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Climate-KIC

Digitalisation – unlocking the potential of the circular economy

About us

EIT Climate-KIC is Europe's leading climate knowledge and innovation initiative, working towards a prosperous, inclusive, climate-resilient society founded on a circular, zero-carbon economy.

INPUTS

- Research and innovation
- Education
- Entrepreneurship

THEMES

- Urban Transitions
- **Sustainable Production Systems**
- Sustainable Land Use
- Decision Metrics & Finance

>1000
Climate-positive companies incubated

>€550m
Capital raised by start-ups

Over **300** partners

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Introduction

The world as we know it is changing.

Every week, the global population increases by 1.5 million people[1]. Every week, 3 million people enter the global middle class[2], and another 3 million move from rural to urban areas[3]. This rapid demographic shift has one inevitable consequence: there is an increasing demand all over the world for basic goods, housing and transportation.

How we meet this growing demand is an urgent question for society today. While centuries of mechanisation, mass production and automation have shaped societies and improved the lives of billions, they have exhausted many of the planet's resources, damaged essential ecosystems, and put our global climate under immense stress. Our development cannot continue on its current trajectory.

In response, increasing numbers of businesses are creating profitable, sustainable models that offer real hope for a new kind of growth. At the same time, digitalisation is progressing rapidly. For the first time, we have the opportunity to scale up circular economy business models swiftly and widely to put us on course for a more sustainable future.

Sustainability has become a key part of the global agenda, a fact reflected by the creation of the UN Sustainable Development Goals and the ratification of the Paris Agreement. In this context, the circular economy is a crucial tool for decoupling economic growth from further unsustainable resource use and increased CO2 emissions.

Our global resources may be gravely diminished, but – on the positive side – we have innovations today that would have been inconceivable 50 years ago. The exponential growth of digital technology represents a paradigm shift in the way we interact with each other and our surroundings; while new technologies that blend the physical, digital and biological realms can offer previously unimagined value to business and society alike.

Digital solutions such as artificial intelligence (AI), blockchain and the Internet of Things (IoT) can redefine production and consumption in the 21st century, powering a new circular economy that works for people and planet alike.

To realise the full potential of this fourth industrial revolution, though, we need to assess where we are today – and that is the purpose of this research paper. Based on the real-world experiences of start-ups and innovation projects supported by EIT Climate-KIC, we explore the current barriers and opportunities facing companies attempting to apply digital solutions to circular models in European markets.

The key drivers identified in this space are technology, policy, market structures and skills. Together, they enable systemic change towards circularity through the development and implementation of digital innovations. This paper examines each driver individually, identifies current issues, and proposes solutions.

With the planet's future in the balance, there has never been a more important time to find new approaches to the challenges we face.

[1] http://www.worldometers.info/world-population/
[2] https://www.brookings.edu/research/the-unprecedented-expansion-of-the-global-middle-class-2/
[3] World Migration Report 2015 – International Organization for Migration

Methodology

The findings in this research paper have been produced through qualitative interviews and a review of the literature.

We have focused on 14 key start-ups and innovation projects associated with EIT Climate-KIC, all operating with circular models. They represent a broad cross-section of the potential for innovation at the digital/circular interface.

The below graphic provides an overview.

Our contributing initiatives

Bin-e

- Bin solution using AI to identify waste types and sort correctly. The IoT system reports on waste types and amounts, making waste collection more efficient.

ConnectedBin

- Start-up that makes waste collection more efficient by implementing an IoT system. Sensors are placed on waste containers to report on fill-level, location, temperature, upright position, and last pick-up time, among others.

N2 — Applied

- N2 Applied serves as a nucleus for the development of new technologies within the area of nitrogen. For example, N2 Applied has developed a technology to produce nitrogen fertiliser on farms.

refurbed

- Online platform offering refurbished electronics through a network of independent refurbishers, as a way to achieve product life extension.

NOVAMET

- Novamet is applying an IoT system that analyses real time data (temperature, pressure, fluid state) to optimise the industrial process of aluminium recycling. The system provides precise input to the operator on when to do what, optimising processes and increasing energy efficiency.

DTU AMICa Advanced Mapping of Industrial Capabilities for Climate

- AMICa have developed a platform that maps existing technical and scientific capabilities to reach the UN Sustainable Development Goals. Using keywords and other variables, users can map which research, knowledge and information exists within a certain topic, and ultimately identify synergies between areas and materials.

MASH BIOTECH

- MASH Biotech specialises in the creation of innovative/unique ways to convert biowaste into biofuel and develop end-to-end processes, machinery and economic models.

be circle

- BE CIRCLE has developed an online platform using existing and empirical data on waste and resource streams from industries, to identify synergies in industrial parks and optimise resource usage within and across industrial companies.

SIRPLUS

- Sirplus is a service available on and offline that works with industry to mainstream 'food rescue' and reduce waste.

REFARMED

- Refarmed establishes greenhouses on commercial building rooftops, using excess heat, energy and waste as input, providing fish and vegetables for usage or product in commercial buildings (supermarkets etc).

INNOVOPOLIS

- Project developing a decentralised waste management model that allows large buildings to transform their own waste into clean energy on site. Future ambition to incorporate IoT in the solution to gather data, monitor and communicate best waste practices in buildings.

Resourcify

- Cloud platform for digital waste management. Features include one-click waste pick-up and compliance-ready documentation on type and amount of waste.

recycl3R

- Mobile and web application providing recyclability information to end-users on products/packaging, with an integrated reward system.

REPAMERA

- Online platform offering tailoring services to repair damaged clothing items, extending their use cycle.

The circular economy and digitalisation – a new economic model

The circular economy is **the essential future alternative to the traditional linear model** of 'take, make, dispose'. Its key aim is to decouple global economic development from the consumption of finite resources, and to find utility and value in what today is considered as 'waste'. Circular business models extend product life, maximise asset utilisation, and create multiple value loops in supply chains. By spreading circular business models that circulate materials and use them more efficiently, it is estimated that we can cut EU industry CO2 emissions by 56 per cent[5].

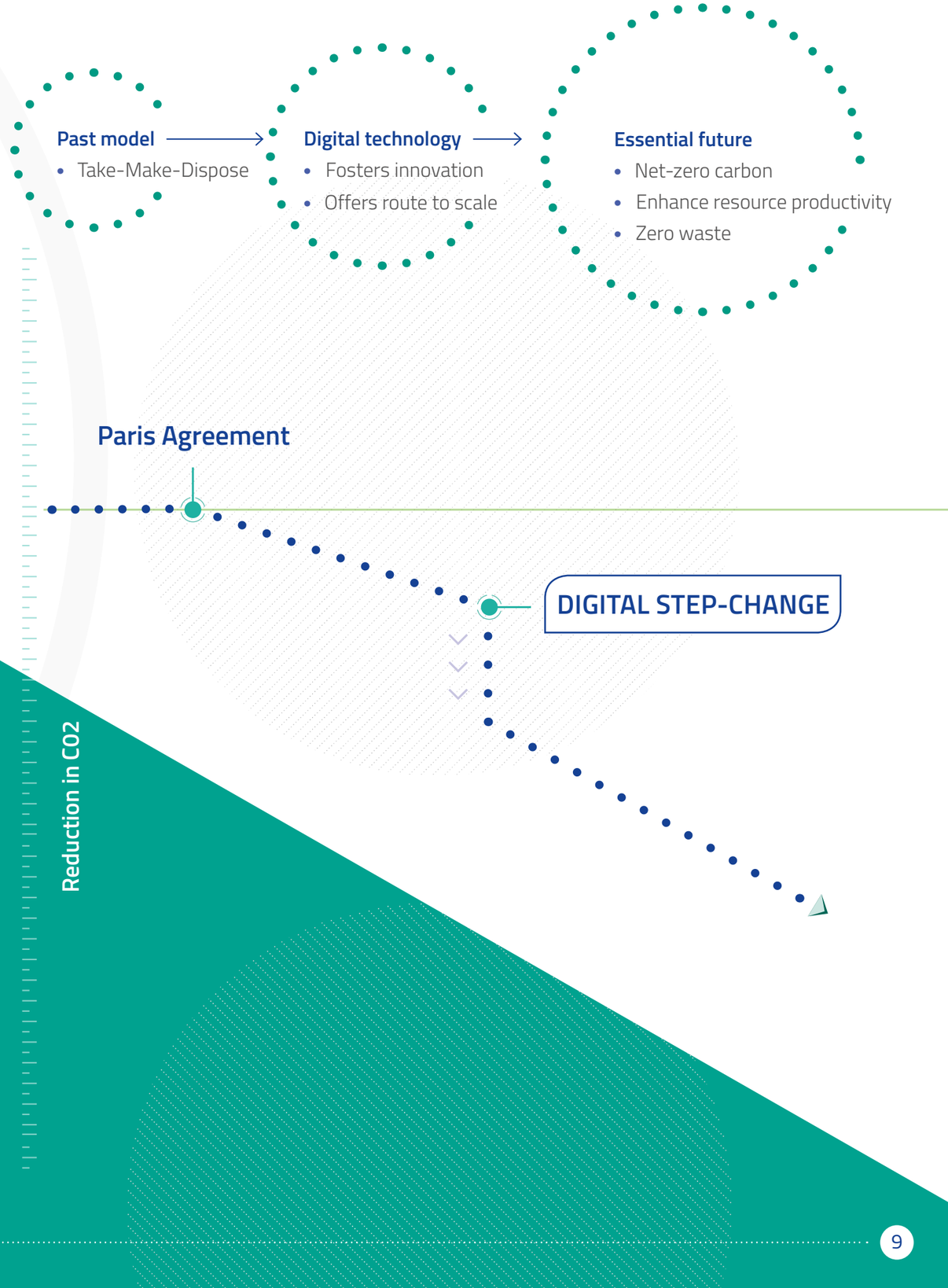
Digitalisation could unlock the huge potential of the circular economy

To unlock the tremendous opportunities that the circular economy holds, information about resource usage along the entire product lifecycle and value chain is vital. So too is detailed information on material specifications.

Digitalisation is the key to obtaining and leveraging this information. Digital solutions can provide real-time data about an item's location, condition and availability; increase traceability of materials; ease access to products and services; and make processes more convenient and effective. In doing so, they can enhance value retention in every design, manufacturing and consumer decision.

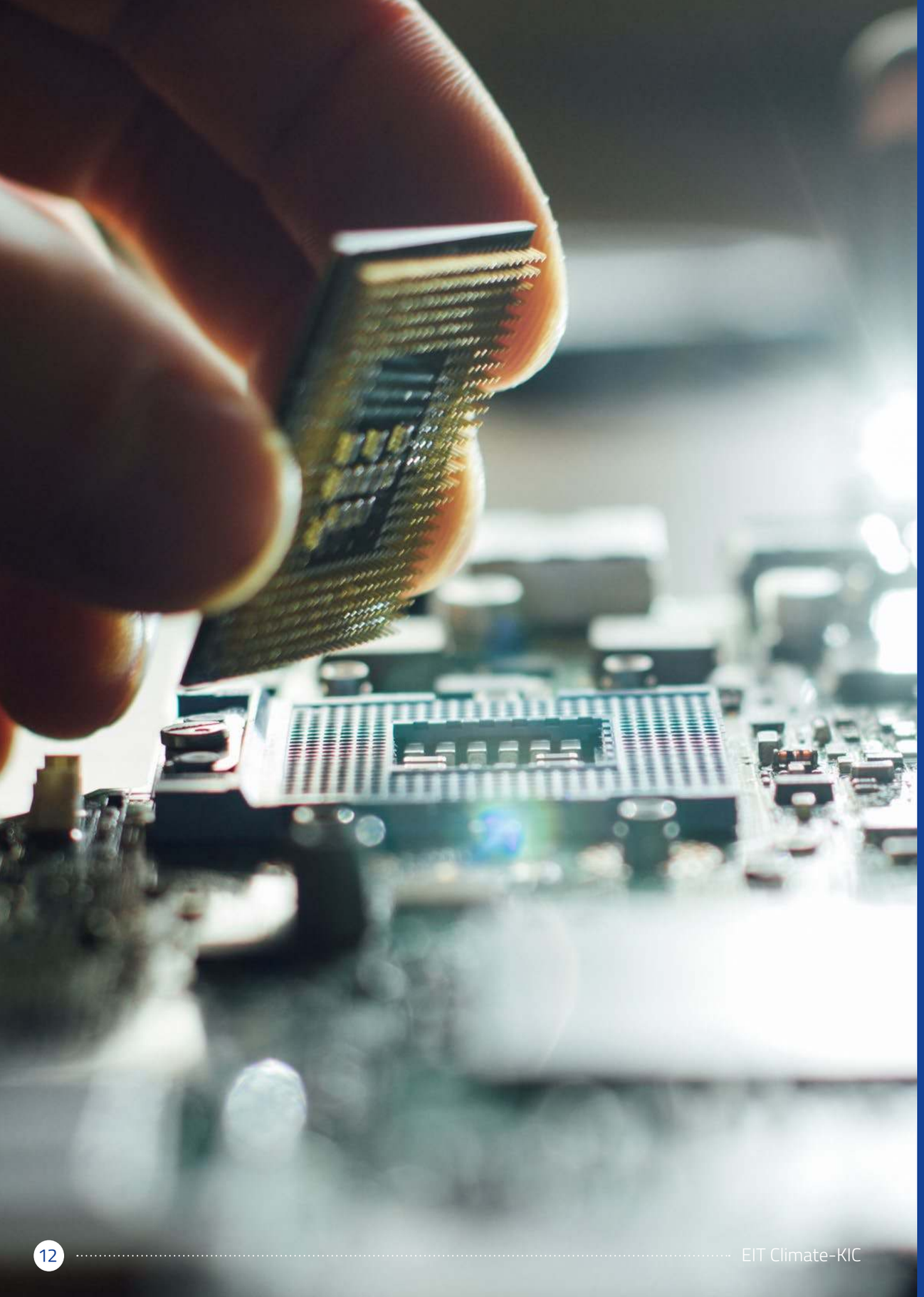
Together, the circular economy and digitalisation offer new paradigms for producing, consuming and living. Together, they offer an invaluable opportunity for human society.

[5] The Circular Economy – A Powerful Force for Climate Mitigation



Opportunities and barriers at the circular/digital interface

In the following sections we examine the four key drivers in the digital/circular space: Technology, Market Structure, Policy and Skills & Knowledge. This is evidenced by the real-world experience of our partners. Their insights reveal tremendous opportunities, but also expose the systemic barriers which need to be addressed before we can fully benefit from the potential of innovative circular business models.



Key conditions:

- **Technology**
- Marketplace
- Policy
- Skills & Knowledge

CONSIDERATIONS:

1. Application of software and hardware technologies
2. Data is essential
3. Lack of access to data
4. Lack of data standards
5. The challenge of interoperability

Technology

Digital solutions can revolutionise service and flexibility, facilitating the flow of products and services between their producers and users at any place and time. A number of start-ups have adopted them as a core feature that offers two main advantages: they give access to a far larger customer base, enabling rapid growth of an existing circular model; and they improve productivity as well as energy and resource efficiency. Our interviews revealed the following key points about the technological aspects of digitalisation in the circular economy.

CONSIDERATION 1 – Application of software and hardware technologies

Several of our partners employ web-based platforms to sell their product/service, or the platform itself is the product/service. In general, they have opted for existing digital solutions. Some of them have made a conscious choice to apply existing solutions, so time and resources can be focused on business development rather than technological development.

In some cases, though, it appears that start-ups are not fully aware of the opportunities offered by existing solutions, and are missing opportunities to improve data collection and scale up their current operations as a result. There are also enablers and barriers to success, such as understanding how to leverage search engines and social frameworks that can be instrumental in market creation and changing opinions.

CASE STUDY

Using existing solutions

There is no need to reinvent the wheel. Start-ups that offer products and services through web-based platforms – such as Repamera and Sirplus – often feel that developing a bespoke platform is too challenging. It is seen as costly and risky, and would need ongoing maintenance – none of which are attractive when trying to build a business.

Equally, businesses that rely on a hardware solution (ConnectedBin, Bin-e) have found that their needs can partly be met with existing hardware, which can then be modified as required.

Lesson:

It is often not the technology itself that makes a business innovative and successful, but rather how it is incorporated into the business model.

CONSIDERATION 2 – Data is essential

The ability to collect, interpret and use data underpins a central aspect of value creation at the digital/circular interface: lack of data obstructs optimised flow and traceability. Partner companies from different countries and sectors are all clearly aware that they need data to fully realise the potential of their digital solutions.

Data points typically cover user habits (e.g. type and quantity of waste, type and amount of food purchases) or product lifecycle data (e.g. origin, component lifecycle stage). The more knowledge of this kind a business can acquire, the easier it becomes to make the most of the use and lifespan of the product or service, improving the circularity of the model.

CASE STUDY

Reducing food waste with IoT data

Sirplus has spotted an opportunity to reduce food waste. It is partnering with another start-up to explore using an IoT solution to collect data on individual food items from the moment of their production, enabling more accurate expiry dates and lower overall waste.

CASE STUDY

Product passports and circularity of materials

RecycI3R and Bin-e highlight the use of product passports to facilitate efficient material flows and enhance value in the circular economy – these would provide information about the product/packaging's content (e.g. valuable resources, hazardous materials). Using RecycI3R and Bin-e's solutions to support better waste segregation, combined with information from the product passport, could potentially lead to more materials being recycled and thus circulated.

Lesson:

Data is needed to unlock true potential for value creation in many circular models.

Technology

CONSIDERATION 3 – Lack of access to data

As data has become a source of greater power, ownership and access has become more challenging. Buying or collecting data can be time-consuming, resource-intensive and expensive for circular start-ups, but a lack of supply can be a serious barrier to enhanced circular business models.

CASE STUDY
Inaccessible data can undermine the business

AMICa and BE CIRCLE rely on data. The latter has found that accessing data held by private companies is difficult, as they either have no incentive to share it, or they have commercial operational reasons for protecting it.

AMICa would benefit from more open data sources on industrial activity and R&D. The rights to mine text and metadata gathered by scientific publications are unclear, meaning the data analysis and platforms they run are constrained and more difficult to roll out at scale. The data may also become obsolete. The company hopes that the 'Exception for Text and Data Mining' in a proposed directive on copyright in the digital single market will clarify and improve the situation regarding the use and re-use of scientific data.

Lesson:

Valuable data is out there, but ownership and lack of incentive to share limits start-ups' access to it.

CONSIDERATION 4 – Lack of data standards

Some partners report that data from public institutions (e.g. municipalities) is difficult to gather and use because collection and dissemination methods differ by institution, region and country.

CASE STUDY
Disorganised data limits scalability

For Recycl3R, lack of access to streamlined data is a barrier to scalability nationally and internationally. Public data on recycling is hard to obtain through public channels (e.g. municipalities' official websites), which means time and resources must be spent gathering it directly and then streamlining it so it can be cross-analysed.

Lesson:

Data needs to be streamlined and centralised to enable more efficient data processing.

CONSIDERATION 5 – The challenge of interoperability

Many digital solutions are developed in closed innovation processes and mainly work in siloed environments. This limits their potential for circular applications.

Start-ups emphasise how important it is to be able to form partnerships with clients and partners, and also to easily integrate different web-based platforms. They report that it can be difficult to synchronise with other systems, and this can affect the willingness of partners and suppliers to co-operate.

Lack of interoperability increases the risks and costs of integrating new software into the existing corporate IT architecture. Customers are wary of getting 'stuck' with a solution that will not be developed further if a start-up disappears from the market, leaving them to invest in a completely new solution all over again.

CASE STUDY
Public customers risk-averse

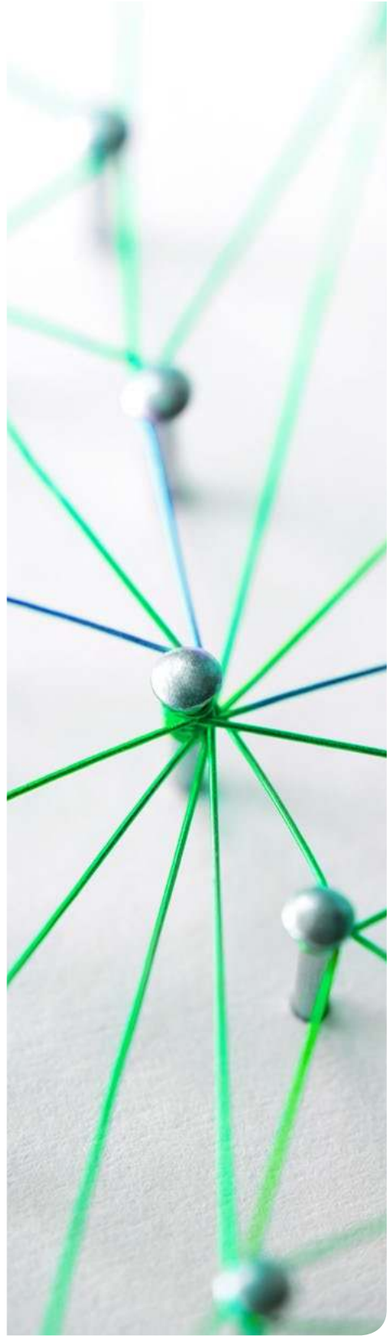
ConnectedBin has a strong new product which augments the way waste is collected, in terms of frequency and type of collection by virtue of empowering collectors with fill level data. It has however found that public authorities tend to be risk-averse and stick to an 'if it's not broken, don't fix it' approach. The idea of adopting an unestablished digital innovation appears too high risk.

CASE STUDY
Operating across platforms

Refurbed relies on a network of refurbishers to facilitate online sales of refurbished electronics. But when the online platform they use cannot synchronise stock with one of their refurbishers' own online platforms, the potential for scale and larger circularity is diminished.

Lesson:

Greater interoperability of datasets, protocols and data feeds is needed to unlock true potential for value creation in many circular models.



Key conditions:

- Technology
- **Marketplace**
- Policy
- Skills & Knowledge

CONSIDERATIONS:

1. Ready to buy circular products?

2. Innovation overload

3. Competing on price, quality and convenience

Marketplace

On the demand side we see a rising interest in circular products and services, with an increasing focus on resource optimisation and the sharing economy. But the decision to act and buy is another matter: circularity demands a change in conventional consumer behaviour, because the customer is involved in circulating the materials back into the market after their consumption.

CONSIDERATION 1 – Are people ready to buy circular products?

The circular business model moves from product to service, from use and dispose to reuse, refurbish or recycle. However, while consumers may like the concept of the circular economy, they may not be ready to make the changes needed to achieve its full potential.

This is where digitalisation comes in.

CASE STUDY
Changing consumer behaviour

Repamera faces a challenging task in trying to change the habits of consumers who discard damaged clothes and buy new ones. But if the challenge can be overcome, there's an opportunity for considerable circular value. Repamera uses a standard online platform, very similar to the online shopping experience with which customers are familiar. This emphasises the convenience of the new service, which the business hopes will enable it to overcome the barrier of traditional behaviour and take the role of first mover.

Lesson:

Digital solutions can make it easier and more convenient for customers to go circular.

CONSIDERATION 2 – Innovation overload

Every start-up must understand the adoption patterns of its target customers – how willing they are and how fast they will be to adopt new products and services. Several of our partner start-ups have said that they have had to balance their own ambitions with the reality of the level of adoption they see from their customers.

CASE STUDY
Simple interface and user-friendly platform

Novamet retrieves an array of data from their client's aluminium plant and produces complex analyses to optimise aluminium recycling processes. However, while top management may buy in to the solution, its successful implementation largely depends on the operator working the furnace. To avoid complicating their routine with underlying analysis, Novamet communicates easy-to-understand 'commands' to the operators through a platform with a simple interface.

CASE STUDY
Implementing digital solutions step by step

Innovopolis aims to introduce a centralised waste management and recycling system irrespective of land-use or occupancy. Ideally this would incorporate an IoT solution on waste bags to collect data on tenants' waste habits, and establish a communication channel (probably a smartphone app) to report back to them on how to sort more effectively. However, the start-up's tests have shown that introducing a new way of handling waste while also trying to get tenants to adopt a new digital solution is too big a barrier, so it has decided to focus on implementing the decentralised waste system first.

CASE STUDY
When digital solutions are redundant

While this research paper is focused on how digitalisation can enable the circular economy, it is also important to recognise that digital solutions can themselves sometimes be barriers to circularity. MASH Biotech finds ways to convert biowaste into biofuel and develop end-to-end processes, machinery and economic models. It operates mainly in developing nations, where there is often a lack of digital infrastructure. In addition, their product is operated by people who have little experience in using such software.

Complex digital solutions could, in this instance, kill the business.

Lesson:

Digital solutions which connect the customer with the business need to be intuitive and accessible. If the interface is easy to use, there is a better chance of getting customers on board.

Marketplace

CONSIDERATION 3 – Competing on price, quality and convenience

For the circular economy to make a real impact, sustainable products and services must be competitive on price, quality and convenience. They must also be scalable, so more consumers can easily adopt circular consumption and usage patterns.

While all our partners strive towards these goals, in reality it can be difficult – and if they don't achieve them, consumers lack enough incentive to change their behaviour. Where they do manage to compete with linear models on these fronts, however, customers are attracted.

CASE STUDY
Price, quality and convenience

- **Price:** By using Refarmed's on-site vegetable-growing solution, supermarkets can cut transportation and energy costs – this makes the product competitive on price.
- **Quality:** The waste management platform Resourcify enables its customers to produce higher quality documentation for compliance requirements.
- **Convenience:** Online platforms such as Repamera make it convenient for customers to extend the use cycle of their clothes.

Lesson:

Applying digital solutions can potentially enable circular models to achieve competitive prices, quality and convenience.

Key conditions:

- Technology
- Marketplace
- **Policy**
- Skills & Knowledge

CONSIDERATIONS:

1. Political support can make or break
2. Regulation is complex and rigid
3. New regulation is a key opportunity to enhance circularity
4. Public digital infrastructure does not accommodate new digital solutions
5. Economic instruments can incentivise circular business models
6. Proof of concept is needed for additional funding

Policy

Every start-up and innovation project operates against a particular institutional, political and regulatory backdrop that influences its ability to succeed. A supportive political environment for circular models, for example, could increase capital flows and public awareness; while over-rigid regulation could leave start-ups without the flexibility to try better circular models.

CONSIDERATION 1 – Political support can make or break

Our research shows that start-ups and projects in countries and regions where the circular economy is on the political agenda are more likely to get the support they need to succeed: many have benefited from public and private funding opportunities.

CASE STUDY

Different regional political agendas, different foundations for business

Partners largely from Southern and Eastern European countries report a lack of political support for circular ventures, which results in a lack of public funding and a general lack of understanding from customers such as municipalities and public procurement institutions. One business comments: "Without political support you would not get public support, but at the same time, without public support, you would not get political support. In essence, it turns into a chicken and egg kind of situation."

In Northern Europe there has been increasing political support for circular economy initiatives, especially those which focus on digital and technological innovation. This offers start-ups the chance to raise capital through a range of public and private financial vehicles.

Lesson:

Political emphasis on the potential of digital/circular solutions encourages growth and increases awareness of new products and services among customers and suppliers.

CONSIDERATION 2 – Regulation is complex and rigid

Many of our partners find that regulation – both domestically and especially internationally within the EU – is complex, and does not accommodate circular business models or new digital solutions. For start-ups, simply determining what regulation applies to their venture can be a challenge. Several point out that limited finances mean they do not have the option to employ full-time resources to focus on analysing and working with regulation, so it is much more straightforward to stick with old familiar business models.

CASE STUDY

Liability concerns discourage corporate customers

Sirplus initially wanted to re-sell expired food items B2B, ensuring bulk sales and eliminating more food waste. However this idea was quickly abandoned, as corporate customers were reluctant to buy because of cumbersome processes: reselling companies would have to inform customers about the condition of each food item, and get verbal consent before every transaction.

CASE STUDY

Complex documentation limits cross-national business

The WEEE directive* – aimed at limiting electronic waste in the EU – actually makes re-use more difficult. Refurbed would like to establish a pan-European network of refurbished electronic items for re-sale, but every time it transports electronic waste across a border, it is obliged under the directive to provide clear documentation stating that its purpose is refurbishment, and the exact amount and type of material that is being shipped: "The process becomes really complex – when, ideally, trading products in the EU should be as easy as possible."

*The Waste Electrical and Electronic Equipment Directive (WEEE Directive) is the European Community Directive on waste electrical and electronic equipment (WEEE) which, together with the RoHS Directive 2002/95/EC, became European Law in February 2003.

CASE STUDY

Inflexible public procurement contracts

ConnectedBin's sensors enable waste management companies to collect waste more efficiently, by only doing so when containers are full. But public waste management contracts tend to oblige companies to collect waste on a daily basis, so adopting ConnectedBin's services would lead to a breach of contract since daily collection would no longer be necessary. Even though the product would make them more efficient, clients are discouraged from buying it.

CASE STUDY

New businesses need new definitions

N2 Applied has attempted to get its manure-based fertiliser certified as organic, but current regulatory structures are little help: the EU refers the business to the national institutional body, which then refers it to the national certification body. "If you really innovate, and innovate against the normal stream, it's very difficult – everybody keeps pointing to everybody. There is no level playing field. As a small business you don't have the lobby power to change it." Several start-ups have commented on the difficulties SMEs face when trying to influence and request change in institutions.

Lesson:

Complex regulatory frameworks which require businesses to access legal or technical expertise in order to remain compliant can be almost insurmountable to a start-up.

Policy

CONSIDERATION 3 – New regulation is a key opportunity to enhance circularity

Ratification of EU regulation that enhances circularity – for example by promoting the looping of materials through waste regulations – has been crucial in paving the way for some of the start-ups EIT Climate-KIC is working with. Digitalisation has also made compliance with the regulations smoother.

CASE STUDY

Legally binding recycling targets are an opportunity for digital waste management solutions

EU member states are legally obliged to reach targets for municipal waste recycling (60% by 2030). This has proved to be an opportunity for several start-ups, including RecycI3R, Bin-e, Resourcify and Innovopolis. By using IoT, AI and web-based platforms, they have created solutions that enable easier and more effective waste segregation, incentivise recycling, and ultimately increase amounts of recycled waste from households and companies alike. As one of the businesses comments: "If you want to achieve anything with companies, manufacturers and the cities (municipalities), you have to do it through regulation."

Lesson:

Regulation that sets targets for increased circularity can open the door to the use of digital solutions.

CONSIDERATION 4 – Public digital infrastructure does not accommodate new digital solutions

New digital solutions rely heavily on access to public digital infrastructure. Where this is lacking, there is doubt over the scalability of start-up businesses. Different IoT solutions require different types of mobile networks, from high-power 4G to much lower bandwidth, depending on the application. There are cases where IoT assets, which do not need high-power networks, are obliged to run on them nonetheless as no other networks are available: this means the devices must be replaced more often than they otherwise would be, making the solution more expensive and energy-reliant than planned.

CASE STUDY

The need for different networks

ConnectedBin's devices only require minimal power consumption on low bandwidth channels. When these networks are unavailable, devices are replaced more often than necessary, increasing the running costs of the business.

Lesson:

Public digital infrastructure should cover all geographical areas and support both high and low power/bandwidth networks.

Policy

CONSIDERATION 5 – Economic instruments can incentivise circular business models

There is a clear need for economic instruments which target those developing truly circular business models and reward them through tax relief or other benefits. Conversely, tariffs or higher taxes could be imposed on businesses which stick to wasteful, linear models.

CASE STUDY
Tax exemption for circular businesses

In Sweden, smaller businesses that extend the lifetime of products through repair benefit from a reduction in VAT. For Repamera this has been a crucial opportunity to enhance their potential and be more competitive on price. Start-ups from other countries with similar business models (e.g. Refurbed) say that simple economic instruments like this can be paramount to success.

Lesson:

Fiscal instruments can help circular businesses compete on price with linear business models.

CONSIDERATION 6 – Proof of concept is needed for additional funding

Several of our partners highlight the importance of proof of concept to get support from private investors. Innovative products and services have no precedent and are therefore considered as uncertain and high-risk investments.

CASE STUDY
Credibility network

Network and funding sources can also be a stamp of credibility. Resourcify point out that EIT Climate-KIC acts in this way. Being associated with and endorsed by established institutions can enable start-ups to gain further support from potential investors.

Lesson:

Early stage public seed funding to establish proof of concept can spur further private investments.

Key conditions:

- Technology
- Marketplace
- Policy
- **Skills & Knowledge**

CONSIDERATIONS:

1. The right combination of knowledge and skills
2. Lack of financial resources limits access to key employees

Skills & Knowledge

The right technology, market structures and policies are essential for digital/circular businesses, but access to the right skills and resources is equally important.

CONSIDERATION 1 – The right combination of knowledge and skills

Most of our partners are tapped into useful networks and have access to skilled employees to support their development. There is an enthusiasm for making contact with potential partners, and a range of sources are used for knowledge and inspiration. Investors and funders are more than a financial source, they can also provide useful guidance and access to their own networks and partners. Professional partners and academic institutions are also valuable.

Barriers occur when cross-disciplinary knowledge and skills are hard to find. In some specialist areas this can be particularly difficult.

CASE STUDY
Accessing interdisciplinary knowledge

Novamet has found it difficult to find people with expertise in developing digital platforms and a scientific background in aluminium metallurgy. Novamet would like the appropriate skills in-house so as to expedite growth.

Key point:

There is an abundance of skills and knowledge available, but finding the right interdisciplinary mix can be challenging.

CONSIDERATION 2 – Lack of financial resources limits access to key employees

Highly qualified digital talents are a prized commodity in the labour market, and tend to be prohibitively expensive to hire on a start-up budget. Good legal minds who can help innovative companies navigate through regulations are expensive too. The barrier is not so much a lack of competent resources as a lack of accessible, affordable ones.

CASE STUDY
Expert resources are needed early on

Partners including Refurbish, Recycl3R and Resourcify all state that they would benefit from highly competent resources to develop and improve their digital solutions. N2 Applied and Refurbish need the same level of assistance to support and guide them through the complex EU-wide regulatory landscape.

Key point:

An institutional support system offering start-ups access to highly qualified skills is needed.

Summary

The relation between the circular economy and digitalisation is still in its early phases, but the foundations are in place. The circular economy can increase resource productivity and value retention, and reduce CO2 emissions, while digitalisation can enhance transparency, efficiency and convenience. The combination shows great potential.

There is an eagerness in the market to use digital solutions to enable and scale circular models. Customers are beginning to welcome new ideas, and the institutional context is moving towards one of support.

That said, the field is complex and there are still major challenges.

Start-ups in particular report a need to focus on either business growth or technical issues, as developing both at once can be too challenging. Customers are still adjusting to new forms of consumption. On top of that, the old institutional framework has yet to really accommodate the new business models that the digital/circular interface facilitates.

But great challenges are also grand opportunities, and now is the time to think big, act fast and make change happen.

As we enter the fourth industrial revolution*, our lives are changing again. At its core lies global connectivity through digitalisation: connectivity between human and human, human and machine, and – not least – machine and machine. Digitalisation holds the key to a rapid transition to a circular economy. It not only scales and replicates, but it empowers consumers and communities.

Digitalisation offers us the opportunity to reinvent our relationship to natural resources. IoT applications will intensify connectivity between units, gathering data across things and people. Blockchain brings greater transparency, security and traceability. AI allows us to analyse data with higher detail and accuracy, increases resource efficiency and productivity, enables predictive maintenance, and opens up further untapped potentials.

If we use digitalisation to maximise the true potential of the circular economy, we could in future cut 296 million tonnes of CO2 emissions each year in Europe[6]. Today, digital opportunities are already helping to accelerate circular innovations, moving the growing circular economy from a sometimes slow, manual process to a streamlined, efficient business for a sustainable future.

It is time to take positive steps to unlock the huge opportunities we have before us.

*The Fourth Industrial Revolution (4IR) is the fourth major industrial era since the initial Industrial Revolution of the 18th century. It is characterised by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.

[6] Materials Economics, The Circular Economy – A Powerful Force for Climate Mitigation (2018)

Key findings

TECHNOLOGY

- It is often not the technology itself that makes a business innovative and successful, but rather how it is incorporated into the business model.
- Data is needed to unlock true potential for value creation in many circular models.
- Valuable data is out there, but ownership and lack of incentive to share limits start-ups' access to it.
- Data needs to be streamlined and centralised to enable more efficient data processing.
- Standardised platforms enable easier integration between suppliers and partners, and reduce risk. There is a key opportunity for institutional customers to lead the way and be more willing to buy innovative products and services.

SKILLS & KNOWLEDGE

- There is an abundance of skills and knowledge available, but finding the right interdisciplinary mix can be challenging.
- An institutional support system offering start-ups access to highly qualified skills is needed.

MARKET

- Digital solutions can make it easier and more convenient for customers to go circular.
- Digital solutions which connect the customer with the business need to be intuitive and accessible. If the interface is easy to use, there is a better chance of getting customers on board.
- Applying digital solutions can potentially enable circular models to achieve competitive prices, quality and convenience.

POLICY

- Political emphasis on the potential of digital/circular solutions encourages growth and increases awareness of new products and services among customers and suppliers.
- Regulation is not adapted to circular business models, which inhibits potential for scale and business development.
- Regulation that sets targets for increased circularity promotes the use of digital solutions.
- Public digital infrastructure should cover all geographical areas and support both high and low power/bandwidth networks.
- Fiscal instruments can help circular businesses compete on price with linear business models.
- Initial phase public funding to establish proof of concept can spur further private investments.

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