

Data sharing for a circular economy in the Nordics



Nordic
Innovation

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Disclaimer

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Nordic Innovation is an organization under the Nordic Council of Ministers. Nordic Innovation aims to make the Nordics a pioneering region for sustainable growth and works to promote entrepreneurship, innovation and competitiveness in Nordic business.

Foreword

Data sharing, the circular economy and value creation

The Nordic Council of Ministers and the Nordic Prime Ministers' vision is to make the Nordic region the most integrated and sustainable region in the world by 2030. In the work towards the vision, Nordic Innovation has identified data sharing as a value driver in the circular economy. Nordic Innovation has worked with circular business models as a means to accelerate the transition to the circular economy for companies and organisations since 2018. In this work the Nordic countries, with their highly digital population, has come to realise that we can achieve a competitive advantage if we learn the value of sharing data to provide more sustainable circular solutions. The report is a way to start the work and to showcase the opportunities and barriers within data sharing and how we can improve and reduce them.

Nordic Innovation September 2021.

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Executive summary

Executive summary

The traditional "take, make, waste" approach of production and consumption will not be sustainable in a world with ever-expanding consumption rates. The circular economy offers an alternative approach to the linear economy and redefines the concept of waste as a valuable resource. The circular economy holds significant value potential, and it is estimated that up to \$140 billion can be captured by 2030 in the Nordics if the circular economy is implemented at scale.

The ability to share and utilize data both along and across the value chains is crucial to create a well-functioning ecosystem approach to a circular economy. Currently, data sharing in the Nordics is characterized by data sharing internally in the company or between a few trusted actors in the value chain. Despite the low maturity level there are examples of data sharing initiatives in the Nordics that demonstrate how companies are starting to share data and realizing value. The most common data flows are material traceability data to support sourcing and recycling processes, and product performance and other operational data to support the extension of a product life.

As the maturity level advances, shared data ecosystems and end-to-end product traceability could be developed, benefitting from aggregated data, benchmarking information and access to information from previously inaccessible parts of the supply chain. An important part of the future circular data flows will be to transition to new innovative business models, where businesses do not only look at how to reduce waste occurring in their existing operations, but rather focus on transforming their business models and how they deliver products and services to their customers.

Sharing data across the value chain makes new insights available to improve efficient use of resources. The utilization of new knowledge creates value for companies in four different dimensions: reduction of costs, improvement of brand image, reduction of risk and increase in revenue. Currently, there is a higher focus on cost reduction, risk reduction and brand enhancement, however, new circular business models are also opening up new opportunities for revenue generation.

There are several barriers to data sharing for the circular economy. The barriers can be split into four main categories: Value case, legislative, technical and knowledge/culture based barriers. Legislation, and in many cases the lack of the right legislation, acts as a major barrier to data sharing for circularity. The introduction of the right policies on national and international level can be a powerful enabler to the extended collection, sharing and use of data for circular economy practices. EU level policies on data and the circular economy indicates direction and sets out the framework for data driven circularity, but first movers and pilots are needed to showcase applications and value creation.

The Nordics is already at the forefront of developing digital capabilities, providing a great starting ground for also advancing their capabilities within data sharing for circular outcomes. Provided with the right incentives, Nordic companies can accelerate the global shift to a circular economy, underpinned by data.



Introduction

Introduction

The increasing knowledge about humans' negative impact on the climate, as well as the urgency to make drastic changes to avoid irreversible consequences to the natural environment, calls for innovative solutions and initiatives to accelerate the green shift. The recent IPCC report underlines the severity of the situation¹.

The traditional "take, make, waste" approach of production and consumption will not be sustainable in a world with ever-expanding consumption rates, and businesses are starting to understand the financial and ethical risks that this entails.

\$140 billion can be captured by 2030 in the Nordics if the circular economy is implemented at scale



1. IPCC, (2021) AR6 Climate Change 2021: The Physical Science Basis

The circular economy offers an alternative approach to the linear economy and redefines the concept of waste as a valuable resource. A transition from a linear economy to a circular economy has the potential to optimize material flows, reduce CO₂ emissions, and enable a sustainable future.

The circular economy also holds significant value potential, and it is estimated that up to \$140 billion can be captured by 2030 in the Nordics if the circular economy is implemented at scale². To realize the trapped value, collaboration is required across the entire value chain with traditional and new businesses. An ecosystem approach across the value chain is needed to fully close the circle.

The rapid development of new technologies is a game changer for circular business models, and are opening new opportunities faster than ever before. There is a range of technologies that are transforming value chains and creating well-functioning ecosystems, spanning from artificial intelligence to Internet of Things. The pace at which these new innovations are being developed and scaled is advancing rapidly.

The technologies are underpinned by the ability to share and utilize data. This could be data on product traceability (e.g. material composition, origin, characteristics etc.) or product performance (e.g. expected lifetime of a product, repair guidance etc.). However, there are barriers present today for collecting, sharing and utilizing data between actors, such as data security, interoperability, quality, and business sensitive data.

This report aims to map out the current landscape of data sharing for the circular economy in the Nordics, as well as the future potential and opportunities that follow. Based on insights from interviews and survey responses from Nordic organisations (see appendix 2), the report identifies barriers and enablers to an accelerated transition towards use of data sharing for circularity, the role Nordic and international policy can play in this, and presents recommendations for the implementation of pilot projects.

2. P. Lacy et al., (2020) The Circular Economy Handbook, page 331

Definitions

Definitions

The following section presents the description of key terms and concepts as they are used in this report.

Circular value chain

The circular value chain includes all steps creating value for a product or service. The process starts with the design and material sourcing, followed by the manufacturing phase. Next, the product moves into the use phase. Finally, the product is recycled and looped back into the production cycle (see figure 1). The scope of this report includes the complete value chain.

The circular economy

The circular economy aims at decoupling growth from consumption of finite resources and presents an alternative to the traditional linear economy based on a "take, make, waste" approach to consumption. A circular economy introduces circular loops of materials with the aim of keeping materials and used resources in the value chain for as long as possible. See description of the five circular business models in table 1. Note that there are multiple variations and use cases for each business model, which will also be explained in the following chapters.

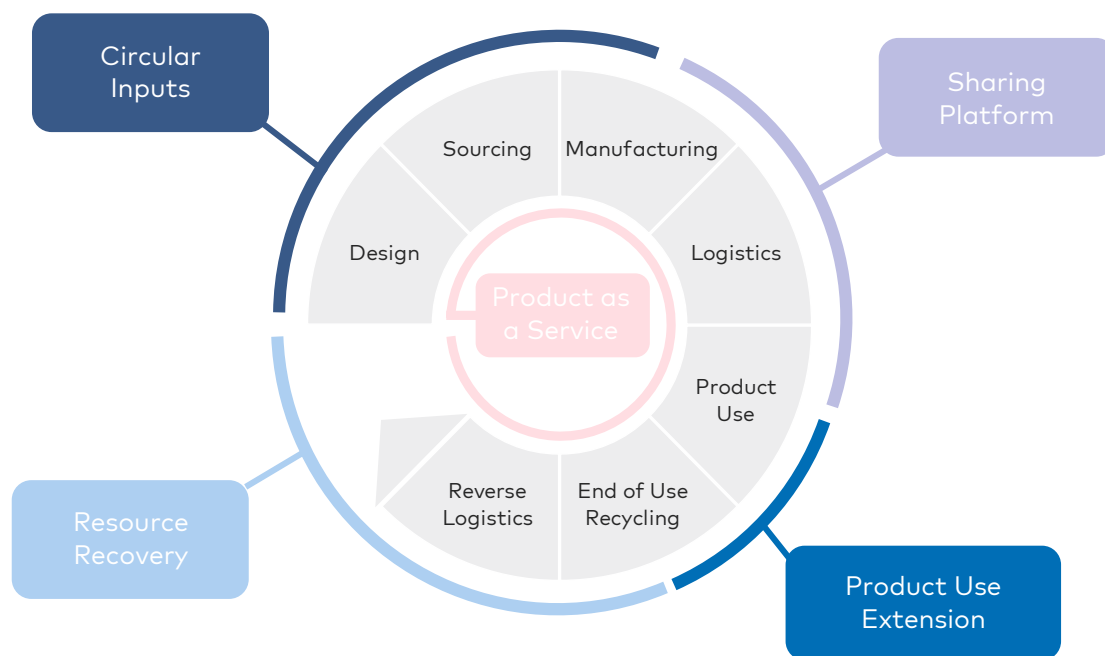


Figure 1 : Circular business models³

3. Nordic Innovation, (2020) [The Circular Economy Playbook](#)

Circular Business Model	Description
Circular Inputs	Use of renewable energy, bio-based or potentially completely recyclable materials and design products that are durable and easy to repair.
Sharing Platform	Increased product usage rates through collaborative models for usage, access, or ownership.
Product as a Service	Product ownership is retained with the manufacturer and customers lease/rent the product, which incentivises increase in resource productivity along the whole lifecycle.
Product Use Extension	Extension of the product lifecycle through repair, maintenance, upgrading, resale and remanufacturing.
Resource Recovery	Recovery of usable resources or energy from waste or by-products.

Table 1 : Circular business models⁴

Data and data sharing

All information connected to the business or organisation can be defined as data. This includes product material composition, user behaviour, equipment performance and CO₂ emissions. Data sharing entails the processes of making different types of data available, internally or externally, to one or more actors. The level of

data sharing is determined by the amounts of data made available, the type of data, with whom it is shared and with how many. The report will be using a maturity curve to illustrate and assess the maturity level of data sharing for circularity. The maturity level is defined by the sharing of data and the circular value created from this. See appendix 3 for a technical glossary.

4. Nordic Innovation, (2020) [The Circular Economy Playbook](#)

Current level of data sharing for a circular economy

Current level of data sharing for a circular economy

The following assessment of the current level of data sharing for circularity in the Nordics provides an indication of where the Nordics is today. The current situation is overall characterised by low maturity, with data sharing internally in the companies or between a few trusted actors in the value chains. Despite the low maturity level there are examples of data sharing initiatives in the Nordics, which demonstrates how companies are starting to share data and realizing value.

Current maturity

The landscape is characterized by overall limited data sharing between value chains, where sharing mostly takes place internally within the company or between only a few trusted partners in the value chain. Moreover, innovative business transformation and elaborate data

sharing ecosystems are missing. The data collected is usually stored in silos, and comparability between the different data sets is challenging because of a lack of standards and data governance agreements. The current level on the maturity curve for the Nordics is therefore assessed to be on the lower end, in the emerging and maturing phases (see figure 2 and table 2).

The concepts of data sharing in a circular economy context are often new for businesses, and there is limited knowledge on how data sharing can drive circular value. There are, however, innovative examples of data sharing in the Nordics. This indicates that the Nordic market is at the beginning of a potential shift towards a circular economy where data can flow freely.

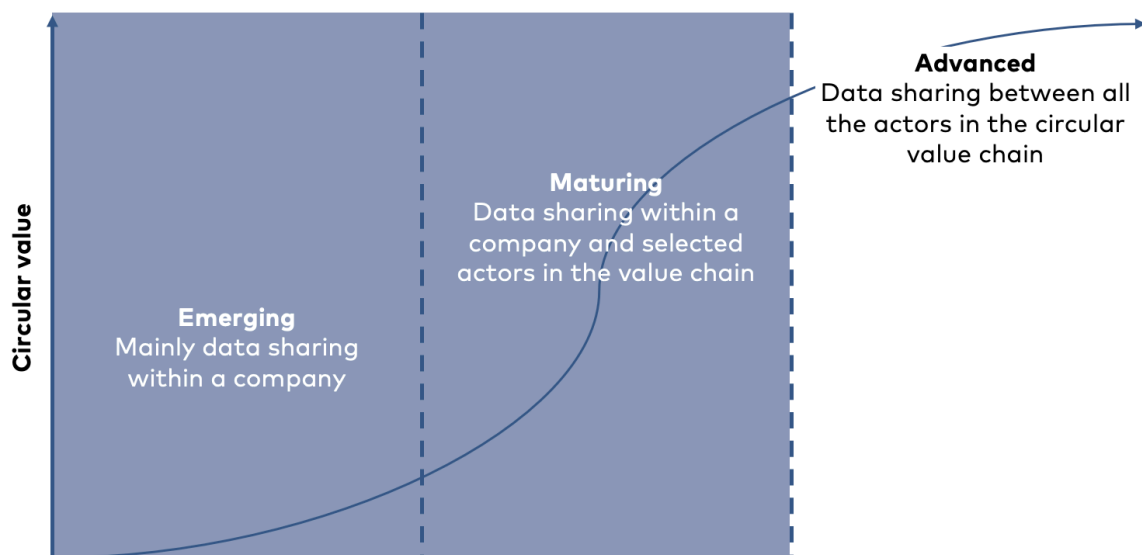


Figure 2: Current maturity level

There are, however, some innovative examples of data sharing in the Nordics. This indicates that the Nordic market is at the beginning of a potential shift towards a circular economy where data can flow freely. Table 2 below outlines the criteria for the maturity levels in more

detail, and is based on Accenture's experience working with Nordic companies on development of their digital capabilities. The majority of companies participating in the survey and the interviews met the criteria for emerging and maturing levels.

Criteria	Emerging	Maturing	Advanced
Actors	Within company	Between two/three actors in value chain	Between all relevant actors in the value chain
Data comparability	Lack of data standards require manual reconciliation	Lack of data standards require manual/partly manual reconciliation	Use of data standards ensures comparable data
Data exchange	Siloed databases require manual transfers within company	Manual/semi-automated data exchange between two/three actors	Automated data exchange between all relevant actors
Data governance	N/A	Agreements developed on a case-by-case basis	Standard data governance agreements

Table 2: Current maturity level



Current circular data flows

The circular business models are underpinned by technologies. The technologies rely on data exchange between actors, and data is essential for ensuring scalability and realizing value from the circular economy. Figure 3 illustrates the most common current data flows identified in the Nordics in the circular economy. The figure covers the full value chain of circularity, and highlights the circular business models that typically leverage data to drive value.

The current data flows support the circular business models that are focused on the production of the product. The most common data flows are material traceability data to support sourcing and recycling processes. This type of data flows are typically restricted to a few actors in the value chain, e.g information exchange between a supplier and a manufacturer. Accessing information

about the origin, properties, previous use and location of materials and products create transparency and facilitates both sourcing and recycling decisions.

In addition, product performance and other operational data are used to support the extension of a product life. Data and digital technologies are employed to find trends and correlations, which is used to plan maintenance and replacements.

Capitalization on data flows from Product as a Service and Sharing Platforms are identified as the least utilised today. These data flows are associated with an advanced level of data sharing with multiple actors that are not necessarily directly connected with each other. These business models also require a higher degree of business model transformation as the sales model of the company changes, requiring a different set of capabilities.

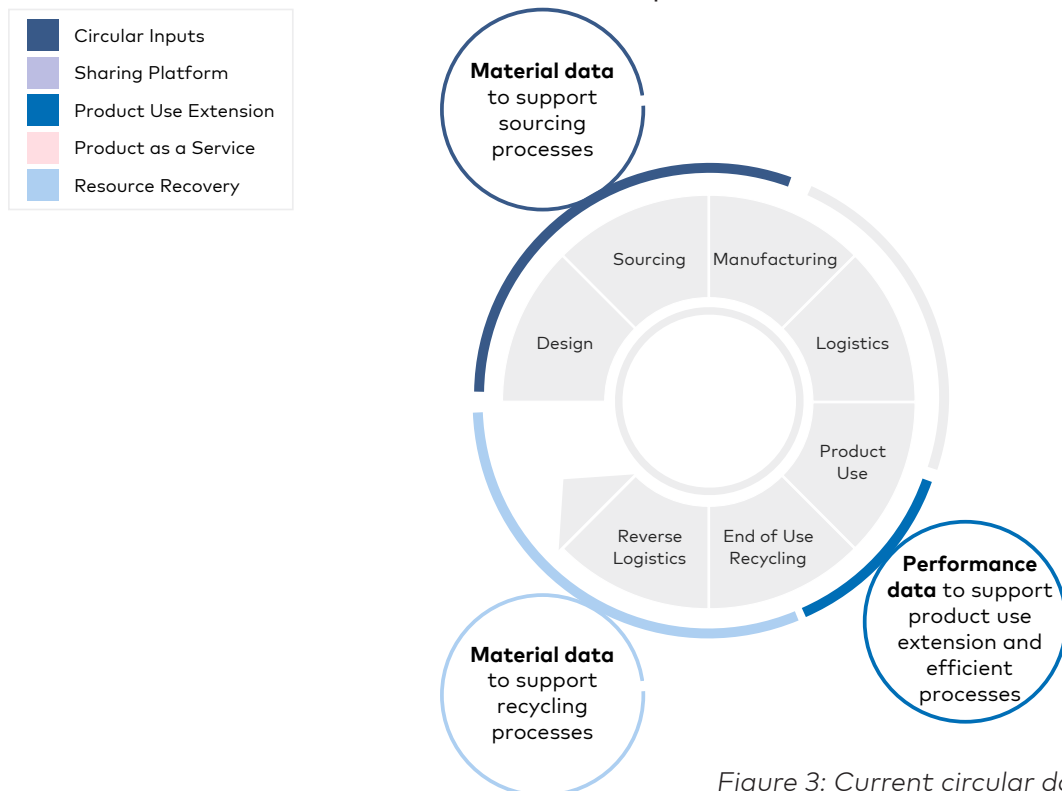
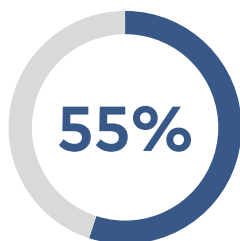


Figure 3: Current circular data flows



of companies use data sharing to facilitate recycling

Figure 4: Percentage of companies that use data sharing to facilitate recycling from the survey

The circular focus areas vary depending on the type of industry. Material traceability and recycling are more common in consumer goods industries, such as retail, fashion and the plastics industry. This can partly be explained by the increased public attention surrounding the topic in the past decade. One example is how recycled materials declarations in clothes and plastic products is frequently communicated to the end customer. According to the survey, the construction industry identified recycling as a common circular application supported by data sharing. Furthermore, data sharing on waste amount and type was more common in the construction

industry than in the manufacturing industry. This might be a result of an increasing regulatory pressure in construction over the last few years.

Product performance data is more commonly collected in the manufacturing and heavy equipment industries with high operation costs and energy intensive processes. These companies are also typically experiencing high operational efficiency expectations from their stakeholders. Data on material composition was also among the most common data shared by manufacturing companies, according to the survey.

Traceability for the after market

As a Danish remanufacturer of automotive parts, Borg Automotive extends the life time of parts from used cars. Borg Automotive gain access to information about the components and their traceability from TecDoc, a centralized, global vehicle and replacement parts catalogue. This facilitates the preparation of the parts for the after market. The information is also sold as a service to their customers. By leveraging data to sell remanufactured automotive parts, Borg Automotive is able to keep the parts in a closed circular loop.

Second-hand shopping through Blocket

The Swedish second-hand online marketplace Blocket provides a platform where used clothes, furniture, cars and other consumer items can be easily sold. As the platform facilitates reselling of products, it offers an alternative to the final stage of the traditional "take-make-waste model" and encourages extension of product life. Through the collection and sharing of second-hand consumption data, Blocket achieves valuable insights that can help optimize the offering in their services and increase sales. Using and sharing consumption data for the growth of their business contributes to increased utilization of second-hand products, thereby increasing the circularity of the society.

Value creation

Sharing data across the value chain makes new insights available to improve efficient use of resources. The utilization of new knowledge creates value for the company in four dimensions: reduction of costs, improvement of brand image, reduction of risk and increase in revenue (see figure 5).

The four dimensions of value creation illustrates how data sharing for more circular practices benefit the individual company translated into traditional business incentives. The environmental and societal benefits of such activities will be the natural results of a circular economy.

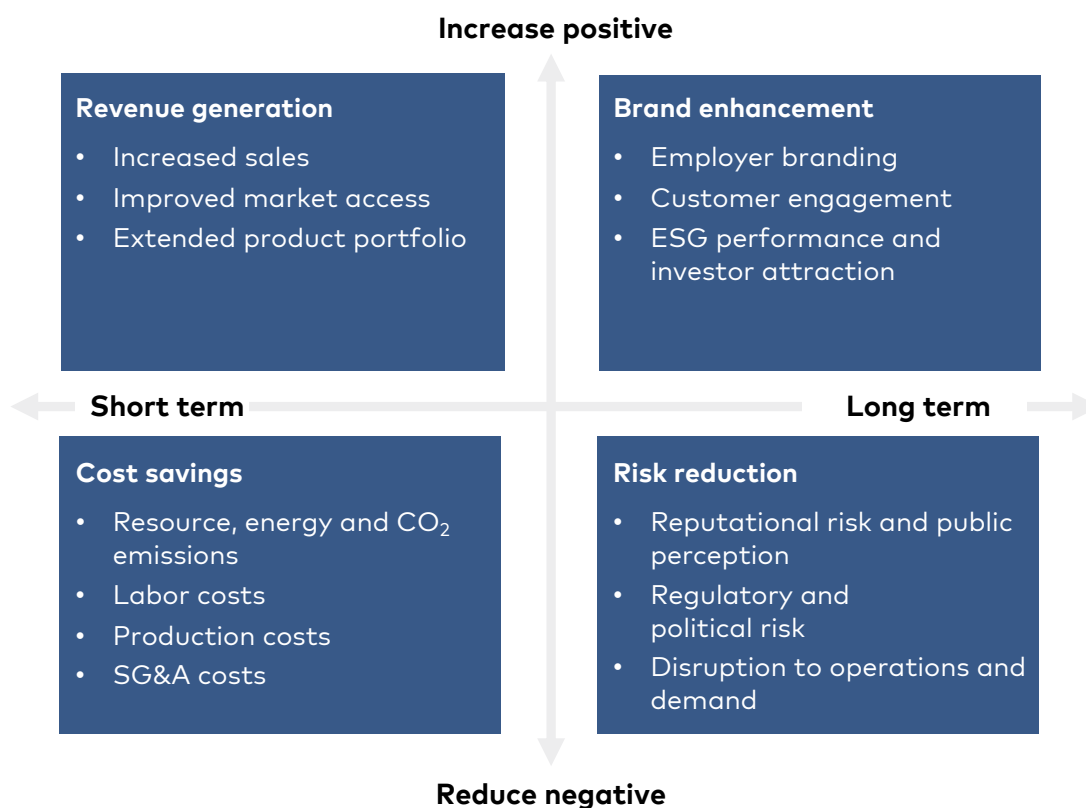


Figure 5: Four value dimensions⁵

About a third of the material in a new Volvo truck come from recycled materials, reducing their material costs and dependency on volatile commodity markets. This is enabled by registering information about the material used in the cars during the production step⁶

5. P. Lacy et al., (2020) The Circular Economy Handbook, page 210

6. Nordic Innovation, (2020) [The Circular Economy Playbook](#)



The existing use of data sharing in the Nordics is generating value in all four dimensions, however, there is a higher concentration on cost reduction, risk reduction and brand enhancement.

Within cost reduction, data can be employed to drive waste out of the product design and production stages, reducing material and energy costs, and product development costs. Cost reduction can also be achieved through the use of cheaper recycled materials (see example from Volvo on the previous page). Reduction in costs were identified as the most common value creator from data sharing among retail companies in the survey. This might indicate that, in addition to external pressure to communicate recycling efforts to the end consumer, the retail industry has realised added

benefits through efficiency gains from data sharing for circularity.

Within risk reduction and brand enhancement, data can be employed to document and communicate sustainable operations and products, and shield a company against upcoming regulations and rapidly changing customer behaviour and demand.

Overall, value generation is typically focused on individual company quick wins and future proofing their operations, rather than generating value from a transformational system change.



Data platform for simplifying transport services

Easy2You is a Norwegian digital service provider in the logistics sector. With a goal of making transport services easier and more efficient, they have built their business with data sharing at the core. Easy2You matches transport needs with available resources through an online platform. The route and capacity optimization limits half empty rides and unnecessary detours, increasing the overall utilization of the trucks and reduces empty space in the trucks. Easy2You also contextualizes data on CO₂ emissions, helping the customer reduce their carbon emissions. The use of this type of data is still at the early stages, but as the data pool grows, so does the potential for increasing utilization of the trucks and reducing overall CO₂ emissions.

Data platform for seamless chartering process

Ankeri is an Icelandic cloud-based platform that allows ship owners and charterers to communicate and stay on top of fleet performance and potential chartering prospects. The platform unifies commercial and technical ship data allowing teams on both the ship owner and the chartering side to view and share validated information. The platform contributes to optimizing the energy efficiency of the vessel by competitive benchmarking. In addition, it facilitates the selection of the most optimal vessels, increasing overall utilization of the vessels.⁷



7. Ankeri, (nd) [Calm chartering begins with Ankeri](#)

Future potential for data sharing for a circular economy

Future potential for data sharing for a circular economy

The previous chapter established that the maturity level of data sharing for circularity in the Nordics is low. With limited knowledge about the concept and a lack of recognition of the value of data sharing, the potential for improvement and utilization of data sharing to achieve circular value is great.

From emerging to advanced maturity level

An advanced maturity level of data sharing for circularity consists of open ecosystems with public actors, competitors, suppliers and customers across industries and countries. Instead of a siloed approach to data collection and storage, these shared data ecosystems benefit from

aggregated data, benchmarking information, and access to information from previously inaccessible parts of the supply chain.

The maturing level is characterised by data sharing between actors that have a direct natural relationship, e.g. a supplier and a manufacturer. On the advanced maturity level, data can be exchanged between actors that in a traditional value chain would not interact directly. One example of this type of data sharing is benchmarking between competitors. This kind of data sharing ecosystem is made possible by identifying a common problem that all parties involved would benefit from solving, which would motivate collaboration.

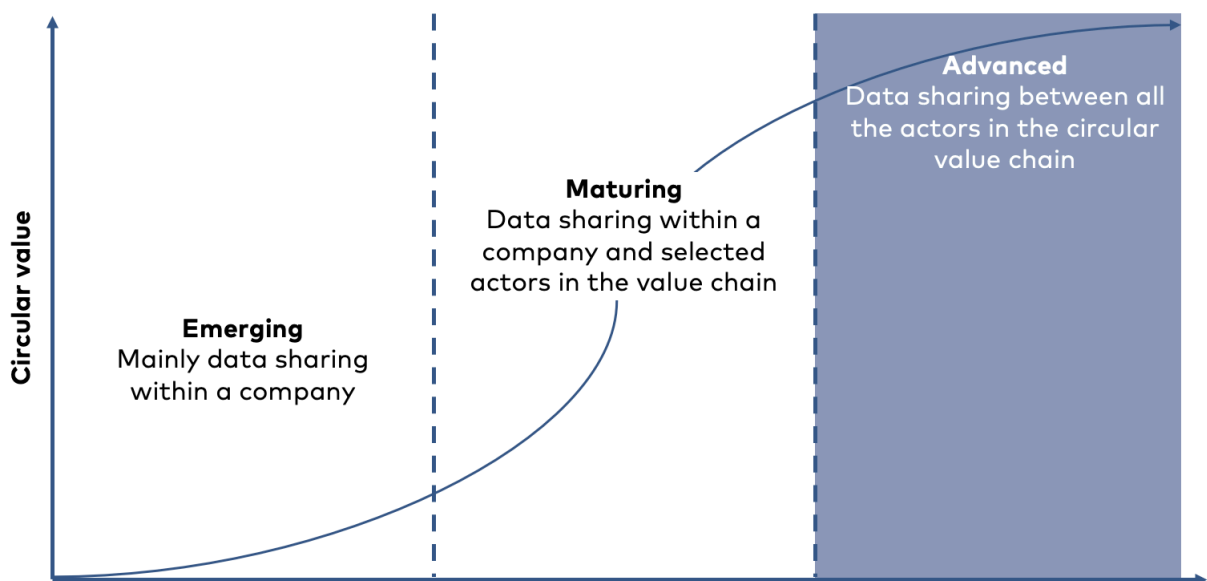


Figure 6: Future potential maturity level

Further detailing of the advanced maturity level follows below in table 3. The table outlines the criteria for the maturity levels in more detail, and is based on Accenture's experience working with Nordic companies on development of their digital capabilities. The case studies included in this chapter are progressing towards meeting the criteria for the advanced level.

Future circular data flows

The future potential for data sharing represents a more free flow of data, both in terms of amounts, quality, and openness, as well as how many actors the data it is shared with. The flows enter all steps of the value chain, ensuring complete transparency. Figure 7 on the next page illustrates a non-exhaustive overview of the future flows of data that has the highest potential. The figure covers the full value chain of circularity, and highlights the circular business models that have the

potential of leveraging data to drive value.

The first focus area is how data can follow a specific product through its end-to-end life cycle. One opportunity within this area is data driven circular product design. Data about the dismantling and recycling process, as well as by-products and waste generation from manufacturing, is fed into the product design phase to improve the product to be more easily recyclable and repairable. Data on user behaviour and product performance is collected and reported back to the manufacturer to optimize design, features and durability.

End-to-end material and energy traceability to support reuse and recycling is a second opportunity, as described in the blockchain example with Hydro on page 26.



Figure 8: Percentage of companies that see the highest potential for data sharing within end-to-end material tracking and product design from the survey

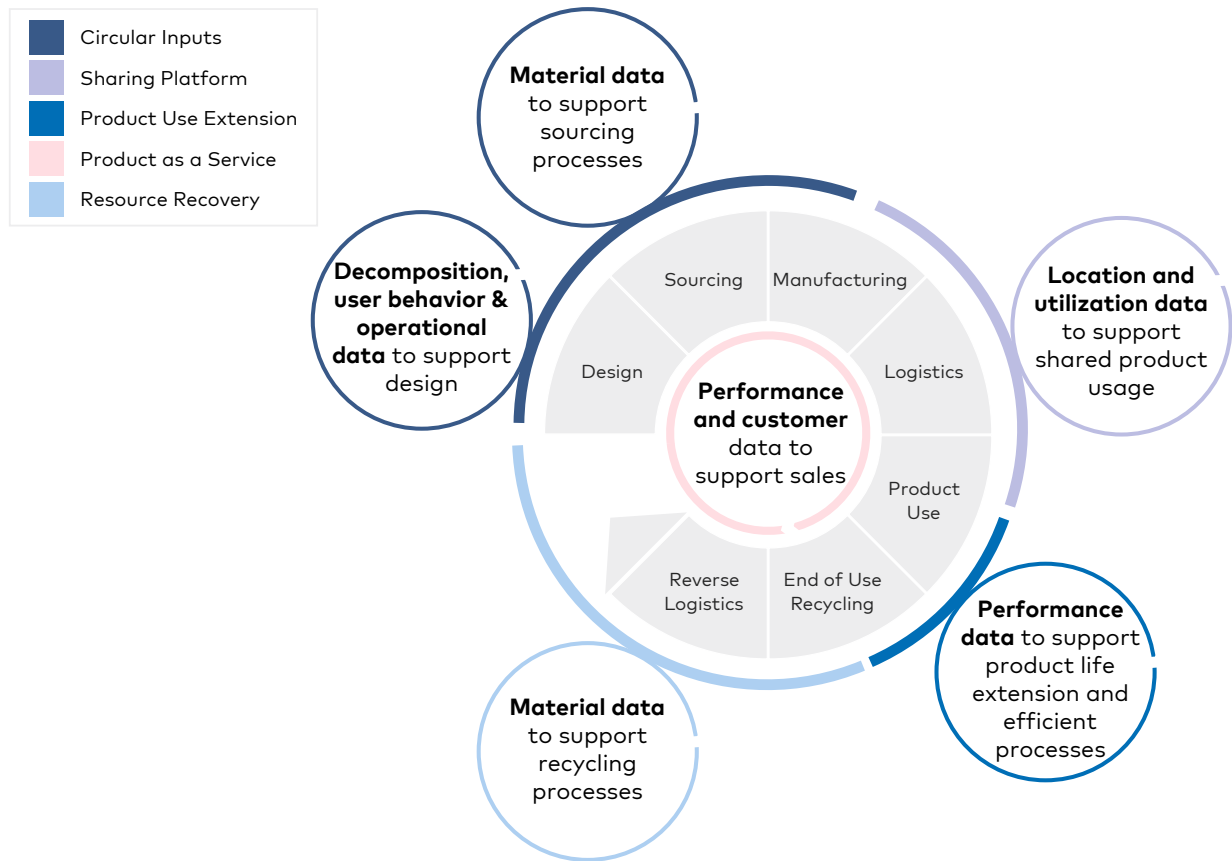


Figure 7: Future circular data flows

The second focus area is how companies will use data to transition to new innovative business models, where businesses focus on transforming their existing operations and how they deliver their products and services to the customers.

An example of this is the Product as a Service business model, where companies retain ownership of a product and offer the product to their customers through a lease or pay-for-use agreement. This immediately incentivises the manufacturers to focus on selling the performance of the product, instead of volumes.

This creates a circular value as the manufacturers will focus on extending the lifetime of the machine, thereby reducing the resources required to make new products. Another example is Sharing Platforms, where utilization of products are optimized through shared ownership or access.

Both of these business models rely on the flow of data, including operational, customer location and performance data.

Traceability using blockchain

Demands for end-to-end traceability in the supply chains are increasing, surpassing the practice of traceability between selected actors in the value chain. As a solution to this challenge, Hydro, the Norwegian aluminium and energy company, has teamed up with DNV, an assurance and risk management company. Through a blockchain technology service provided by DNV, Hydro can assign a unique digital ID to the aluminium used in the end product, providing the user information on selected sustainability properties of the material, including CO₂ emissions. End-to-end traceability ensures that the material can be correctly recycled at the end of life, reducing the production and consumption of virgin material. The project is currently in the pilot phase, with testing through selected product lines with the furniture producer Vestre. With the help of a QR-code visible on the finalized furniture, information about the material used in the product can be accessed. The first furniture tracked on the blockchain was registered in June 2021. The goal is to review the pilot result and use it as a basis for a standardized model used for all customers to Hydro.⁸



Mobility as a service

The Nordic Open Mobility and Digitalization (NOMAD) project aims to enable seamless mobility using several modes of transportation across the Nordics. The project will introduce a market enabler framework of technology and business practices for Mobility as a Service (MaaS) and other smart mobility services. The goal is to make it possible to use your favourite mobility app in other cities, regions and countries, combining public transport, rental cars, car pooling, city bikes and more. Building upon the European data regulation as well as other projects working with mobility, the project aims to secure high quality, reliable, real-time data from all kinds of transport modes, freely available for new mobility solutions. A seamless mobility experience can contribute to increased utilization rate of shared transportation modes, and reducing the reliance on low-utilization transport modes such as private cars. The project is currently at an early stage of development and testing, however, the ambition level illustrates the greater potential of sharing data on broad scale across the Nordic countries.⁹

8. Hydro, (2021) [The certificates of Hydro's greener brands feed into digital product passports](#)

9. Nomad, (nd) [Nordic Open Mobility and Digitalization](#)

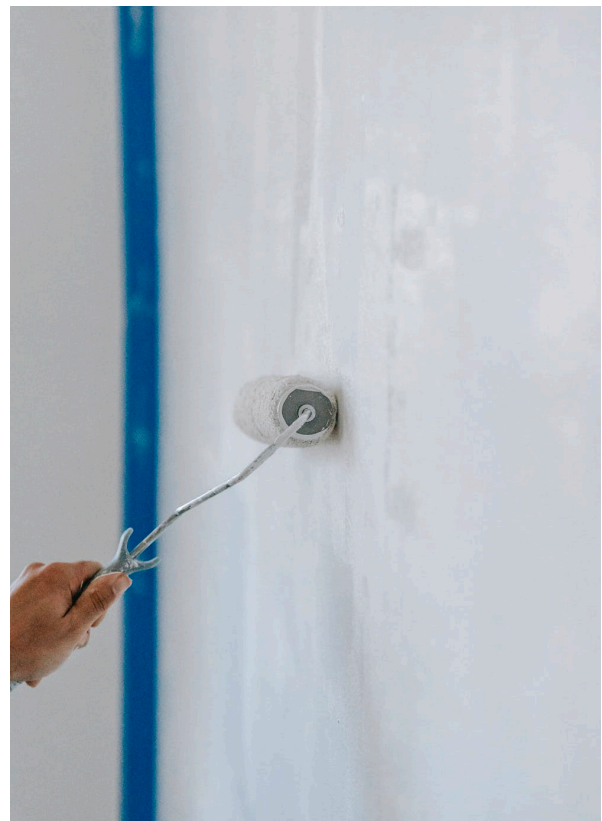


Monitoring in construction

Moisture in timber structures utilized in buildings are challenging to detect, and results in damaged timber and expensive repairs. Currently, moisture checks are typically conducted manually and sporadically. The Danish company Woodsense offers IoT solutions that monitor timber components in buildings and notifies the building owner if there are any risks of moisture damaging the timber. The solution connects three actors in the ecosystem – the timber producer, the building developer and the building owner. By sharing moisture data, the lifetime of the timber is extended, waste is minimized and material costs are reduced.¹⁰

From customer feedback to product design

The Finnish paint and coating company Teknos collects data from customers on the use and performance of their products, and shares this with the product development team to improve their product properties such as drying time and paint coverage. Teknos improves their product, resulting in greater customer satisfaction and potentially greater revenue streams. They are also creating a more efficient product that requires less resources for the same coverage, and that has a greater product life span. Overall, the solution contributes to reduced consumption of virgin resources.



10. Woodsense, (nd) [Monitor moisture in timber structures automatically](#)

Value creation

Value drivers identified in the future potential for data sharing for circularity distinguishes itself from the value generated from the current use in two dimensions.

Firstly, future applications also contributes to increased revenue. The new revenue streams are generated from innovative business models such as Product as a Service and Sharing Platforms. The amount of data captured offers opportunities for monetizing the data, offering a new type of services to the customers to improve efficiency of their operations. Operational data can for example be analyzed by the manufacturer to suggest measures for reducing energy costs of a machine or reducing idle time.

Value perception shifts from individual value to shared value

Secondly, the future potential presents a shift in the perception of value, moving from individual value capturing system to value capturing divided between the different actors contributing to the value generation. Value from integrating data sharing ecosystem across the value chain outperform the scepticism towards sharing sensitive company information, and is achieved when all actors involved commonly see a value of sharing. This is illustrated in the example of AquaCloud on page 29.

The e-commerce company Rent the Runway, offering designer dress and accessory rentals to their customers, has grown their yearly revenues to \$100 millions since it was founded in 2009¹¹

11. Sam Hollis, (2021) [How Rent The Runway built an \\$800 million business in a mom-and-pop industry](#)

Data platform and industry standards

AquaCloud was established in 2017 to address the issue of sea lice in the aquaculture industry. This was done through the collaboration between several industry actors as a part of NCE Seafood Innovation. AquaCloud is a platform that collects operating data from collaborating fish farms along the Norwegian coast, and shares the data with stakeholders to facilitate innovation and solutions to the aquaculture industry challenges. Once the project was launched it became evident that the quality of data was not strong enough to maximize the potential use. The initiative has therefore additionally started working towards the creation of standards for sensor data, fish health and environmental data for the sector, addressing the issue of data quality, consistency and comparability. This is an example of how the industries are also working towards creating common standards, where policy makers have an important role in aligning and ensuring standardization. One of the outcomes of such a collaboration could be reduced fish mortality, increased lifetime and improved health of the fish, all contributing to increasing the utilization of the fish.¹²



12. AquaCloud, (nd) [Data Sharing and Digital Standards for the Aquaculture Industry](#)

Barriers to data sharing for a circular economy

Barriers to data sharing for a circular economy

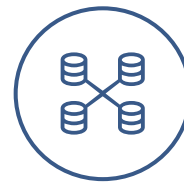
There are several barriers to data sharing for the circular economy. These are important to highlight and understand to map out further recommendations on how to accelerate the transition in the

Nordics. The barriers can be split into four main categories: Value case, legislative, technical and knowledge/culture based barriers.



Value case

- Lack understanding of holistic value
- Lack willingness to invest based on current incentives



Technical

- Siloed data bases
- Lack data interoperability
- Poor data quality
- Data security and privacy challenges



Legislative

- Lack clear legislation
- Lack incentivizing legislation
- Presence of inhibiting legislation



Knowledge & Culture

- Lack knowledge of circular economy and data sharing
- Skepticism towards data sharing and lack of trust

Table 3: Overview of four main barrier categories

Different challenges needs to be addressed to accelerate the transition towards more data sharing for circularity. The four most common barriers identified by companies are

national/international regulations, data security, risk of manipulation or misrepresentation of data and vulnerability towards competitors.



Figure 9: Most common barriers according to survey responses¹³

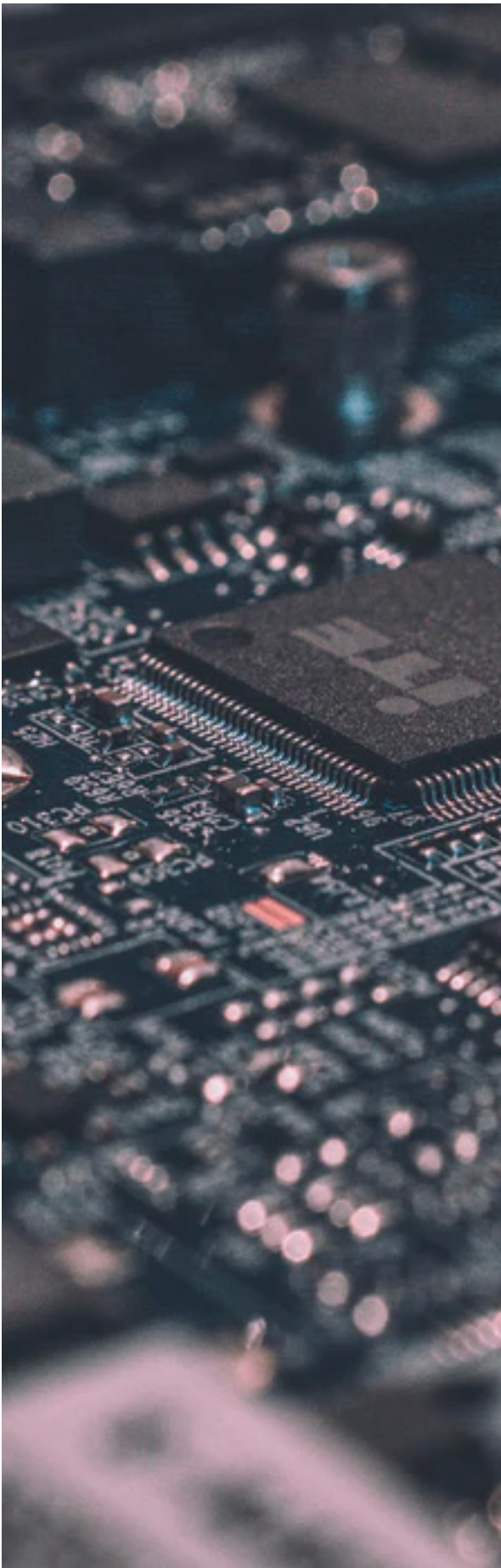
13. Survey respondents were given the option to cross off multiple barriers. Total percentage will therefore exceed 100

Value case barriers

Value case barriers are defined by a lack of understanding of holistic value from data sharing across the supply chain. For the majority of actors, the focus lies currently on immediate individual value. This leads to a narrow view of the possibilities for data sharing for circularity, both in terms of limiting the environmental footprint and in terms of generating financial gains. Due to the novelty of the concepts and lack of well-known examples of data sharing for circularity on a broad scale, there is currently a challenge for companies to understand and identify the full benefits and potential for broad data sharing, let alone what their role could be in this and how they could leverage it. This results in a lack of willingness to prioritise the investment of time and finances in new data collection methods and sharing platforms, infrastructure and circular operations based on current incentives.

The more mature data sharing examples are typically driven by the recognition of common value potential in the industry from sharing data. This category of barriers to data sharing for circularity emphasizes the importance of developing and showcasing successful pilot projects, and inform about the possibilities and shared value for all parties involved in increasing the flow of data across value chains.





Technical barriers

Technical barriers include challenges connected to the lack of data interoperability, siloed data bases, low data quality and the lack of technical know-how. Data security is a frequent issue, and companies are hesitant of sharing sensitive data as they risk losing control of the data. Data sharing agreements are required to be developed on a case-by-case basis, which is resource consuming.

These barriers are often of less importance to larger companies that have the technical capabilities and resources in place. However, for smaller businesses, the technical barrier poses a large threat to the implementation of a data sharing strategy. This in turn inhibits the more tech-savvy companies from fulfilling the data sharing potential because they need aggregated data from the entire supply chain. With each company that does not have the means or knowledge to collect or share relevant data, the potential for maximising value from circular processes decreases for all parties involved. Partnerships are therefore crucial, and there is a need for a common platform or interoperable platforms to avoid that data is locked in silos.

Legislative barriers

Legislative barriers can inhibit data sharing in two manners. The first is a lack of clear legislative demands and guidelines that create external pressure for, and facilitates, collecting and sharing of data. An example of this is that there is not yet any data standards developed on an EU level (i.e. guidelines on how data should be described and recorded). The second is that the presence of certain regulations can complicate the adoption of data sharing for circularity (see example of GDPR below). Therefore, both the implementation of certain regulation and the absence of certain regulation can act as a legislative barrier.

An example of a regulation that can be a barrier to data sharing is GDPR. There is still uncertainty among companies on when GDPR should be applied and the scope of the regulations. One example mentioned by survey participants were the GDPR regulations that needed to be taken into considerations when assessing at which granular level IoT data from machines could be captured (i.e. geographic granularity). The question of data ownership and how to navigate data privacy regulation makes many organisations reserved to fully embrace the concept of sharing data openly. As companies are wary of overstepping the boundaries, they will rather apply GDPR more restrictively than necessary. Businesses need to strike a complicated balance when sharing data, while also respecting GDPR and other data privacy regulations.





Knowledge/culture barriers

The final category of barriers is categorised by a lack of knowledge or company cultures that limits the acceptance and embrace of data sharing. As mentioned in the first chapter, the concepts of the circular economy and sharing of data across

the value chain and sectors are relatively new and foreign to many. This is connected to the value based barriers where a lack of information and understanding of the concepts creates a scepticism and lack of trust connected to how the data will be managed. This also results in a lack of understanding the link and connection between data sharing and the circular economy.

There is also a protective approach to data and a scepticism towards sharing what is perceived as sensitive company information. Vulnerability towards competitors and risk of manipulation or misrepresentation of data demonstrate the mistrust and the protectionism. In the survey conducted with Nordic organisations, a significantly larger portion of companies that identified 'vulnerability towards competitors' as a barrier were established more than 10 years ago. A little more than 10% of companies younger than 10 years said that vulnerability was a barrier, while closer to 50% of the older companies said the same. This might point towards a traditional perception of data sharing, and a potential shift as new, innovative companies enters.

This scepticism can be compared to the push-back that cloud technology received when the concept was introduced. Companies were concerned about data safety when storing valuable information digitally in the cloud and reluctant to embrace the new technology. However, as time progressed, it has slowly become the norm and is a technology where companies are understanding the value.

Policy as an enabler to data sharing for a circular economy

Policy as an enabler to data sharing for a circular economy

Legislation, and in many cases the lack of the right legislation, acts as a major barrier to data sharing for circularity. The introduction of the right policies on national and international level can be a powerful enabler to the extended collection, sharing and use of data for circular economy practices.

Current policy landscape

The EU is currently in the process of implementing strategies and regulations connected to the circular economy and data. These include, but are not limited to, the EU Green Deal, the Circular Economy Action Plan, EU Taxonomy for Sustainable Activities, Regulation on Data Governance, Regulation on the Free Flow of Non-personal Data, and the Open Data Directive.

The EU aims at transitioning from a linear to a circular economy (through the Circular Economy Action Plan) and at creating one single market for data to move freely (through the European Data Strategy). As a part of the Sustainable Product Initiative, the European Commission has also suggested to introduce a digital product passport. This would encourage traceability and make product data available to both consumers and businesses.

All Nordic countries, apart from Iceland, have released their own strategies for a circular economy, focusing on the importance of the circular economy and how to transition. Data is usually mentioned as a driver for the circular economy, however it does not dominate the circular strategy discussion.



"Data sharing is a must for circular economy, but should be given the right fundamentals and regulations along with the data security and operability" ¹⁴

Implications of policies

The policy landscape presents an unexploited potential as an enabler. It provides a clear incentive for companies to increase their digital capabilities to be able to benefit from the regulative developments. However, legislation connected to data sharing is perceived as complicated, broad and somewhat unclear for businesses.

As the majority of value chains and data flows are cross borders, several policies should be set at a EU level. The EU should target the challenges that require a uniform approach across borders. These are challenges related to data interoperability, data quality and data security. Clear data standards and requirements need to be set for the above challenges, to ensure comparable data. Only when the data is comparable can the full value potential of common or interoperable platforms be leveraged.

Data privacy is also an important area where uniform guidelines can support. There need to be clear rules that address how data can be shared and that regulates how intellectual property is shared and protected.



14. Quote from survey respondent

The introduction of separate Nordic policies can also complement and enhance EU regulation, without conflicting with EU policies and guidelines.

Firstly, Nordic countries can introduce policies or incentives that mitigate the typical value case barriers. As mentioned earlier, companies are often hesitant to pursue circular pilots due to business cases with intangible benefits or with longer payback time. Policy makers can promote funding to circular pilot projects within data sharing to showcase the value. They can also provide subsidies and fiscal benefits to reward practices that are beneficial, e.g. to companies that are investing in data sharing to promote circular outcomes. This will also

address the knowledge gap. As more companies are incentivized to invest in circular data driven solutions, more information on the circular economy and data sharing is spread, increasing overall awareness.

Secondly, national digital infrastructure is also needed to meet the technical requirements of EU policies. Policymakers can invest in R&D to accelerate the development of digital infrastructure. As an example, the Environmental Protection Agency in the United States has set up a national system to track hazardous waste shipments, creating an "e-manifest" for all companies generating hazardous waste.¹⁵



Image by Magnus Fröderberg/norden.org¹⁶

15. P. Lacy et al., (2020) The Circular Economy Handbook, page 316

16. Image by Magnus Fröderberg/norden.org, can be found [here](#)

Governments can also introduce requirements of digital data collection and reporting in their processes, including funding and public procurement processes, pushing businesses to invest as well to meet the requirements. The Nordic countries are already progressing fast on the digital maturity scale, where individual national and Nordic plans are driving the progress.

By securing funding, awareness building and further investments in digital infrastructure, the Nordic countries are able to move simultaneously with the policies introduced by the EU and contribute to capturing the value that is lost in linear economies.

What is the role of companies?

The shaping of a supportive policy landscape has been identified as strongly beneficial for businesses to overcome the current barriers that they are facing. However, the introduction of guidelines, directives and regulations is not sufficient. Collaboration between policy makers and businesses is necessary to facilitate sharing on a larger multinational scale. One shared approach across countries and value chains is preferred in favour of siloed individual approaches.

The EU's ambition to create a circular and data driven economy provides a good foundation for companies to identify challenges to this transition and communicate this to policy makers.

Pilot projects can act as a demonstration of potential value creation, as well as identification of shortcomings in current regulations. It is therefore important to point out that businesses and sectors as a whole can be leading at embracing circular economy and data sharing, and communicate to regulatory institutions what is required to achieve success. Through this approach, companies can position themselves instead of waiting for the decisions to be made on a EU level.

Accelerating the data driven circular transition through pilots

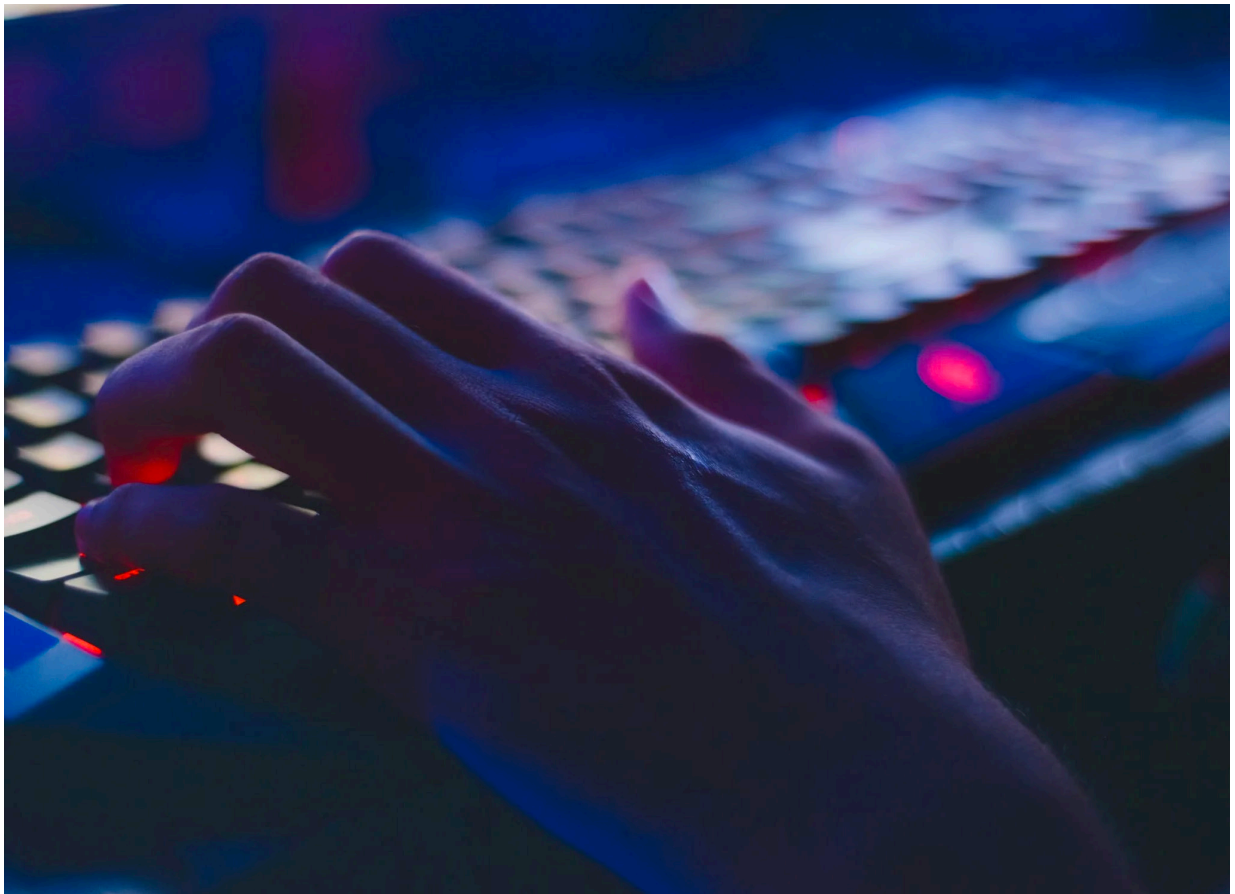
Accelerating the data driven circular transition through pilots

The findings of this report underlines the need to be able to point to real examples of data sharing for circularity in the Nordics. By showcasing how data sharing can increase circularity and create financial value, more businesses will be motivated to follow. In addition, pilot projects can help identify and communicate needs in the market and regulatory landscape that can facilitate even greater sharing and circular applications.

Two ambition levels

There are two approaches to pilot projects that target different

ambition levels: Low hanging fruits and advanced business innovation. Low hanging fruits pilots focus on data sharing between actors that have not shared data before, and on improving already existing business models with the help of data sharing. One example is securing traceability data between a supplier, a manufacturer and customers. As the information travels with the product, the actors are able to make informed decisions on how to extend the lifetime of the product or how to ensure accurate recycling. The pilot run by Hydro, described on page 26, is an example of this.



Advanced business innovation involves more transformative business innovation, bringing together companies that would not necessarily interact with each other or developing new methods of selling products and services to customers. The pilot run by AquaCloud, described on page 29 is an example of this.

Which ambition level to target depends on the maturity level of the sector and organisation. The Nordics have overall the advantage of being highly digitized, compared to the majority of the European countries. Both Finland, Sweden and Denmark scored the highest ratings in the Digital Economy and Society Index 2020 by the European Commission.¹⁷ This provides the opportunity for the Nordics to aim for a higher ambition level than some of their European neighbours.

Step by step approach

The topics of sustainability, data and the circular economy are complex and can for many businesses seem overwhelming. It is therefore necessary to underline the positive effect of starting small and building upon the experience as you go. For example, businesses and organisations that wish to improve their practices do not need to address the whole supply chain or all their products at once. Starting off by looking at one small aspect of their business, whether it be one product, one process or maybe even just one material type, can help gain experience and build momentum for scaling the solutions. The examples of AquaCloud and Hydro demonstrate this. More information on how to

develop an idea for a pilot and how to run and scale a pilot can be found in the Nordic Circular Economy Playbook, published by Nordic Innovation.

Incentivised sectors

It can be argued that there should be a focus on sectors that already understand the sense of urgency and potential value dimensions of data sharing and the circular economy. This includes sectors such as industrial manufacturing and construction, which already have examples of data sharing that are driven by efficiency gains. Despite being the industry represented by the most companies in the survey, only one manufacturing company mentioned a lack of incentives as a barrier to data sharing for circularity. The retail sector does also already hold a sense of urgency and potential, where consumer expectations and brand image drive data sharing and development of circular business models. In these sectors there is already a certain understanding of value creation from data sharing and circularity, providing clear incentives. This makes these sectors better suited for initial pilot projects as you can more easily communicate the value generated.

The pilots should target to involve actors from several Nordic countries. As previously mentioned, value chains of companies are typically cross borders. Therefore, orchestrating pilots across borders would be the most efficient in identifying type of policy measures that are required to advance the Nordics as a whole.

17. European Commission, (2021) [Digital Economy and Society Index 2020 - Key Findings](#)

There is a need for Nordic organisations to support pilot projects through knowledge and funding to accelerate the data driven circular transition

Pilot facilitation

To facilitate the creation of pilots, competence building and funding is required. To overcome the barriers to data sharing, knowledge of the circular economy and data sharing, practical use cases and value creation is needed. Funding is also necessary as value creation from data sharing is not always evident and might only realize value in the long run. Therefore, there is a risk that investments with a more clear business case is prioritized rather than investing in data sharing for circularity.

As successful pilot projects demonstrate the value of data sharing, the necessity for funding will decrease. There is a need for Nordic organisations to support pilot projects within these two aspects to accelerate the data driven circular transition.

Conclusions

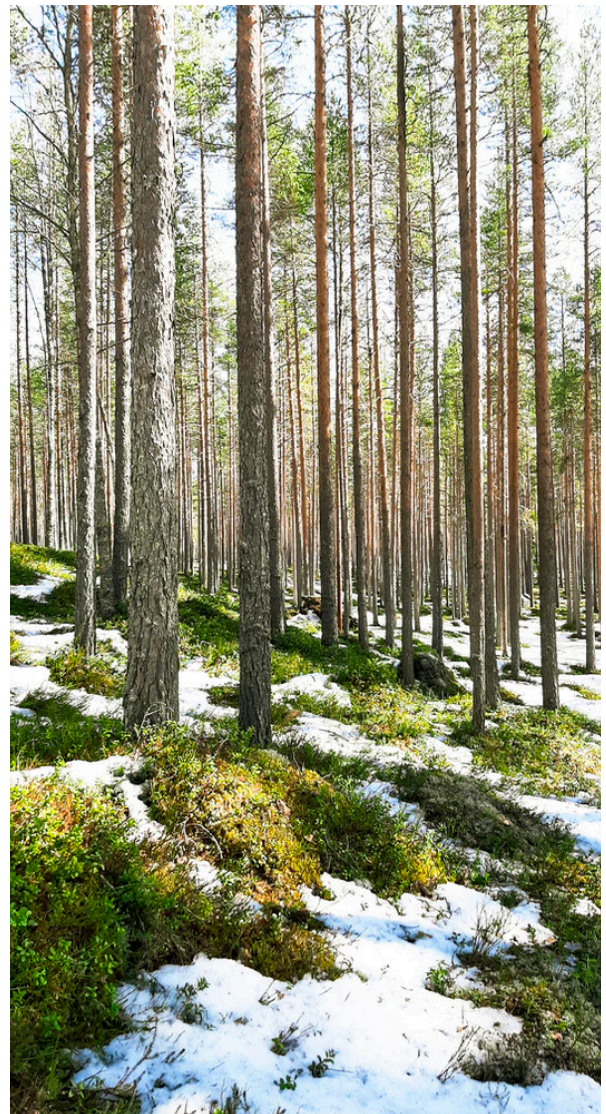
Conclusions

The practice of collecting, interpreting and sharing data across companies and sectors holds great potential for reducing waste and resource use, ensuring longer product use and higher capacity use, as well as generating financial value for the businesses involved. The maturity level of data sharing for circularity in the Nordics is currently low, but there is a high future potential to move from mainly data flows for material traceability between a selected few actors to open ecosystems where data flows freely. Most strategies and regulation connected to the circular economy and data sharing have been introduced in the last few years, indicating that the market is at the very beginning of the transition. However, there is a need to overcome the legislative, value, technical and knowledge barriers that are currently present.

Companies might have the technical capabilities and competence in place, but the main issue often revolves around understanding the value potential and overcoming the scepticism of sharing data. Therefore, education on circular economy, data sharing and value creation for businesses is needed. The introduction of the right policies can also enable and set a direction for new innovation in this field, creating incentives for data sharing and circularity. EU level policies on data and the circular economy indicates direction and sets out the framework for data driven circularity, but first movers and pilots

are needed to showcase applications and value creation.

The Nordics is already at the forefront in terms of developing digital capabilities, providing a great starting ground for also advancing their capabilities within data sharing for circular outcomes. Provided with the right incentives, Nordic companies can accelerate the global shift to a circular economy, underpinned by data.



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Data collection

The research collected data through both primary and secondary research.

The primary research focused on interviews and surveys. 24 companies were interviewed from the five Nordic countries. They represented different steps of the value chain and different industries (including, but not limited to, the automotive, energy, manufacturing and transport industries). The data collected from the interviews was supplemented by 101 responses to a survey completed by Nordic actors.

The secondary research was conducted through desktop research of publicly available information and Accenture documents and data.

Appendix 3:

Technical glossary

Data comparability: Ability to compare different data sets and aggregate the data into common data sets/pools.

Data standards: Documented agreements on representation, format, definition, tagging and structuring.

Data exchange: Methods of how data is exchanged between different parties, either manually or automatically.

Data governance: Processes, roles, policies and metrics that ensure efficient use of information. Defines who can take actions on the data and in which situations.

Interoperability: Ability of computers to connect and exchange information with each other.

Data security: Protecting data from unauthorized access and corruption.

Data privacy: Proper handling of sensitive data, including personal data and other confidential data.