become the world's first carbon neutral continent and has developed a comprehensive regulatory framework to support this transition. Central to this is the EU Green Deal - a regulatory roadmap towards achieving Europe's sustainable future.^{xv}

One of the Green Deal's major building blocks is the Circular Economy Action Plan, a package of policies focused on reducing pressure on natural resources, changing our production and consumption habits, and minimizing waste^{xvi}. It includes new regulations designed to ensure that businesses are aiming their influence, purchase power, and impact in the right direction. And that consumers have access to clear and transparent information about how to use their own purchase power for good.

So, what does it all mean for European businesses?

A focus on sustainable product design

In a circular economy, manufacturers play a key role in ensuring the principles of circularity are applied throughout design and production process. With this in mind, the EU has begun implementing new legal frameworks, including the Sustainable Product Initiative^{xvii} and the Eco-design Directive^{xviii}, to ensure all products produced or sold in the EU align with sustainability standards. This means products must be more durable, reusable, repairable, recyclable, and energy efficient.

Enshrining the right to repair

Adding to this is a new EU rule that aims to make repairing products easier and more attractive for consumers. Right to Repair legislation puts the onus on manufacturers to repair a product for a reasonable price and within a reasonable timeframe, even after the warranty period has expired^{xix}. As well as informing consumers about their rights to repair, manufacturers will also have to provide reasonably priced spare parts and will be prohibited from using contractual or technical practices to prevent repairs.

Extended Producer Responsibility

Manufacturers must also consider the new focus on Extended Producer Responsibility, which ensures producers are operationally and financially responsible for a product throughout its lifecycle and requires intervention before products become waste via initiatives such as take-back schemes, repair services, and spare part sales.

Greenwashing

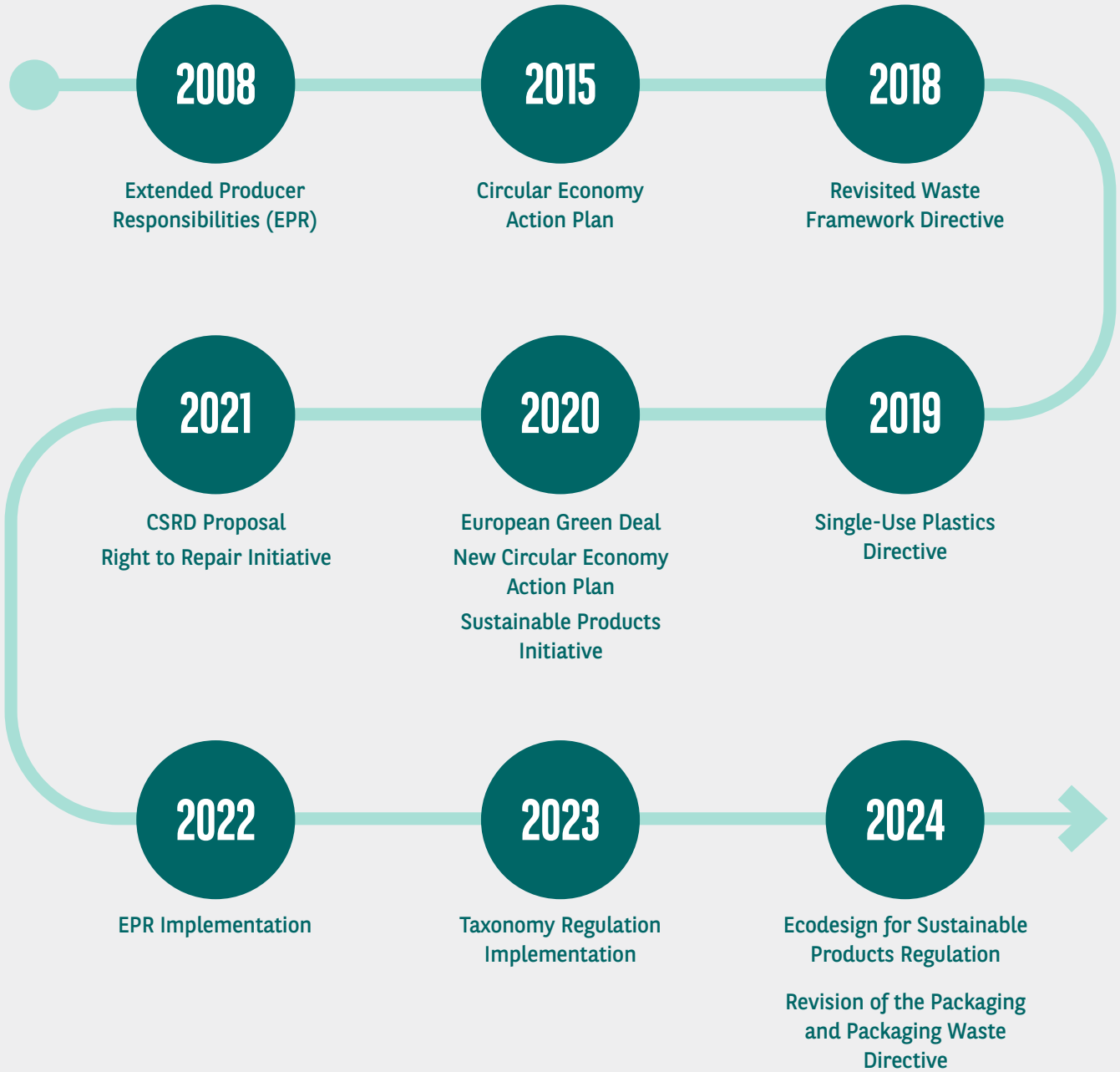
The EU has amended the Unfair Commercial Practices Directive^{xx}, preventing companies from making misleading environmental claims, or as it's more commonly known, "greenwashing". This places the requirement on organizations to provide substantive proof of their environmental credentials and use clear, transparent language across all reporting, labels, and marketing.

Rigorous reporting

Following the introduction of the Corporate Sustainability Reporting Directive^{xxi} (CSRD) and the Sustainability Due Diligence Directive^{xxii} a growing number of companies with a European presence are required to report on both their environmental and human rights impact across their entire value chain and have a plan to mitigate these impacts. The CSRD requires in-scope companies to report as soon as 2025, based on 2024 data, across a range of ESG issues, including, for the first time ever, circular economy performance.



Timeline of EU laws showcasing the EU's circular economy evolution



WHAT OUR EXPERTS TOLD US:

Stéphane Dierick is Director of Cloud Projects at Zuora, an industry leading provider of subscription and monetization solutions.

"As regulatory pressures increase, more businesses will turn to circular and PaaS models to stay competitive and compliant."

SUSTAINABLE FINANCE IN THE CIRCULAR ECOSYSTEM

The transition to a circular economy is, at its heart, an economic transition. This transformation may include a new financial taxonomy, structural changes to production, market reform, and the adoption of innovative technology and digital tools. Global financial institutions have a critical role to play in redirecting finance towards low carbon, circular solutions. The financial levers and products they offer have the potential to be agents for change.

Supporting circular economy business models

Global ambitions to address climate change have led to the rise of green bonds and sustainable finance, which prioritize investments in projects that have a positive environmental impact. Financial institutions may also redirect funding to initiatives that adhere to circular economy principles, channeling investment into organizations, projects, and technologies that are both environmentally sustainable and economically viable over the long term. Banks could also play a role in supporting new circular innovation, by providing financial backing to entrepreneurs and start-ups.

From ownership to access

Financial products, like leasing, can enable the shift from traditional product sales and ownership by providing the contractual framework that allows ownership to be retained by one party, while the user of the product may change. These circular, service-based models allow customers to benefit from using things, without having to own them. The leasing model can encourage the maintenance and preservation of the asset's condition to retain its value for future use, either by the same customer or by others. This approach aligns with the principles of the circular economy, which emphasizes keeping products and materials in use for as long as possible to reduce waste and the need for new resources.

Evolving to meet new societal needs

As society adapts to address the challenges of climate change, financial services may also begin to evolve in response. Take low emission zones, for example. Regulations are beginning to have an impact on consumer behavior, with consumers starting to shift towards circular mobility alternatives, like ride share and carpooling. Businesses are also starting to focus on upgrading or replacing their existing fleets, and this in turn will prompt local authorities to implement new infrastructure, like charging stations. Financial institutions can act as facilitators in this process by adapting traditional finance models, like lending, leasing, and insurance, to support these new business models and encourage collaboration across the ecosystem.

The leasing model can encourage the maintenance and preservation of the asset's condition to retain its value for future use, either by the same customer or by others. This approach aligns with the principles of the circular economy, which emphasizes keeping products and materials in use for as long as possible to reduce waste and the need for new resources.



Value creation and risk mitigation

Research by the Ellen MacArthur Foundation and Bocconi University^{xxiii} found that circular economy adoption can be used as a de-risking strategy for businesses. Their analysis of more than 200 European companies across 14 industries showed the more circular a company is, the lower its risk of default on debt over both a one and five-year period. Higher levels of circularity were responsible for “superior risk-adjusted stock performance for European listed companies”.

As investors become more aware of the ESG risks associated with climate change they can influence organizations to tackle those risks more effectively, by supporting clients with the education and financial mechanisms required to transition to circular models.

Enabling and connecting

Financial institutions have strong enterprise client bases to scale solutions, trusted reputations, strong regulatory parameters, expertise in contracting and credit-risk evaluation, and established global networks. These credentials make them facilitators in a circular economy ecosystem, in which a cross-section of organizations and trusted partners, as wide-ranging as manufacturers, dealers, legal services, consulting firms, billing companies, and asset disposal firms, are collaborating, sharing information, and working together to support the transition to circular and service-based models.

WHAT IS PRODUCT-AS-A-SERVICE?

Circularity is a powerful guiding principle for sustainable growth, but organizations also need practical tools to help them implement this new way of doing things. This is where service models, like Product-as-a-Service (PaaS) come in.

In a PaaS model customers pay for the services and outcomes a product can provide, rather than for ownership of the asset itself. Payment is made on a regular basis over the contract term, instead of purchasing a product outright. Additional services such as maintenance, insurance and asset tracking can also be included.

A clear definition for Product-as-a-Service

Until recently, there were no standardized definitions or criteria for assessing circular business models. However, in June 2023 the EU released a new taxonomy to evaluate economic activities for their environmental sustainability, emphasizing circular economy practices such as repair, refurbishment, and new models like PaaS.^{xxiv}

Key requirements of the new taxonomy include:

- Retention of product ownership by service provider.
- Access to products via service models available to customers.
- Service models categorized as either use-oriented or result-oriented.
- Return of the product by the customer upon completion of the contractual agreement.
- Service results in either extended product lifespan or enhanced product utilization.

Trends driving the shift to Product-as-a-Service



Complex global economic environment

Rising inflation, supply chain disruption, fluctuating energy prices, and climate change are playing a part in driving PaaS adoption as organizations look to adopt more sustainable and resilient alternatives to traditional asset ownership.



New regulations

Alongside the EU's new taxonomy, many of the policies set out as part the EU Green Deal and the Circular Economy Action Plan, are designed to encourage and support organizations to transition to circular, service-based models.



Subscription economy

The technology sector has been at the forefront of developing subscription models, with a growing number of software and hardware as-a-service options proving popular with organizations.



Sustainability

Organizations face mounting pressure to transition toward sustainable operations, driven by environmental regulations. However, the capital expenditure required for green technologies often presents a barrier to adoption. PaaS can enable organizations to access sustainable technologies and equipment without the burden of substantial upfront investments.

Which financial contracts are considered Product-as-a-Service contracts?

Contract type	Definition	Meets PaaS criteria?
Operating lease	The customer uses an asset for a defined period, paying for its use without assuming ownership.	✓
Pay-per-use	Customers pay based on actual use or consumption of a product. The provider retains ownership and responsibility for maintenance and updates.	✓
Pay-per-performance	Customers pay based on the achievement of specific performance metrics or outcomes, rather than a fixed fee. The provider retains ownership and ensures performance criteria are met.	✓
Subscription	Customers pay a recurring fee at regular intervals to access a product or service for a defined period. The provider retains ownership and responsibility for maintenance and upgrades.	✓

Value-add services that can be bundled into PaaS contracts

Customer support

Training

Consultancy

Warranty

Maintenance

Asset management

Reverse logistics

Equipment upgrades

Equipment installation

Data insight



WHAT OUR EXPERTS TOLD US:

Stéphane Dierick is Director of Cloud Projects at Zuora, an industry leading provider of subscription and monetization solutions.

“PaaS is a pillar of the circular economy, but its potential remains largely untapped in many industries. As regulatory pressures increase, more businesses will turn to circular and PaaS models to stay competitive and compliant.”

THE PRODUCT-AS-A-SERVICE ECOSYSTEM

In order for PaaS models to proliferate and deliver the greatest value, a whole ecosystem approach is needed, with collaboration across many industries and organizations. Each stakeholder brings specific capabilities and resources, and must coordinate their efforts to ensure these circular business models are viable and attractive to end users. Technical and legal mechanisms are also necessary to enable the sharing of data and intelligence between parties and introducing these new systems and processes will require close and trusted partnerships across the PaaS ecosystem.



The role of financial institutions

As these models develop, financial institutions may become central hubs in the PaaS ecosystem, as they are able to provide the infrastructure that allows ownership to be retained by one stakeholder while permitting the user to change. They could also leverage their global networks and reputations to promote the adoption of PaaS models.

In the future, financial institutions may be able to facilitate and enable PaaS solutions by:

- Supporting manufacturers to track assets and close the loop on raw materials by incorporating contract clauses that allow for assets to be returned.
- Exploring options to create onboarding tools, client-facing apps, and education materials, which help integrate PaaS models into the market.
- Providing expertise in contracting and credit-risk evaluation, aiding in developing contracts and sales tools.
- Exploring new ways to structure payment terms, pricing strategies, and revenue recognition methods to evolve PaaS models to meet industry specific needs.
- Facilitating strategic partnerships as part of the wider PaaS ecosystem.



WHAT OUR EXPERTS TOLD US:

Olivier Bussenot is Vice President for Sales Operations and Enablement at DigitalRoute, a leading international provider of revenue and usage data management software.

“The ability to capture customer data and cross-sell services will define success in this space.”



The role of manufacturers

Manufacturers are uniquely positioned to develop and market PaaS offerings due to their extensive product knowledge, control over product development, and access to operational data. Some are transitioning their business models from a focus on single product sales, to a service-oriented approach. PaaS models also incentivize manufacturers to design and produce for optimal product performance, extended product lifespans, and reduced environmental impact.

In the future, as the designers and producers of equipment, manufacturers could consider supporting PaaS models by:

- Incorporating modular features into product design to improve durability and enable simple repair, remanufacture, refurbishment, and recycling.
- Supporting organizations to transition to low carbon alternatives by offering access to green tech without the traditional financial and operational burden.
- Assessing asset performance to develop a better understanding of how utilization and age impacts market value, which can in turn inform the development of usage-based models.
- Diversifying revenue streams through the introduction of add-on services in PaaS contracts.
- Establishing partnerships or building dedicated operations to enhance product lifecycles, including maintenance services, return logistics, repair, refurbishing, and recycling operations.
- Creating and contributing to second-hand markets.
- Using recycled components in asset production, closing the loop on raw material use.
- Using additional service revenue, plus insights gained from asset tracking and secondary markets, to drive future research, product improvements, and sustainability innovations.



The role of dealers and intermediaries

Dealers are the interface between manufacturers and end-users. Their direct customer relationships and product expertise enable them to effectively promote the benefits of PaaS. They help shift mindsets from ownership to usage by explaining the industry-specific benefits and tailor solutions to meet specific customer needs. Dealers often facilitate the management and transfer of equipment, including for maintenance and end-of-life services.

As key players in the distribution of goods and services, dealers could consider promoting future PaaS models by:

- Working closely with customers to understand their specific needs and operational challenges.
- Collaborating with the wider PaaS ecosystem to develop tailored PaaS solutions.
- Managing logistics, delivery, and set up of equipment, as well as ongoing maintenance.
- Monitoring equipment performance and offer operational insights.
- Managing the return of equipment at the end of its lifecycle, ensuring seamless transitions for customers updating or changing equipment.

Virtual distribution networks: In addition to traditional dealer networks, virtual distribution networks like e-commerce and subscription platforms can also provide add-on services, expanding the reach of PaaS offerings and catering to the growing preference for online interactions. E-commerce platforms can facilitate the subscription process, offering easy access to services and seamless management of equipment needs, thus broadening the potential customer base and enhancing convenience.



The role of specialised tech companies

Tech companies provide essential tools for PaaS models, including IoT and cloud computing platforms. These technologies can support data analytics, crucial for understanding customer usage patterns and maintenance needs. Telematics and data analytics tools enable precise billing and residual value calculations for pay-per-use contracts.

In many cases, PaaS-enabling technology is nascent or still in development, but partnerships with tech companies will be key to enabling manufacturers to offer user-friendly interfaces and improved user experiences on PaaS platforms. These companies are developing intuitive customer-facing tools for managing subscriptions, scheduling services, and accessing support. Enhanced user interaction facilitates higher engagement and retention rates, driving the broader adoption and success of PaaS models.



The role of consultancies

PaaS-specialized consultancies provide market analysis and customer insights, helping to tailor PaaS offerings and assess potential risks and rewards associated with different market segments.

Implementing PaaS models can require significant changes in company culture, processes, and customer interactions. Consultancies provide change management support and offer training programs for sales teams, customer service, and technical staff to ensure they are equipped to sell, manage, and support PaaS offerings.



WHAT OUR EXPERTS TOLD US:

Jean Philippe Hermine is Director of the Mobility in Transition Institute and Associate Researcher at the Institute of Sustainable Development and International Relations.

“PaaS is a model where the manufacturer has an interest to make products sustainable as it gives them a competitive advantage and an opportunity to set up a logistics chain for second-life spare parts, and the added bonus of having more than a single user for the product.”



UNLOCKING THE BENEFITS OF PRODUCT-AS-A-SERVICE

PaaS models support a shift away from purchasing products outright to buying the services, value, and benefits products provide. Beyond their clear sustainability impact, PaaS models also offer important operational, financial, and environmental benefits for stakeholders across the entire value chain.

Manufacturers: a new route to sustainable profitability

Recurring revenue and profitability	PaaS enables manufacturers to shift from one-time sales to recurring revenue across the product lifecycle through contracts that include services such as software updates, maintenance, and reverse logistics.
Customer insights	Retaining ownership of a product throughout its lifecycle provides access to valuable data on usage and performance. Manufacturers can identify common issues, develop targeted improvements, and offer tailored solutions that enhance customer satisfaction.
Circular value creation through material reuse	PaaS contracts give manufacturers the mechanism to recover products and reuse their precious metals and rare earth elements instead of extracting more raw materials. This reduces supply costs and reliance on external suppliers, which is especially important for materials that are expensive or geopolitically sensitive.
Regulatory & ESG compliance	PaaS facilitates better lifecycle management and embeds circular economy practices into manufacturing businesses. As new legislation emerges, this may help producers to align business practices with regulatory requirements and fulfill ESG commitments.
Market differentiation and brand loyalty	Offering products as a service differentiates manufacturers from competitors due to its integrated service offerings. Manufacturers can build stronger customer loyalty by offering services over the lifetime of the asset, instead of focusing on single sales opportunities.



WHAT OUR EXPERTS TOLD US:

Olivier Bussenot is Vice President for Sales Operations and Enablement at DigitalRoute, a leading international provider of revenue and usage data management software.

“Manufacturers need to shift from a unit price mindset to measuring the lifetime value of equipment. Unlike one-off sales, transitioning to a model with outcome-based pricing offers the potential for predictable revenue streams and in parallel, a more attractive business model.”

Financial institutions: supporting the transition

New revenue streams	Financial institutions could diversify revenue streams and benefit from the predictable, recurring payments PaaS contracts offer, including from leasing fees, services charges etc.
Risk mitigation	In the future, PaaS contracts may have lower risk exposures compared to traditional loans. Ongoing asset ownership by the manufacturer can lower the likelihood of default, and the residual value of assets can be used as collateral, potentially minimizing the risk of financial loss.
Market growth	Increased demand for sustainable assets and circular financing solutions could create new market opportunities for financial institutions.
Enhanced customer relationships	Financial institutions could deepen their relationships with customers and cross-sell additional services (for example insurance and business consultation).
Supporting sustainability goals	Financing PaaS models could align with the growing emphasis on sustainability and ESG investment criteria. Financial institutions may be able to enhance their ESG performance by supporting circular economy initiatives and green financing projects.

End users: embedding efficient and sustainable circular practices

Improved cash flow	End-users could benefit from lower upfront costs for investment in modern, sustainable equipment, as well as improved cash flow, budget predictability, and reduced exposure to unplanned costs.
Operational efficiency and flexibility	PaaS contracts could help to reduce technical failure risks by offering guaranteed lifecycle services, such as maintenance, training, data optimization, and software updates.
Simplified processes	PaaS simplifies processes for clients by bundling services like maintenance and support into a single contract, reducing the need for multiple service providers. This can save time and resources that could be spent focusing on core business activities.
Scalability	PaaS contracts allow organizations to scale equipment volume and tailor their procurement to their business needs. This potentially allows organizations to be more adaptable, resilient, and responsive to their external environment.
ESG commitment	Adopting PaaS models can, in some cases, help to reduce resource consumption, extend product lifespans, and maximize usage. This may allow organizations to align with ESG and circular economy principles. PaaS models also relieve clients from the responsibilities and costs of end-of-life handling, like reselling or recycling equipment.

DEVELOPING PRODUCT-AS-A-SERVICE MODELS

Despite the enormous potential posed by circular solutions, these models are still emerging and can lack the maturity of well-established linear systems. Today, PaaS models are not yet mature in any sector. Developing and implementing these nascent models within organizations has the potential to drive significant transformation, but change of this magnitude can be complex. Organizations that are willing to pioneer solutions to these challenges will be at the forefront of an innovative, efficient, sustainable, and future-fit way of doing business.

Adapting to a service-based approach

PaaS models can support businesses to shift away from one-time sales, towards a service-based approach that offers multiple customer touchpoints across the product lifecycle. This will demand new pricing structures, cost considerations, information systems, and risk assessments, as well as different allocations of resources and talent. The revenue curve of PaaS business models is also inherently different from a traditional sale. Significant upfront investments are often required to embed new capabilities, as well as new reporting metrics for financial performance. This transition away from capital asset transactions will take time, however, as the PaaS models mature, companies can expect to see the long-term financial and operational benefits.

New risk considerations

Usage-centric models require tailored strategies to mitigate financial risks associated with revenue that can fluctuate based on customer behavior. PaaS contracts are also more exposed to operational and environmental risks in certain industries because they're more responsive to customer needs and behavior. For example, risks can include issues such as regulatory changes, technology advancements, and data breaches due to the connectivity and data sharing that occurs within PaaS models.

Navigating these challenges inevitably require an adequate legal framework that captures a clear risk-sharing agreement between service provider and financial institutions.

Accurate residual value assessment

Residual value estimates an asset's future value at the end of its lease term, accounting for depreciation. It's crucial for risk management and pricing, impacting financing terms, portfolio valuation, and regulatory compliance. Getting the balance right between competitive pricing and profitability requires proven market and product expertise. This can be challenging, especially for complex assets or those with a long lifespan. Artificial Intelligence is being deployed to interpret historical trends and make accurate predictions on future values.



WHAT OUR EXPERTS TOLD US:

Yann Toutant is Co-Founder and CEO of Black Winch, a company specialising in Product as a Service solutions

“Incorporating data management into PaaS models is crucial; it’s not just about compliance but about creating value through effective data flow.”



Capacity building needed

Today, most industries lack the scale of refurbishing and recycling capacity needed to fully enable PaaS models. Building strong refurbishing and recycling ecosystems, whether by setting up these activities themselves or partnering with specialized companies, presents a significant opportunity for manufacturers to retain control and access predictable supplies of raw materials.

Measuring the PaaS impact

The EU Taxonomy clearly identifies two KPIs to prove PaaS services are circular - services must result in either extended product lifespans or enhanced product utilization^{xxv}. Beyond this, accurately assessing the environmental impact of PaaS models in terms of CO2 emission reduction, resource efficiency and waste reduction, can be more challenging. Assets with lifecycles that span several decades, for example, can be difficult to track and monitor as possession of the asset transfers between different parties, and accessing and maintaining environmental data can also be an issue over the longer term.



WHAT OUR EXPERTS TOLD US:

Olivier Bussenot is Vice President for Sales Operations and Enablement at DigitalRoute, a leading international provider of revenue and usage data management software.

“Subscription offers flexibility, but it complicates the CFO’s role in securing revenue—outsourcing billing platforms may be the way forward. As we shift towards a circular economy, understanding the fair price and managing asset recirculation become crucial.”



WHAT OUR EXPERTS TOLD US:

Florian André is Founder and CEO, P2S Management Consulting, a boutique consultancy specializing in helping companies develop their own subscription and as-a-service business models.

“Transitioning to subscription models requires a deep understanding of both pricing strategies and IT integration - a structured approach is essential for success.”

PRODUCT-AS-A-SERVICE IN THE AGRICULTURE SECTOR

The agricultural sector is the lifeblood of our communities and the custodians of our environment. For centuries, farmers have fed the population and protected our food security. Today, rapid developments are impacting agricultural practices and the way we produce, distribute, and consume food. A sustainable agricultural revolution is underway, with farmers developing new ways to reduce water consumption, regenerate soils, and capture carbon. Electrification of machinery is an emerging trend that may grow in the future, as is the implementation of cleaner energy solutions, like wind and solar. Artificial intelligence and big data are helping farmers monitor their environmental footprint and implement new, low impact farming practices. As the agricultural industry transforms, Product-as-a-Service solutions can help farmers access the tools they need to adapt and succeed, with some experts predicting PaaS solutions could reach 20-25% of financing contracts in the future.^{xxvi}

Trends in agriculture

Emerging technologies are transforming the sector, including ground-based sensors, autonomous tractors, drones, AI, robotics, GPS technology, and more.

Climate change is creating challenges for farmers due to unpredictable weather patterns and natural disasters. The sector is facing pressure to mitigate its impact while meeting the food security needs of a growing population.

High equipment prices and long lifespans mean farmers can face high upfront investment costs to modernize and access new sustainable equipment. This makes PaaS models ideal for manufacturers, who can lower the cost of investment for their customers, while offering services across the equipment lifecycle.

Tightening regulations, new policy developments, and green subsidies have driven significant transformation in the agriculture sector, with a particular focus on regenerative farming and lowering the impact of modern industrial farming practices.



The PaaS opportunity

Access to modern, digital farming tools:

Smart, modern equipment can increase environmental protection of farming areas, improve working conditions, and sustain farmers' economic activities. Today, many labor-intensive farming practices can be automated. Costly, time-consuming jobs like harvesting, fertilizing, and crop management are benefiting from digital tools that improve precision and accuracy, and lower operating costs. PaaS contracts allow farmers to invest in high-cost equipment, such as combine harvesters, sprayers, and tractors, by spreading the cost of equipment over the life of the contract. This frees up cash flow and offers financial certainty and predictability for business operators.

Mitigating risks and uncertainty:

PaaS models are helping agricultural operators mitigate some of the risks and uncertainty the sector faces, including changing climate and weather patterns, fluctuating market prices, variations in crops, labor shortages, pest management, and more. PaaS contracts provide affordable access to new technology to manage these challenges and, importantly, support better planning and budget control through predictable monthly payments. Additional value-add services are included in the price of the contract, supporting farmers to manage business risks and costs, while keeping budgets stable.

Data-driven performance:

PaaS models rely heavily on digital asset management to track asset usage and performance. These data insights are changing the way primary producers use machinery and manage their resources. New software can support farmers to gather real-time information on soil moisture, temperature changes, livestock behavior, and more, taking out all the guess work. With this vital information at their fingertips farmers can make better decisions, improve productivity, and limit waste.

Value-add services:

PaaS solutions allow farmers to access new digital tools, while benefiting from a range of add-on services, like training, customer support, and maintenance as part of a simple monthly payment plan. Warranties and repair services can also be included in PaaS contracts, mitigating the impact of unplanned costs, as well as high prices for maintenance and spare parts. Remote monitoring capabilities further reduce hassle for agricultural operators, as repair service providers can be automatically notified of equipment failures.

Benefits for Manufacturers

Manufacturers offering PaaS contracts can benefit from predictable revenue streams by offering services across the asset lifecycle. This shift away from one-time sales is particularly important because agricultural machinery can have a lifespan of more 30 years. Bundling services, like sensors with data management software, creates additional customer touchpoints after the initial sale and diversifies revenue opportunities. These agreements also allow manufacturers to reclaim valuable materials at the end of the equipment's life, mitigating raw material price fluctuations and supply chain disruptions.

Prime assets for PaaS



Combine harvesters

Operating leases for combine harvesters allow farmers to optimize performance and cost predictability per hectare. Embedded services that are included in PaaS contracts help keep assets in better condition, which may yield better asset quality and increase lifetime utilization.



Seeders and sprayers

Precision agriculture is an emerging trend in the sector, fueled by advances in technology, new EU regulations, and rising fertilizer costs. Acquiring seeders and sprayers through PaaS contracts can reduce upfront costs and aid the transition to data-informed practices.



Tractors

Traditionally, old tractors were dedicated to lesser farming tasks and maintained at low-cost. However, the increase in electronics and software means maintenance of older equipment become more expensive and complex. In a PaaS contract, assets are leased, while ownership is maintained by a single party, often the manufacturer or financier. The leasing mechanism is designed to maximize the use and value of assets by encouraging maintenance of the asset to retain its future value. Additional services embedded in the PaaS contract, such as software upgrades, repairs, and end-of-life handling may also play a role in increasing product utilization over its lifespan.



New and emerging technologies

including ground-based sensors, autonomous tractors, electric harvesters, and robots.



WHAT OUR EXPERTS TOLD US:

Jürgen Sieber is Chief Commercial Officer at Maschio Gaspardo, a global leader in sustainable agricultural solutions.

“In the agricultural machinery industry, strong dealer networks are vital, as they manage not only sales but also the essential services that keep our customers operational, such as maintenance and repair. Manufacturers generally avoid holding assets because it negatively impacts financial performance metrics, which is why we often outsource asset ownership to financial institutions.”

Value-add services for agricultural businesses

Hardware Options:

Maintenance, spare parts, and consumables, like fuel and fertilizer, and other agrochemicals.

Software Options:

Autonomous driving, fleet management, crop data interpretation.

Function Optimisation:

Performance enhancement through data analysis, such as crop analysis and drone surveillance reports.

Support Services:

Customer support, training, consultancy, legal compliance assistance, carbon credit schemes.

Performance guarantees:

Ensuring equipment reaches specified performance metrics or depreciates less than a specified threshold.

What's next? Addressing the challenges to PaaS adoption

The agricultural sector can set a positive example for how PaaS models can work in other sectors that operate complex, heavy machinery. To fully embrace the potential of a circular economy, the sector will need to consider how to:

- Design agricultural equipment with maximum utilization with easy repair and reuse in mind.
- Adopt and streamline new digital practices that allow for transparent and consistent residual value pricing.
- Reform current funding and subsidy structures that often incentivize outright purchases. For example, the EU's Common Agricultural Policy aims to modernize agricultural operations through subsidies. Can these policies be adapted to support servitization?
- Develop and grow a thriving second-hand market.



PRODUCT-AS-A-SERVICE IN THE GREEN TECH SECTOR

In the race to reach net-zero by 2050, we are witnessing one of the greatest global collaborations of our time. International governments are united on decarbonization and across every industry, new solutions are being implemented to drive down environmental impact. At the same time technology is developing rapidly, creating new digital solutions that will drive the sustainable transition. This is creating demand for green tech assets that can support organizations to tackle rising energy costs, compliance requirements, and ESG requirements. PaaS models can provide access to green tech and support organizations to streamline their transition efforts, while delivering important ESG progress.

Trends in green tech

Energy security has become a driving force for investment due to pressure on global supply chains, fluctuating prices, and geopolitical uncertainty.

Renewable energy, like solar and wind power, is a key part of global decarbonization ambitions, but it also presents challenges with resource scarcity and waste management.

Rapid urbanization and digitalization are creating demand for green tech solutions, especially in cities. However, while subsidies and incentives exist to promote green tech adoption, they encourage traditional purchase and ownership over service models.

Sustainable mobility is an emerging trend, with consumers, businesses, and regulators beginning to seek cleaner, low-carbon ways to travel.



The PaaS opportunity

Promoting the energy transition:

The EU has set a renewable energy target of 42.5% by 2030 as part of its long-term drive to become the first climate neutral continent^{xxix}. Just five years away, this will require the rapid decarbonization of Europe's energy supply and represents a huge economic opportunity for organizations willing to invest in and transition to renewables. Diversifying the energy sources powering business operations, can protect an organization from fluctuating energy prices and disrupted supply chains. PaaS contracts remove the upfront costs that can create barriers to investment, freeing up cash flow with predictable, planned monthly payments that are spread over the life of the contract. Value-add services that are included in PaaS contracts, like training, operational support, and maintenance, could have the potential to reduce pressure on internal resources, save costs, and improve efficiency.

Driving sustainable mobility:

New regulations from low emission zones to diesel bans in cities, as well as targets and subsidies for vehicle electrification, are prompting some organizations to transition their fleets to electric. PaaS contracts reduce the complexity and expense of this transformation, by bundling services such as batteries and charging stations. Through collaboration in the PaaS ecosystem, financial institutions, energy providers, manufacturers, dealers, installers, local authorities can work together to make sustainable mobility a reality.

Incentivizing sustainable product design:

Manufacturers are ideally positioned to implement PaaS models, as they have deep product knowledge, control over product development, access to detailed operational data, and the ability to scale solutions. Those leading the transition towards service-based business models are offering significant value to customers and differentiating their brand in a competitive marketplace. By cooperating across the PaaS ecosystem, manufacturers can increase sales and cash flow, secure additional information on clients' needs, develop well-rounded contracts, and extend the reach of their marketing campaigns.

What's next? Addressing the challenges to PaaS adoption

The green tech sector is a key enabler of the energy transition and the shift to low carbon alternatives. Its focus on innovation makes it an ideal sector to adopt PaaS solutions, however the sector still needs to consider how to:

- Design green tech with repair, reuse, and recycling in mind, and address resource scarcity.
- Collaborate across often fragmented and complex eco-systems.
- Evolve contracts to solve for discrepancies between asset and contract duration.
- Educate the market about the opportunities and benefits presented by PaaS models.



A snapshot of PaaS potential: EV chargers

The EV charger market is growing:

The electric vehicle (EV) charger market has experienced rapid development, with a 31% CAGR from 2016 to 2022 in the EU27+UK.

Continued growth will be driven by regulatory forces:

The EU's 2014 Alternative Fuel Infrastructure Directive (AFID) sets targets for charger installation, including one public charger for every 10 EVs by 2020. Various countries offer tax reductions and subsidies to promote EV adoption and charger installation. For example, The Netherlands offers substantial tax incentives for EV infrastructure.^{xxx}

EV technology is evolving rapidly:

New innovations like high-power fast chargers, solar-powered chargers, Vehicle-to-Grid (V2G) technology, wireless charging, and smart energy management systems are changing the EV landscape. Emerging concepts such as Battery-as-a-Service (BaaS) are also enhancing user experience and operational efficiency.

Collaboration is needed across a complex ecosystem:

The EV charger market is characterized by complex interdependencies between different stakeholders who manufacture, supply, maintain, connect, and power EV systems. The industry has seen some consolidation, with major players acquiring smaller companies or forming partnerships to enhance their market presence, however, more collaboration is needed.

Charging Point Operators can facilitate PaaS adoption:

Clients in the EV market have varied needs, ranging from charging their own fleets to selling electricity as a core business. Charging Point Operators (CPOs) are crucial facilitators, managing stations for end-customers and providing operation, maintenance, installation, and billing services. CPOs can also offer membership plans and charging credits, catering to these diverse market demands through integrated services.

PAAS IN ACTION

VIRTA: An end-to-end EV charging solution

The business

Virta offers an end-to-end EV charging solution for organizations wanting to establish or scale an EV charging business. Virta's digital EV charging platform is used by over 1,000 private and public companies and organizations in retail, hotel, real estate, parking, petrol retail, automotive, and energy industries. These customers operate over 100,000 chargers in 35 countries, forming the "Powered by Virta" network.^{xxxi}

PaaS features

Virta supports its customers with charging station installation, IT infrastructure, payments and invoicing, fleet management, customer and driver support, roaming and station analytics - all provided under one contract.

Benefits for customers

Virta streamlines EV operations for its clients by providing EV charging solutions and says it can save customers up to 50% in CAPEX and OPEX^{xxxi}. This end-to-end approach eliminates hidden operational costs, reduces supply chain complexity, and simplifies administrative tasks.

Circular impact

Virta enables organizations to establish or grow their EV charging business with integrated end-to-end services, such as maintenance and data analytics, helping to maximize hardware utilization and lifespan.



WHAT OUR EXPERTS TOLD US:

According to a Senior Executive working in the supply & installation of EV charging solutions..

"With the rapid evolution of EV charging technology, our financing models are designed to anticipate the need for upgrades, ensuring customers always have access to the latest innovations. Manufacturers also need to set up systems so that end-of-life EV charging terminals are returned to them for recovery and reconditioning, and then they can give them for sale to the second-hand market."



A snapshot of PaaS potential: Lighting solutions

The LED lighting market is experiencing significant growth:

The LED lighting market is projected to maintain a 10% CAGR from 2023 to 2030,^{xxxiii} driven by population growth, regulatory measures, environmental awareness, energy price fluctuations, technological advancements, and declining LED prices.

The regulatory environment supports a transition to LED:

EU regulations like the Single Lighting Regulation and the Eco-design Directive mandate the phase-out of outdated lighting technologies, as well as enhanced efficiency and recyclability standards. Nations like Italy provide tax rebates to support the transition to LED lighting, further boosting market growth.

Innovation is driving efficiency gains:

LED efficacy has improved by 4 lumens per watt annually since 2010^{xxxiv}. Advances in smart lighting, like DC chips

and Li-Fi, promise enhanced energy efficiency and improved integration with building systems.^{xxxv}

Manufacturers and consumers are shifting towards Light-as-a-Service:

Manufacturers and suppliers are increasingly focusing on lighting systems, as some customers seek to avoid capital expenditure on non-strategic assets. LaaS provides preventive and corrective maintenance, parts procurement, and advanced monitoring through apps, offering flexibility and reducing impact on EBITDA.

LaaS offers and contracts are still maturing:

Companies providing genuine LaaS contracts can command premium pricing given the enhanced flexibility. However, these companies can face operational challenges with collection and retrieval, particularly if clients default during the contract period, making asset retrieval challenging.



WHAT OUR EXPERTS TOLD US:

Executive Sales and Marketing Director, Tellco

“Increasingly, customers are gravitating towards Light-as-a-Service (LaaS) solutions rather than outright purchasing, driven by a reluctance to allocate capital expenditure for non-strategic assets, which could negatively impact their EBITDA.”^{xxxvi}

PAAS IN ACTION

SIGNIFY: Light-as-a-Service

The business

Formerly known as Philips Lighting, Signify provides an end-to-end solution encompassing the planning and design of new lighting systems, equipment installation, the removal of outdated fixtures, ongoing system operations, maintenance, and optimization services.

PaaS features

Using an “outcome-based performance contract”, Signify charges a monthly fee based on agreed performance metrics. This includes services, such as maintenance and repair of lighting solutions and performance optimization throughout the contract duration.

Benefits for customers

Signify highlights its superior light quality and cost savings, which it delivers through the enhanced performance of LEDs, dynamic light level adjustments, and remote monitoring to mitigate maintenance needs. By maintaining ownership of the luminaires, Signify is responsible for end-of-contract and end-of-life handling of an organization’s lighting assets. The company says that through its LaaS contracts, customers can reduce maintenance costs by up to 60%.^{xxxvii}

Circular impact

Signify says switching to connected LEDs can reduce the built environment’s lighting-related energy consumption by up to 80%, which in turn reduces lighting-related carbon footprint and supports organizations to move toward achieving carbon neutrality. A connected lighting system also helps to keep track of energy savings, identifying both efficiencies and areas where improvements can be made. The company recycles or repurposes all luminaires at the conclusion of their life or contract, with a zero-waste-to-landfill objective.^{xxxix}



A snapshot of PaaS potential: Solar

Renewables are a key focus of the EU and other jurisdictions:

The 2022 EU Solar Energy Strategy targets 320 GW of solar electricity production by 2025 and 750 GW by 2030.^{xlviii} Initiatives like the Pact for Skills and the European Solar PV Industry Alliance support this growth. The EU Renewable Energy Directive and national regulations, such as France's mandate for PV installation on parking spaces and new commercial buildings, further promote solar energy adoption.

The Solar-as-a-Service market is still developing:

Currently, Solar-as-a-Service offerings primarily take the form of Power Purchase Agreements (PPAs), which can be better suited for larger projects. Despite regulatory support and market momentum, widespread PaaS implementation in the solar sector remains an ambition and requires further development.

Potential of batteries:

Batteries complement solar panels by storing excess energy and ensuring continuous power supply. Coupling batteries with PV systems in Energy-as-a-Service contracts could drive the development of more robust PaaS models. Emerging models like Schneider Electric's grid-interactive buildings highlight the integration of energy optimization algorithms, enhancing the appeal of these contracts.

Recycling and reuse of solar panels remains challenging:

The EU Waste from Electrical and Electronic Equipment (WEEE) directive targets 80% recycling of used solar panels. While silicon-based panels achieve 95% recovery rates, thin-film panels, which represent 30% of end-of-life panels, pose greater challenges. The technology that will allow for the reuse of solar panels is still developing, and upcycling is also limited due to material impurities and the challenge of recovering precious elements.¹

Greater collaboration needed in the solar industry:

Manufacturers of solar panels are largely based outside the EU, while smaller regional players handle installations for residential and small to medium commercial needs. Fragmentation in the market can make PaaS adoption more challenging as these circular models rely on a whole ecosystem approach.



WHAT OUR EXPERTS TOLD US:

Yann Toutant is Co-Founder and CEO of Black Winch, a company specialising in Product as a Service solutions

“The real value in solar lies in combining photovoltaic (PV) systems with batteries and heat pumps, creating an Energy as a Service model, which is already present in the B2B sector. The challenge in PaaS is managing the flexibility it offers—balancing risk with the need for dynamic solutions is key.”



PAAS IN ACTION

SOLNET: Solar-as-a-service via Power Purchase Agreements

The business

Solnet Group is a leading European project planner of commercial and industrial solar installations. In 2016 it received the WWF's Climate Solver Award^{li}, highlighting its commitment to sustainability and innovative solutions in the renewable energy sector.

Solnet offers a comprehensive end-to-end solar-power solution, including:

- **Analysis:** Assessment of potential subsidies, permits, and grid connections.
- **System design:** Designing the layout of solar panels and forecasting lifetime production.
- **Installation:** Executing the project plan, including configuration, testing, and necessary adjustments to ensure optimal performance.
- **Maintenance:** Ongoing maintenance, regular inspections, and remote monitoring.

PaaS features

The typical Solar-as-a-Service contract offered by Solnet utilizes Power Purchase Agreements (PPA), which are long-term service agreements between an electricity producer and a customer, typically over a 10-year period. Solnet retains ownership of the system while customers pay for the electricity they use. With no upfront costs, Solnet handles the installation, ownership, and operation of the solar system.

Benefits for customers

According to Solnet, customers can save up to 20-30% in electricity costs, coupled with the assurance of predictable electricity prices throughout the duration of the service agreement.^{lii}

Circular impact

Solnet's revenue model is linked to the productivity of each solar system over its lifespan. The company has a vested interest in maintaining optimal condition, maximizing productivity, and prolonging each system's lifetime.



THE PAAS OPPORTUNITY: HEAVY VEHICLES

The Truck-as-a-Service (TaaS) market was valued at US\$23.1 billion in 2022, and is estimated to reach US\$172.4 billion by the end of 2031,^{liii} as heavy duty vehicle (HDV) operators seek to simplify operations with a single contract that encompasses the acquisition, operation, and maintenance of their fleet. In addition to the lease of a HDV, these contracts include vehicle servicing, repair, insurance, and data-led insights to optimize performance.

TaaS trends

Online shopping sales have risen significantly, with global e-commerce sales reaching an estimated US\$5.8 trillion in 2023.^{liv} This has driven demand for delivery and logistics, serviced by HDVs.

Urban regions are expanding and growing in density, while limits on HDV use in residential areas increase.^{lv} Operators must optimize performance, meet compliance requirements, and improve sustainability metrics.



Air pollution is a growing concern for regulators. With HDVs responsible for more than a quarter of GHG emissions from road transport, the EU has set HDVs a 15% emission reduction target by 2025, growing to 90% by 2040.^{lvi}

Electrification is beginning to increase in popularity, as manufacturers and HDV operators seek to meet growing ESG requirements and tackle market challenges, including volatile oil and gas prices.

Innovation in the TaaS market

Innovation is exploding in the HDV sector, with new technology that can optimize vehicle capacity, mitigate collisions, remotely control temperature and infotainment, and conserve fuel, just to name a few. Machine-learning and Artificial Intelligence are changing the way operators mitigate risks, like road safety and traffic control, while automatic optimization means that pre-programmed routes can take weather, traffic, and other real-time obstacles into account.^{lviii}

Telematics technology is a dominant force in the TaaS market, enhancing fleet management by enabling real-time tracking, monitoring, and data collection from trucks. These systems also offer predictive maintenance services, which can identify and address vehicle issues before they cause significant downtime.

Fleet Management Consultant, Yohann Desalle, says: "The rise of telematics has opened new avenues for fleet services, transforming how we manage routes, driving times, and maintenance costs."

The TaaS opportunity

Access to technology:

Innovation is driving the adoption of TaaS models, as operators seek to benefit from the efficiency, sustainability, and safety gains that new technology can provide, without facing significant upfront costs for adoption, training, and use.

Industry-specific gains:

The Fast Moving Consumer Goods (FMCG) sector has led the adoption of TaaS models, benefiting from new data-led services like remote temperature control for trucks that deliver perishable goods.

Supporting the energy transition:

PaaS models are helping HDV operators transition their fleets to electric, with contracts that cover charging infrastructure and maintenance. Some manufacturers are extending their TaaS services to install hydrogen or electric motors in existing vehicles.

Optimizing mileage:

Pay-per-use contracts are priced on mileage travelled. When combined with data insights into driver behavior, vehicle performance, route optimization, and fuel conservation operators can ensure trucks are fully utilized.

Top 3 challenges to TaaS adoption

1

Infrastructure for electric and hydrogen-powered vehicles is patchy, creating problems for HDV operators, who travel long distances. Local network considerations, such as sufficient power supply for fast-charging stations, can also limit adoption progress. Investment is needed to establish a comprehensive network of charging and refueling stations.^{lix}

2

Regulatory provisions are still being developed. For example, strict safety standards apply to hydrogen refueling, which may limit some operators to consider PaaS contracts.

3

While PaaS is gaining traction, some organizations still favor traditional cash ownership. Greater awareness is needed to change behavior. Yohann Desalle says SMEs and family-run operators often prefer owning equipment due to historical norms and accounting practices.

PAAS IN ACTION

Volta: supporting the transition to electric trucks

The company

Volta provides an end-to-end solution that simplifies, accelerates and de-risks commercial fleet electrification^{ix}.

PaaS features

A 3-month deposit secures each Volta Zero with no further upfront costs, and Volta Trucks absorbs all residual value risk. This TaaS offer delivers a frictionless way to migrate fleets of all sizes to electric, maximizing their up-time and operational efficiency. For a predictable monthly fee, customers have access to the full-electric Volta Zero, its charging infrastructure, all servicing and maintenance needs, insurance, as well as training for drivers, fleet operators and technicians.


Benefits to customers

Each truck benefits from routine servicing, maintenance, inspections and extended vehicle cover over the holding period of the truck. This includes a guarantee on battery performance for the duration of the TaaS agreement. In the event of an unplanned stop, customers and drivers have access to 24/7 roadside assistance. This includes a 2-hour commitment for roadside support and a 24-hour commitment to getting a truck moving again, either through repair or an optional replacement vehicle.

Circular impact

Volta's all-inclusive service contract allows customers to access an electric fleet, which in turn supports customers to make a sustainable transition. According to the company, one Volta Zero prevents 194.5 metric tonnes of GHG (or CO₂e) from entering our atmosphere, which is equivalent to the CO₂e from 98,842 kg of coal burned. Through end-to-end support throughout the lifecycle of the electric truck, Volta's services also aim to increase product utilization and extend the life of the EVs^{ix}.

WHAT OUR EXPERTS TOLD US:



Yohann Desalle is a fleet management expert at Thluki Conseils, specializing in the transition to energy-efficient heavy trucks and the integration of associated services in the transportation sector.

“Retrofitting diesel trucks to electric has significant potential, but economic and psychological barriers need to be addressed. Full-service leasing is also still niche, but it’s growing, driven by the demand for integrated solutions like fuel cards and tire management.”



THE PAAS OPPORTUNITY: HEALTHCARE

Healthcare is always evolving to improve patient outcomes and using advances in science and technology to push the boundaries of what can be done to keep our population healthy. Today healthcare leaders are faced with significant challenges, including an ageing population, a shortage of skilled workers, budget constraints, and new global environmental risk factors. This has resulted in the rapid digitalization of healthcare, with the sector undergoing huge transformation to prepare for the future. Both private and public institutions are looking to technology to find new solutions that deliver better results for patients and provide the flexibility to scale and innovate.

Trends in healthcare

Europe's population is ageing, with more than 20% of people over 65 years.^{lxii} As the population grows and people get older, the demand for health services is rapidly increasing.

A skills shortage has resulted in a deficit of nearly 1 million health workers in Europe.^{lxiii}



Healthcare funding is under pressure and organizations are being asked to do more with less.

Agility and flexibility are crucial in healthcare, with COVID-19 proving the sector must be prepared to transform and scale quickly in response to unprecedented health events.

Innovation in healthcare

Healthcare providers are turning to new technology, like robotics and artificial intelligence to improve the health outcomes of patients and reduce the strain on medical staff and resources. According to Deloitte, by 2040 hospitals will be using artificial intelligence “to optimize care delivery, workforce efficiency and back-office cost-effectiveness, and to reduce hospital stay durations and costs, while improving patient outcomes and experiences.”^{lxiv}

Robotics is already playing a part in improving surgical precision and reducing the risk of human error. Sanitization remains urgent priority for hospitals and robots are being deployed to clean surfaces and rooms to reduce the risk of infection for patients and staff.^{lxv} As more routine tasks are undertaken by robots, clinicians will be able to focus more on the critical aspects of patient care.

The PaaS opportunity

Relieving budget constraints:

Funding constraints can prevent healthcare providers from offering the world-class care they strive for. PaaS models offer access to modern, scalable med-tech solutions without the upfront costs of investment, easing budget and cash flow constraints.

Data-driven insights:

Asset management software, often included in PaaS contracts, can ensure medical equipment is used efficiently, deployed to the areas of greatest need, and maintained regularly. This potentially maximizes the use and availability of medical technology.

Aligning costs with benefits:

Pay-per-use subscriptions help align costs with benefits and prevent waste from underutilized equipment. For example, MRI machines can be acquired on pay-per-use contracts, which base billing on the number of scans conducted.

Diversified revenue streams for manufacturers:

Medical manufacturers can build business resilience and growth by diversifying their service offer and benefiting from the regular income PaaS contracts provide. This improves cash flow and fosters investment in research.

Top 3 challenges to PaaS adoption

1

The healthcare sector operates within a complex legal environment, especially regarding patient data and privacy. Regulations are still evolving to encompass servitization and can make it difficult to adopt new financial models.

2

Pay-per-use models rely heavily on the sharing of real-time data to measure equipment usage, establish appropriate pricing, and ensure financial viability. New technical, legal, and operational solutions are required to allow this information to be shared across the healthcare ecosystem.

3

Training and education are vital to the adoption of new operating systems. Both manufacturers and healthcare providers have the opportunity to invest in the capabilities of already-stretched medical teams to ensure the benefits of PaaS models are fully realized.

PAAS IN ACTION

GE Healthcare's circular med-tech^{lxvi}

The company

GE Healthcare is a global provider of digital infrastructure, data analytics, and decision support tools in the healthcare sector. GE provides refurbishment and recycling options to its customers once equipment reaches the end of its working life and buys back equipment for lifecycle extensions. The company has a proud record of using circularity to improve energy efficiency and maximize the use of materials, while delivering digitally enabled and remote predictive and corrective maintenance services.

PaaS features

According to Jesus Blasco, Senior Vice President Capital Markets EMEA, GE Healthcare, there is an increasing trend towards pay-per-use models for MRI machines and other med-tech and equipment. "The future of healthcare equipment lies in software upgrades, where AI will play a significant role, ensuring that equipment retains its value over time. Pay-per-use models are becoming more popular, but they require a deep understanding of usage data and a willingness from financing institutions to share the risk."

Benefits to customers

These contracts base pricing on the number of scans, offering healthcare providers flexibility and risk mitigation, especially when usage volumes are uncertain. This approach is particularly beneficial for new product launches where clients may be unsure about future costs and performance.

Circular impact

GE Healthcare's PaaS model for medical imaging equipment promotes equipment reuse and refurbishment. Extending the life of 6700 units of imaging and ultrasound equipment, led to the reduction of 5.15 million kilograms of potential landfill waste.^{lxvii}

"Our strategy is to manage the entire lifecycle of our equipment, from new sales to refurbishment, while navigating the complexities of pay-per-use and circular economy models," said Jesus Blasco.

WHAT OUR EXPERTS TOLD US:

Florian André is Founder and CEO, P2S Management Consulting, a boutique consultancy specializing in helping companies develop their own subscription and as-a-service business models.

"High-priced, connected equipment with fluctuating demand is ideal for PaaS, as it allows for flexible, usage-based billing. Healthcare equipment is increasingly moving towards subscription models, driven by a focus on medical efficiency and asset-light operations."





THE PAAS OPPORTUNITY: IT

Gartner predicts global IT spending will reach \$5 trillion in 2024,^{lxviii} with demand showing no signs of slowing. But as organizations carry out digitalisation initiatives, many are also seeking to improve ESG performance. Manufacturing tech is carbon and material-intensive, and tech devices are often decommissioned before their value is fully utilized. In 2022, \$62 billion worth of recoverable natural resources were unaccounted for in global e-waste,^{lxix} much of which could have been retained through circular economy practices. PaaS models have the potential to address these issues, allowing organizations to acquire technology more sustainably and efficiently.

Trends in the tech sector

Rapid digitalisation is connecting people, businesses and cities, with technology a leading factor in productivity and profitability.

E-waste is a leading cause of environmental harm - 62 million tonnes of e-waste was produced in 2022 alone, up 82% from 2010.^{lxx}



Data security is a board-level concern for every business. Over a quarter of EU CEOs believe their company will be highly or extremely exposed to cyber risks in the next five years.^{lxxi}

The refurbished device market is predicted to double from \$12bn in 2023 to \$24.4bn in 2030,^{lxxii} with refurbished devices increasingly mandatory in public and private tenders.

Innovation in IT-as-a-service

IT manufacturers have begun setting ambitious targets to incorporate recycled components into new products. For example, Apple has announced that soon nearly all rare earths in its products will be 100% recycled.^{lxixiii} Other ICT companies have followed suit, but to achieve these targets manufacturers must consider how to set up closed loop systems that allow for the return of used devices and the recycling of their components.

PaaS models may go some way to addressing these challenges by maintaining manufacturer ownership, while usage is transferred to different parties. Manufacturers also play an important role in designing new technology with its end-of-life in mind. For example, using modular components that promote easier disassembly, repair, and recycling.

The PaaS opportunity

Sustainable lifecycle management:

PaaS models can facilitate better lifecycle management, efficient in-life management, and circular end-of-life handling. Manufacturers that offer services to refurbish returned products, could benefit from reduced waste, lower raw material costs, and easing supply chain challenges.

Market differentiation and brand loyalty:

PaaS models differentiate manufacturers and dealers from competitors and build stronger customer loyalty through integrated service offerings. Flexibility in adjusting equipment volume based on real-time needs also appeals to clients, creating new revenue opportunities mid-sales cycle.

Access to modern tech:

Using PaaS models, businesses can tailor their IT procurement to suit the needs of their workforce, without the upfront of costs of investment. Value-add services also have the potential to lower the total cost of ownership and mitigate compliance, security, and sustainability risks that are inherent with cash ownership of digital devices.

Optimal utilization and efficient:

Asset management software, often included in PaaS contracts, can track the use and health of devices, maximizing efficiency and preventing unnecessary downtime. If devices are refurbished and sold to a new user after each use, it follows that the device's useful life may be extended.

Top 3 challenges to PaaS adoption

1

Recycling infrastructure needs to scale to meet demand, and collection processes for end-of-life products can be fragmented and patchy, making it difficult to track and recover products from end-users.

2

Some manufacturers may express reluctance to sell refurbished equipment, fearing it may impact sales of new products. However, with clients increasingly requesting a share of refurbished items in public and private tenders this is changing incrementally.

3

Damaged or locked devices can be challenging to refurbish and resell. However, knowing an asset has an end-of-life value is one factor that may influence user behavior, as clients could feel more incentivized to maintain and care for the assets.



WHAT OUR EXPERTS TOLD US:

Senior Executive, ICT
Manufacturer

“Device-as-a-Service is not just about offering technology; it’s about managing the entire lifecycle of devices, from deployment to refurbishment, in a sustainable way. Refurbishment is key to our DaaS model, allowing us to extend the life of devices and offer more affordable options to customers while minimizing environmental impact. The challenge in the second-hand device market is the lack of supply, which creates a chicken-and-egg problem where demand exists but there’s not enough inventory to meet it.”

PAAS IN ACTION

BNP Paribas 3 Step IT: Scaling circular technology management across Europe.^{lxiv}

The company

BNP Paribas 3 Step IT is a joint venture between 3stepIT, a leading Nordic circular technology management provider, and BNP Paribas Leasing Solutions. Operating in France, Germany, Italy, the UK, Belgium, the Netherlands, and Spain, BNP Paribas 3 Step IT supports businesses in acquiring new digital technology and managing it during its primary life before ensuring it is securely refurbished and then sold to a second user through a network of trusted trading partners.

PaaS features

BNP Paribas 3 Step IT supports its customers in leasing IT devices over a set term and includes, as part of the contract, an asset management platform that helps businesses to manage technology more efficiently, tracking and monitoring devices during their lifetime, and ensuring their secure return at the end of the contract period. BNP Paribas 3 Step IT then securely wipes and refurbishes the decommissioned technology to be made available for re-sale, with the aim of increasing the product's utilisation over its lifetime and reducing electronic waste.

Benefits to customers

BNP Paribas 3 Step IT offers customers an end-to-end approach to IT management, which encompasses device procurement, management, and circular end-of-life handling. Organisations can access modern technology tailored to their business needs without the upfront cost of investment, while also ensuring they embed more efficient and sustainable IT management approach from the outset. BNP Paribas 3 Step IT's asset management platform enables the efficient use of devices throughout their lifetime and their secure return at the end of the contract period. This software can potentially reduce downtime, improve device performance, and increase utilization. Devices are then securely transported for data sanitization and refurbishing, before being made available for re-sale, giving organizations the confidence that their end-of-life devices are being handled securely, sustainably, and in line with circular economy principles.

Circular impact

In this circular approach, the value of IT equipment is maximized throughout the lifecycle. When devices reach the end of their initial contract, they undergo secure refurbishment, preparing them for a second life. By extending device lifespans through secondary markets, this model not only provides affordable technology options but also reduces the carbon footprint associated with manufacturing new devices.



WHAT OUR EXPERTS TOLD US:

Carmen Ene, CEO of BNP Paribas 3 Step IT, said

“Circular technology service models support businesses to fuel growth and competitiveness with new technology, while ensuring repair and reuse are baked into the procurement process from the outset. Considering the technology’s entire lifecycle—from financing to decommissioning— will support organizations to optimize value, minimize liabilities, and lessen the negative impact of technology on the environment.”



THE PAAS OPPORTUNITY: CONSTRUCTION

The construction industry is very literally building our future. The EU's construction revenue amounted to roughly 2.1 trillion euros in 2022, which in most European countries made up between 4-7 percent of their GDP.^{lxxv} As our population grows, demand for housing and development in cities is on the rise. As urban areas expand, we need more roads, schools, and hospitals, and ageing infrastructure needs maintenance and upgrades. Today, there is also huge investment in sustainable infrastructure projects, such as renewables. Construction companies recognize this opportunity and the need to make sustainable investments in modern equipment to meet the demand.

Trends in construction

Reducing emissions and waste is a priority for the sector, with construction accounting for 37% of global emissions^{lxxvi} and more than a third of all waste generated in the EU.^{lxxvii}

Supply chain disruptions have impacted delivery times for new construction equipment, which has seen some organizations engage with the secondary market to address demand.

Electrification of fleets is underway as companies target sustainable reform and respond to regulatory changes, such as diesel bans in some cities.

Labor shortages in the construction sector are increasingly driving businesses to consider the role that digitalization and automation could play in their operations.



Innovation in construction

Automated materials handling equipment is a growing construction trend, as is the electrification of fleets. Developments in Machine Learning and Artificial Intelligence are helping to manage machinery more safely, efficiently, and sustainably. Telematics is also delivering important gains by combining GPS, vehicle

diagnostics, and wireless technology to share vehicle data and cross-reference it with the vehicle's internal behavior.^{bxxviii} This means information data insights can automatically trigger service needs, such as predictive maintenance and repair.

The PaaS opportunity

Budget control:

Fluctuating payment schedules, rising material costs, and supply chain challenges can make it difficult for construction operators to plan and execute investments. PaaS models remove the upfront costs of investment, prevent capital from being tied up in expensive machinery, and allow organizations to control and plan costs through monthly payment schedules that include the cost of value-add services.

Supporting the energy transition:

Overhauling a construction fleet and adopting electrification can be expensive. Electric equipment generally carries a higher price tag, and organizations must also invest in additional infrastructure, like new batteries and charging stations, as well as training for their teams. PaaS contracts bundle these services in one contract serviced by a monthly fee, supporting organizations to transition to sustainable energy sources.

Diversify revenue streams:

Construction has a long lifespan, sometimes exceeding 20 years or more. PaaS models allow manufacturers to move away from one-time sales and create multiple touch points with customers by offering services across the lifecycle of equipment. PaaS models can accelerate the sales process, grow margins per sale, and improve customer relationships.

Reduce resource costs and mitigate supply challenges:

Producing new construction equipment is extremely resource intensive, and the industry is facing ongoing supply challenges. PaaS models close the loop on resources used in the original manufacturing process, allowing producers to reclaim valuable materials at the end of the equipment's life.

Top 3 challenges to PaaS adoption



The long lifespan of construction equipment can mean progress to modernize the industry with more sustainable solutions and adoption of circular models, like PaaS, can be slow.



New industry standards and regulations are needed to guarantee the quality of refurbished equipment and assist with transparent and consistent grading of used parts.



The recycling and refurbishing market is still developing and needs investment to scale and meet future demand as PaaS adoption accelerates.

PAAS IN ACTION

Caterpillar: Remanufacturing construction equipment

The company

Caterpillar Inc. is the world's leading manufacturer of construction and mining equipment, off-highway diesel and natural gas engines, industrial gas turbines and diesel-electric locomotives.^{lxxxix}

PaaS features

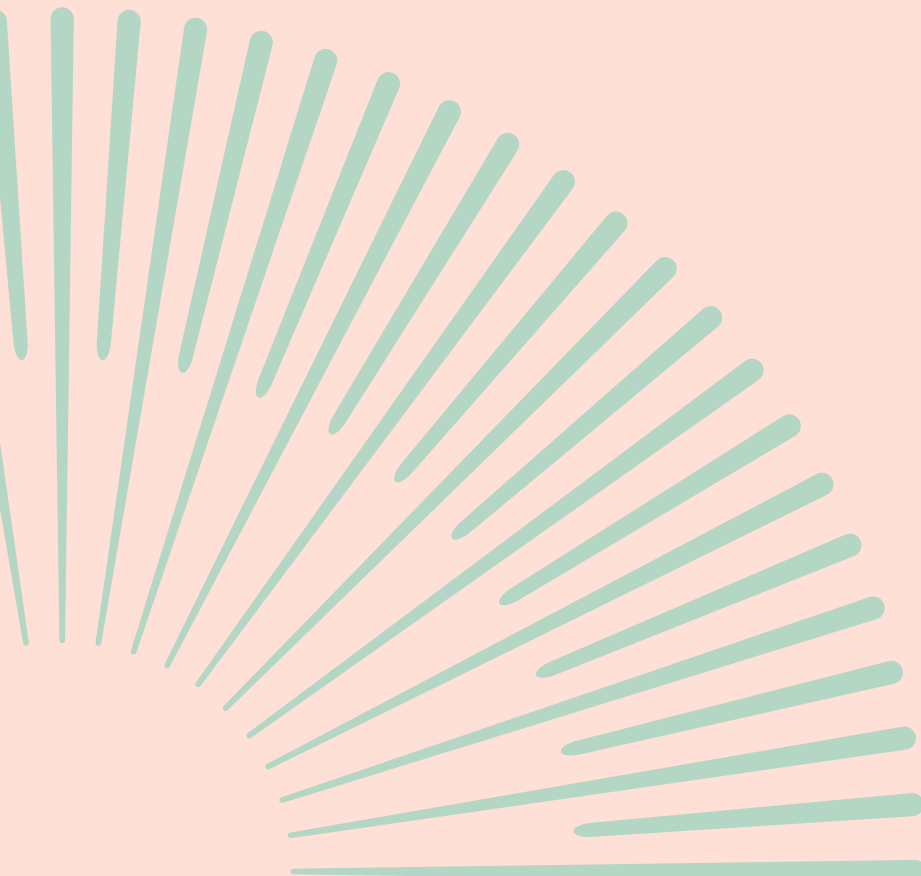
Caterpillar has embraced PaaS models as part of its commitment to circularity, with its products now being "built to be rebuilt". Caterpillar construction equipment is designed to be restored and used for multiple lifecycles.^{lxxx}

Benefits to customers

Remanufactured parts, commonly used in equipment rebuilds, provide customers with quality products that help lower the total cost of ownership, keep high-value raw materials, such as iron, in productive use, and help extend the value of resources used in the manufacturing process.

Circular impact

The company's goal is to increase sales and revenues from remanufacturing offerings by 25% by 2030. It has already taken back 147 million pounds of material for remanufacturing and collects 88% end-of-life eligible returns. The company has seen a 31% increase in sales and revenue from remanufacturing offerings since 2018.^{lxxxi}





CONCLUSION

The transition to a circular economy is undoubtedly underway. Regulators in the EU, and the world over, have made their intentions clear – linear consumption models must become a thing of the past if we are to tackle the immense challenges of climate change and resource scarcity.

The EU's target to have a fully circular economy by 2050 sets a firm deadline for just over two decades to achieve seismic and systemic changes to the way we design, produce, distribute, sell, buy, use, and dispose of goods and services globally. This will require new laws, new technologies, new processes, and new business models. But most crucially, this transition will require a level of collaboration, trust, partnership, and goodwill throughout the value chain that will cross borders and industries.

If circularity is one pathway through which this change will take place, practical tools are now urgently needed to make progress on the ground. New financial and operating models that prioritize servitization

will be one important lever for enabling organizations to adopt the principles of a circular economy.

Product-as-a-Service (PaaS) models support a shift away from purchasing products outright to buying the services, value, and benefits products provide. This has the potential to reduce the demand on natural resources and lay the foundations for producers to take responsibility for assets throughout the entire product lifecycle. Financial and contractual mechanisms, such as leasing, are a key part of the equation. Leasing offers a way to allow the use and possession of an asset to transfer between different parties, while ownership is maintained by one entity; and it encourages optimal use of assets over time.

Today, most of these circular service models are still in their infancy and all major sectors still have a long road ahead to develop mature PaaS offerings. But the potential for these solutions to support the transition to circularity remains immense, as do the benefits right across the ecosystem.



These solutions offer end users greater flexibility to adapt to the rapidly evolving business environment they operate in today, as well as a pathway towards maximizing the use and value of resources and minimizing waste. For manufacturers, PaaS models create a new approach to profitability that no longer relies solely on sales volumes, and instead diversifies revenue streams through an end-to-end customer experience across the whole asset lifecycle. Producers willing to explore this emerging approach have the potential to benefit from new opportunities, more stable revenue streams, greater revenue predictability, and closer proximity to their clients.

Every part of the value chain has an important role to play in progressing this new approach to production and consumption, and there are undoubtedly complex challenges ahead. However, putting in place this new economic system will help every organization to adapt and build resilience in a world of ever-scarcer resources.

The 26 industry experts, who so generously donated their time and expertise to make contributions to this report, were unanimous in their hope for the future and the positive impact PaaS models could potentially achieve. They each highlighted a number of considerations to progress this transition which, together, form the beginning of a discussion about the future of PaaS models and their role in our society, which we invite all stakeholders in the ecosystem to take part in.

LOOKING AHEAD

Collaboration is a top priority

Working across the global value chain to create and contribute to the circular ecosystem is an important challenge we face as a society. Success is dependent on all stakeholders coming to the table to find a fair and just path towards achieving a circular economy that works for all. This will include a wide range of actors, from regulators to private sector organizations, the scientific community, social enterprises, and consumer groups, among many, many more. Today, this level of cooperation remains lacking in most sectors, and as seen throughout this report can present a barrier to progressing PaaS models.

Intensifying ESG legislation is both an operational challenge and a business opportunity

Global ESG legislation has increased rapidly over the last decade, with the EU leading the world in its regulatory approach. New EU requirements for reporting, labelling, product design, and producer responsibility are placing challenging demands on organizations to understand, be transparent about, and mitigate their ESG impact. But this regulatory pressure also presents an opportunity for organizations to meet consumer demand for more sustainable products and services, find alternative pathways to profitability that decouple growth from consumption, and forge new connections and partnerships as part of the circular eco-system.

Education will be key to shifting attitudes from ownership to access

Despite the clear benefits of circularity, the linear approach to production and consumption is deeply rooted in our society and is the foundation of most major industries today. Success has long been measured through volume-based metrics, and shifting behaviour towards a service-based approach for both producers and consumers will take time. Education is crucial and governments will play a vital role in promoting the case for change, alongside the scientific community, the media, leading private enterprises in this space, and other early adopters. Making this shift away from traditional ownership will have a long-lasting and compounding impact, particularly because PaaS models remove the upfront capital expenditure required to invest in new sustainable technology that can help organizations to further reduce the environmental impact of their operations.

Manufacturers could benefit from incentives that prioritize eco-design

The toughening regulatory environment is a strong motivation for producers to prioritize eco-design principles in the manufacturing process. However, further incentivizing this innovation could also have a positive effect on progress, especially given the investment required for new sustainable product development. While most manufacturers are already investing heavily in R&D, they could benefit from more certainty of strong returns from the products they develop. Some of this is inherent in PaaS models, which have the potential to provide greater revenue predictability for manufacturers, strengthen dealer partnerships, and ultimately create a more stable and reliable sales channel. This can in turn be invested in achieving the much-needed breakthroughs required in green technology across various sectors, such as improvements to the recyclability of solar panels and EV batteries.

Capacity building needed to support circular value recovery

End-of-life management processes, like repair, refurbishing, remanufacturing, and recycling, are clearly an indispensable part of a circular economy as they are the mechanisms through which we can extend product lifespan, maximize utilization, and recover value from used materials. As manufacturers continue to grow their sustainable commitments and include greater shares of recycled material in their new products, new infrastructure will be needed to close the loop on material use. Today, most industries lack the scale of refurbishing and recycling capacity needed to fully enable PaaS models. Building strong refurbishing and recycling ecosystems will be instrumental in recovering resource value, and ultimately reducing the strain on raw material supply.

Measuring the PaaS impact will require greater data sharing across the ecosystem

The new EU Taxonomy, which sets out clear KPIs to define circular and PaaS services, has been a hugely important and much needed step forward. Before this, organizations lacked a standard definition by which to measure the validity and success of their PaaS offerings. As these new business models emerge and mature, there is still work to do to understand, accurately measure, and communicate their wider impact in terms of CO2 emission reduction, resource efficiency, and waste reduction. Getting this right will create momentum behind the circular transition by demonstrating positive use cases that other organizations can follow. Data sharing will be crucial. Collecting, interpreting, validating, reporting, and sharing information across the value chain will require new legal, technical, and operational capabilities, much of which is still under development, and new industries are still emerging to support these requirements.



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