



Digitalised Business Models

for Circular Material Flows

Teknikföretagen

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Teknikföretagen (the Association of Swedish Engineering Industries) is the primary representative for Swedish industry. In total, our 4,200 member companies constitute one third of Sweden's exports. Our mission is to strengthen the competitiveness of member companies.

In collaboration with our member companies, the Association builds upon Sweden's historical roots as a powerful innovative and engineering nation. We strengthen competitiveness for our member companies in two main ways:

Firstly, by customising collective agreements and providing consultation and training, primarily in labour legislation and business law. Secondly, by influencing policy issues, in both Sweden and the EU.

Our member companies comprise both major, renowned, global corporations such as Ericsson, Scania, AFRY, ABB and Volvo Cars, and a high number of other companies of all sizes down to the smallest companies.

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Circular economy: do we stop buying things now?

In the short term, the answer is no. However, over time, we will use our products for longer and this will drive new habits and behaviours.

Swedish technology companies are ready with long-lasting and high-quality products and are well prepared for a circular economy. Companies are already testing new ways to increase profitability as products are used for longer periods. The disposable society will be increasingly challenged.

Teknikföretagen's latest report on the circular economy, published during Sweden's Almedalen political week in 2018, stated that for industry a circular economy means achieving greater resource efficiency and extending the economic relationship with customers.

Technological development is a key driving force and enabler of this process. With this as a starting point, and together with a large number of member companies, we have developed and defined what it is that drives progress.

This report presents 15 policy proposals that support the unavoidable shift towards a more climate-neutral future and that seek to accelerate and enable this change. We provide examples of new business models that will result in behavioural change and business relationships in industry and for private individuals.

This report is intended to be a source of inspiration for policymakers in Sweden and the EU. Fortunately, companies and politicians agree on what needs to be achieved. We now need to agree on how to best move forward.

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Circular economy
Business with new values



INTRODUCTION

The engineering companies of the future are circular

We look forward to a future where society and material management are more resource efficient and circular. With new technologies and business models, the use of materials will become more efficient and thereby lead to reduced environmental impact. However, this will require a revolutionary adjustment to the linear economic system. For companies, this represents considerable challenges, but also great opportunities. Teknikföretagen member companies have and can develop solutions that are needed for Sweden to achieve this transition for Sweden to achieve this transition.

In this report, we highlight some of the solutions that Teknikföretagen's members are working on and provide suggestions on how society can participate in the transition through policy measures.

Teknikföretagen presents four thematic areas below that we consider are strategically important for the transition. For each thematic area, we identify opportunities with examples from companies along with concrete policy proposals.

“Circularity provides tools and methods for maintaining the value of materials and at the same time reducing environmental impact. Technological development is central to this, with digitalisation making it possible to create services around products.”

KLAS WÅHLBERG,
CEO, TEKNIKFÖRETAGEN



- **The radical transformation created by new technologies and new business models**

Circular economy is a way of creating value and offers opportunities to achieve greater resource efficiency and to extend the financial relationship with customers. The circular economy provides tools and methods for maintaining the value of materials while reducing environmental impact.

In a circular economy, companies' revenues are to a greater extent based on the provision of services and products that function over a longer period of time. The longer customers can use a product, the lower the initial environmental and economic cost of production in relation to a product's use phase. The cost per unit of time for a product thus decreases, which results in more value being created based on the initial investment cost.

- **Digitalisation enables circular material flows**

To achieve the transition to sustainable development, improved resource efficiency is required throughout a product's life cycle. Society needs to become more resource efficient and use materials more efficiently over a longer period of time. Through technological development, new smart ways to develop and modernise products during their use phase will emerge. Digitalisation is central to this because it makes it possible to create services based on a product's function. For example, it can increase the number of users and customers for one and the same product, which results in fewer products needing to be produced.

- **Co-operation results in increased recycling of complex products**

Association member companies manufacture and supply products that contain metals such as steel, copper, and aluminium and lightweight materials such as plastic. Recycled materials are used as much as possible, hazardous chemicals are avoided, and unnecessary packaging is removed. When products can no longer be used or repaired, they need to be scrapped responsibly. If scrapped, products' components and materials need to be disposed of carefully so that they can be used in new products. The goal is sustainable extraction and use of resources with minimal environmental impact. This needs to be done for more products, which in turn requires collaboration and investment in the form of digitalisation and technological development.

- **Research and innovation that supports the climate transition**

A key link between circularity and climate impact is that many engineering products consume energy in their use phase. Today, fossil fuels still account for about 80 per cent of global energy use.¹ Despite the goals of the Paris Agreement to limit global warming, global carbon dioxide emissions have continued to increase over the past decade.² Although Sweden's emissions are gratifyingly set to decrease in 2019³, we are far from reaching our national targets. Future competitiveness will depend on minimised environmental footprint from the production of goods and services. This requires behavioural changes in society as a whole.

¹ <https://www.energiforetagen.se/energifakta/elsystemet/elektrifiering/>

² <https://www.unenvironment.org/resources/emissions-gap-report-2019>

³ <https://www.naturvardsverket.se/Sa-mar-miljon/Klimat-och-luft/Klimat/Tre-satt-att-berakna-klimat-paverkande-utslapp/Kvartals-och-preliminara-arsvisa-vaxthusgasutslapp/>

Sweden in a circular world

For industry, circular economy involves achieving greater resource efficiency and extending the financial relationship with customers. Industry is vital to Swedish exports, which means that the circular economy needs to be seen in a global perspective. All Swedish investment in the circular economy should therefore be based on the thesis – Sweden in a circular world – with the goal of maximising value and profitability of products over time.

Trade in products and services is based on global value chains and is central to companies. This affects the possibilities of creating a circular economy. The opportunities to create circular material flows and services are thus based on international conditions.

Therefore, Teknikföretagen considers the circular economy as an international policy issue. As a starting point, we can state that it is extremely difficult to create circularity if different countries have different rules.

A common regulatory framework is needed, at least at EU level. The importance of the internal market and a harmonised regulatory framework cannot be underestimated.

Teknikföretagen represents 4,200 companies in different segments and technologies.

“Important driving forces for technology companies are business models, digitalisation, collaboration, and research and innovation,” says Klas Wåhlberg, Association CEO.

“To create good conditions for Swedish industry to be competitive at the right time, with the right technologies and business offerings in the future, policy needs to focus at the national level on these areas,” Wåhlberg adds.



“The EU is a hugely important market for Swedish companies and therefore a common regulatory framework is needed, at least at EU level. The importance of the internal market and a harmonised regulatory framework cannot be underestimated. Development of the international regulatory environment is difficult but important.”

PATRICIA KEMPPF, HEAD OF INDUSTRIAL POLICY, TEKNIKFÖRETAGEN

The European Commission has an ongoing political initiative to accelerate the move towards circular economy that includes several legislative measures. This report is the starting point in Teknikföretagen’s advocacy work regarding policy proposals in Sweden and the EU on circular economy.

Source: A new Circular Economy Action Plan for a Cleaner and More Competitive Europe, COM/2020/98 final.

In a linear economy, companies manufacture products which are then sold, used, worn out, and finally scrapped. New materials are continuously extracted from the Earth's crust to supply society with products, raw materials, and fuels, which in itself has an environmental impact. Extraction, use, and scrapping of products and later waste management causes environmental impact.

A circular economy is an alternative way of using materials to create value and offers opportunities to achieve greater resource efficiency and extend the economic relationship with the customer. The aim is that circular economy results in reduced environmental impact across the board. Circular economy provides tools and methods to retain the value of products and materials while at same time reducing environmental impact. Technological development is vital to increasing resource efficiency and new business models, with digitalisation for example makes it possible to create services around products. Companies can also offer products as services without ownership passing to the customer.

In a circular economy, companies' revenue are based to a greater extent on the provision of products and services that function over a longer period of time. The longer customers can use a product, the lower the initial environmental and economic cost of production in relation to the use phase. The cost per unit of time for the product thus decreases, which results in more value being created based on the initial investment cost. To achieve this, technological development is needed to develop and modernise products over their lifetime.

Source: The Impact of Circular Economy on Business, Final Report. D. Hogg, M. Braddock, M. Hilton
3 September 2018, Eunomia Research.

“Companies have the most significant opportunities to contribute through new business offerings. Although Swedish engineering companies are leading the way, many interesting concepts are still to be scaled up. It is only when these are scaled up – in Sweden and internationally – that legal obstacles emerge, and which policy can then address.”

ELINOR KRUSE, DIRECTOR ENVIRONMENTAL
POLICY, TEKNIKFÖRETAGEN



The radical transformation created by new technologies and new business models

For industry, circularity involves achieving greater resource efficiency and extending the financial relationship with customers. In many cases, the way there involves new business models that increase resource efficiency during the use phase of products. Rather than products, it is services and functions that are important. Society as a whole becomes part of this transition when services and functions are demanded by the private and public sectors and when policy instruments are used to make circular services more profitable.

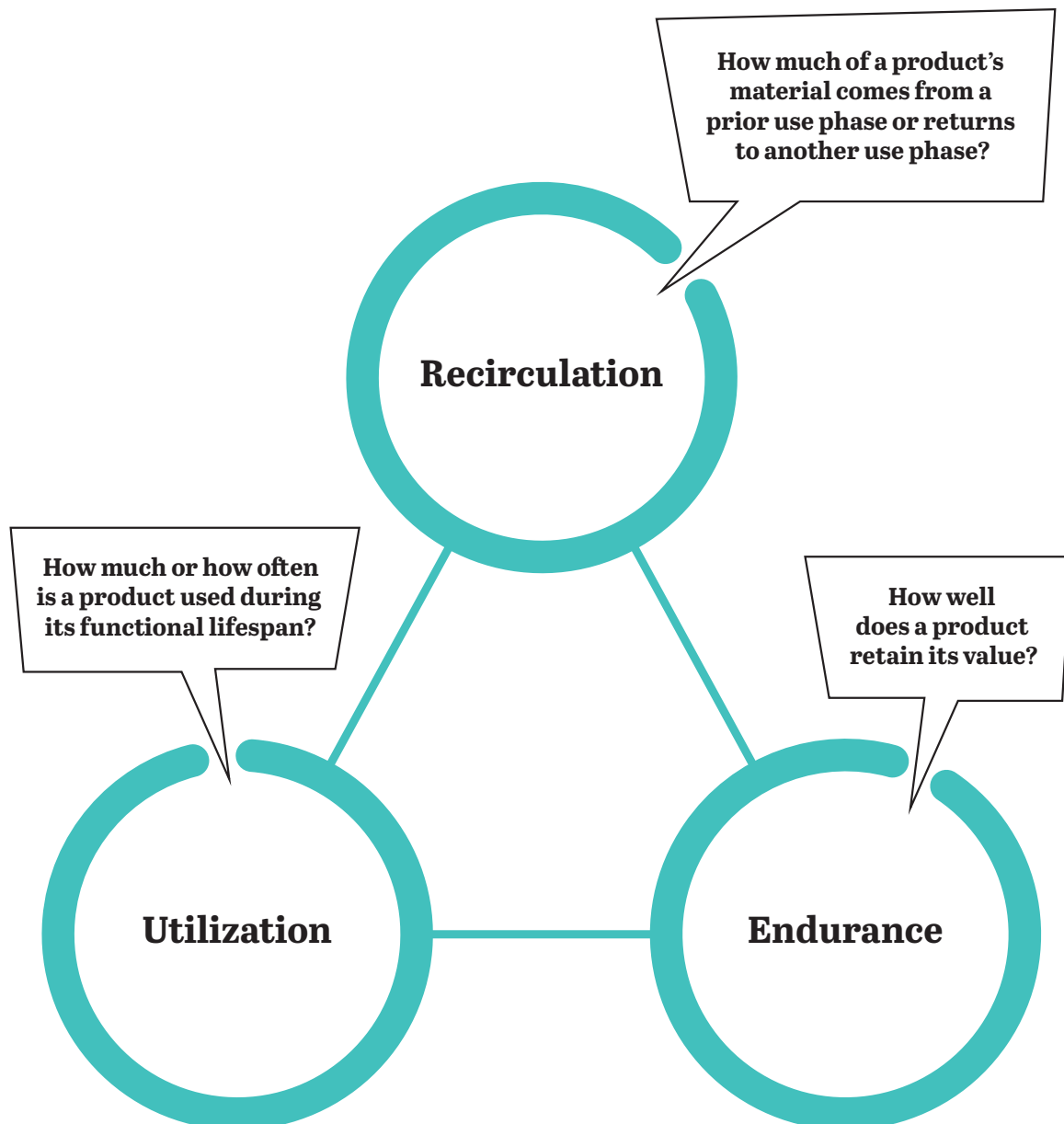
When consumption and the use of products are the dominant principles defining business models, this thinking governs how products and services are designed. As sustainability requirements in society grow, the need for new business models that offer attractive services and products with reduced environmental impact also grows.

The challenge is to create these business offerings, which over time require resources and pioneering spirit. It can be done, however, by for example planning maintenance and expanding scope for the repair and recycling of products at the design stage.

A better understanding of the life cycle costs of products encourages focus on reducing costs in the most important phases of the product – for suppliers and customers. Instead of focusing on the fact that initial production costs are low, focus shifts to creating profitability related to the use phase so that this period is extended and that the potential for reuse increases.

A product's environmental impact derives from the extraction and processing of materials, as well as from energy consumption during its production. Therefore, it is important that the materials – primary resources – that products largely consist of, are used effectively for a long time. This reduces a product's environmental impact to a relatively greater extent than if it is only used for a shorter period of time. By using recycled materials in products, the use of materials can become even more efficient.

Member companies of Teknikföretagen already have several solutions in place for efficient material use and a high degree of resource efficiency. Member companies maintain high product quality standards that are on the market and in most cases, products have long service lives – the majority have service lives of more than 15 years. This can be further extended through maintenance, upgrading, and remanufacturing. New business models may emerge from these phenomena further improving resource efficiency and thereby further reducing environmental impact.



To achieve the desired effect on resource use, (reduced resource extraction from the Earth's crust), in a circular economy, the circularity of products can be thought of in three ways:

- 1) Recycling:** products must consist of materials that have previously been in use, (e.g. recycled materials, or remanufactured or reused components), rather than from primary resources
- 2) Utilization:** products should be used often and a lot, rather than remaining unused (e.g. in stock or on the shelf)
- 3) Endurance:** products should retain their value over time, rather than being physically worn and/or technically, aesthetically, or socially dated.

Optimising the combination of these three dimensions should be included in the design of products and business models.

Source: Boyer, R. et al. (2020). Three-Dimensional Product Circularity:
A working paper from RISE Sustainable Business. DOI: 10.13140/RG.2.2.22460.80004.

GENERAL INSTRUMENTS AFFECTING CIRCULAR BUSINESS MODELS

TEKNIKFÖRETAGEN CALLS FOR:

- **The public sector to be better at procuring resource-efficient products and services.**
This involves putting requirements in place at the design stage in terms of service life, recycling, maintenance, material selection etc.

To enable the public sector to take on its key role more effectively in the transition, a well-functioning and attractive public sector market place is needed. Public sector transactions should actively contribute to companies' innovative drive being in demand, stimulated, and used. The potential of innovation procurement needs to be better used. Teknikföretagen suggests that the state develops a model for continuous financing of innovation procurement in which resources can be identified from public bodies such as municipalities and local authorities. Financing would cover additional costs for working on innovation procurement and would constitute a risk premium for new circular and resource-efficient investments, including products and services.

Komet's proposal* that the Swedish government should develop a strategy and related action plan that support different types of pilot activities throughout the country. Innovation procurement, as well as test demonstration facilities can be included in such an action plan.
- **Continued promotion of sustainable transport, a prerequisite for a circular economy.**
Distribution is a key issue with one challenge being the transport costs and logistical challenges related to returning products from customers in different countries. These logistical challenges prevent functioning business models on a pilot scale from being developed into large-scale profitable business models. Environmental benefits also risk being undermined due to emissions in the transport sector. Collaboration between different actors to increase the transport intensity of goods is necessary to increase resource efficiency.
- **The scrapping of environmental taxes that hinder a circular economy, such as Sweden's chemicals tax.** Sweden's chemical tax contributes to shortening the lifespan of electronic products entirely unnecessarily and is therefore not a policy instrument that helps society to become more environmentally friendly. Even if a product contains no hazardous flame retardants, the chemical tax is levied on the product. The fact that the chemical tax can be levied several times during the life cycle of a product drives up the price of heavy industrial products. On used monitors, prices are almost twice as high when the chemical tax is also levied on the used product. This effectively makes used monitors unsaleable and thus more likely to be scrapped. This tax is sending us in the wrong direction.

* Source: Committee for Technological Innovation and Ethics, the Komet report describes 2020:23 Försök!

BUSINESS MODELS AFFECTED BY REGULATORY REQUIREMENTS ON PRODUCTS

TEKNIKFÖRETAGEN CALLS FOR:

- **Harmonised rules in the internal market to improve competitiveness in industry.** A well-functioning internal market is the basis for circular business models to function internationally. The EU's new approach to product legislation should be applied to environmental requirements for products and the rules must be harmonised within the EU to make the best use of them. A harmonised regulatory framework within the EU makes it easier for companies to sell products, products as a service, and to better reuse and renovate recycled material.

Partnerships and collaborations between different actors also benefit from common regulatory frameworks in the internal market. Specific national requirements within the EU lead to increased bureaucracy and unnecessary costs for businesses and consumers. This damages the market and hinders the growth of the circular economy. Sweden's chemical tax is one such example.

- **Product requirements to be drawn up as technology-neutral, measurable, and unambiguous.** Overlapping product regulations should be avoided. It is important that product requirements are measurable. This is partly so that companies can be certain that requirements are met, and partly so that authorities can control this. Authorities' market control instruments and voluntary standardisation are key tools in relation to legislation and the application of regulatory requirements aimed at products.
- **Legislation has a role by creating consensus around definitions that promote the development of business models. Responsibility for product safety throughout their lifespan needs to be clarified when the use of second-hand products increases. Terms such as "remanufacturing" and "renovation" need to be defined.**

For example, a recycled battery needs to be seen as a new product with requirements for liability and safety guarantees when it is reintroduced to the market. The term "repair as produced" should be the rule and mean that you can obtain a newly manufactured spare part for a long-lasting older product. If the term is not used in legislation, there is a risk that manufacturing new spare parts for older products will not be permitted – legislation should not end up preventing the wider availability of repairs.

“To establish circular value chains, you have to establish circular business models”

For many companies, the transition to a circular economy is about changing their business model, from selling products to offering services. This affects companies' balance sheets and creates a need for new accounting principles to avoid liquidity crunches in companies.

Sandvik Coromant is a classical Swedish industrial company.

“We’re increasingly moving towards selling services rather than products. And this is being reinforced by the fact that this is being integrated into our normal processes,” says Marcus Karlsson, responsible for sustainable business at Sandvik Coromant.”



Johan Lannering
SKF

For many customers, it is better if manufacturers take overall responsibility for customers' machinery, i.e. that they have operational responsibility, Johan Lannering at SKF believes. This creates entirely different incentives.

“In a conventional product store, we sell stock, where better and often more expensive stock lasts longer. But if we get paid to ensure a function, we have the option of using sensors to maintain stock levels ahead of time so that the customer does not encounter unplanned downtime. As we get paid based on “uptime”, our incentives are completely aligned with the customer’s, says Lannering.

By repairing and remanufacturing stock, it does not need to be replaced by new stock, which contributes to a circular economy.

“In addition, customer processes usually becomes more efficient, which reduces, for example, the amount of oil, water, lubricant, and energy used. This in itself leads to reduced environmental impact, which is also a key component of the circular economy,” says Lannering.

In the circular economy, improvements in the design of a product can take place on an ongoing basis. “Because products are connected, you can regularly analyse product performance, which is important for products to be maintained and used for longer periods,” explains Anna Stenströmer, sustainability manager at Siemens.



Anna Stenströmer
Siemens

“By monitoring and analysing a product’s performance, we obtain a continuous flow of data. This means that product design and production planning are based on analysis that is conducted in real time where resource consumption and thus environmental impact is minimised in terms of product life cycle,” says Stenströmer.

“At Scania, our goal is to lead the shift towards a sustainable transport system. Circularity and digitalisation are two important tools for achieving this. Circular Business – our name for what circular economy means for Scania – is therefore an integral part of our work on sustainability. Circularity is built into our corporate culture as we prioritise high quality, constantly challenge existing norms, strive to optimise systems, and eliminate waste in various ways,” says Paulina Edblad Granholm, Senior Business Development Manager at Scania.

A concrete example of this are Scania’s sales of used trucks via through their dealerships. It is now possible to buy a fully certified used Scania truck that meets the EU’s latest emissions requirements, Euro VI. Scania also offers a wide range of refurbished spare parts that meet the same quality requirements as new components, which thus have the same guarantees as new components.

“We also offer various rental and leasing solutions for our customers and have conducted a pilot study into selling vehicles as a service. New business models require us to adopt new approaches in a number of areas, not least in terms of financing. It’s an incredibly exciting change journey for society as a whole – one that has fantastic potential,” says Edblad Granholm.



“At Scania, our goal is to lead the shift towards a sustainable transport system. Circularity and digitalisation are two important tools for achieving this.”

PAULINA EDBLAD GRANHOLM, SCANIA



Erik Svedlund
Epiroc

Mining technology company Epiroc has made considerable progress in the transition from being a linear to a circular business at the same time as phasing out diesel-powered mining equipment in favour of electrified equipment. The climate transition may be driven by the circular business model.

“The entire system for selling products is not a circular value chain. When you buy something, manufacture it, and sell it, it’s no longer the manufacturer’s problem. This is a flawed business model. As we introduce battery-powered machinery, we’re also introducing a new business model, which takes this holistic approach seriously: we don’t sell batteries. We sell the battery as a service.

Epiroc now offers its customers an energy storage service, in the form of a subscription. The company owns the battery and ensures the availability of the energy storage the customer subscribes to.

“When a battery is no longer suitable for its first life/application, we move it to a new one. When we continue to own a battery, even in the final stages of its life cycle when it needs to be recycled, we can ensure that it is recycled correctly and does not end up in a ditch in Africa,” says Erik Svedlund, marketing manager of Epiroc Electrification.

To create circular value chains, you also need to create circular business models. This is an example of that, where we try to rethink and make a difference and create added value,” Svedlund continues.

For engineering companies, circular value chains are global with the EU being the internal market. It is therefore vital that regulations are adapted to how globalised the economy is today. Companies worldwide need to co-operate and trade in relation to, among other things, material flows. Therefore, laws and regulations are required that not only are based on the linear economy of the previous century, but also promote circularity and sustainability.



Marcus Karlsson
Sandvik Coromant

“We want to see uniform application and interpretation of EU law, especially in waste and shipping,” says Karlsson.

A view backed by Lannering at SKF. A first step is fully harmonised rules within the EU for products and materials. Rules that create administrative burdens and different rules in different countries only create obstacles and thus costs for global companies.

Scania’s business model that offers vehicles as a service is a key component of the company’s circularity strategy. It is a way of giving the issue more weight – and one that creates greater opportunities for financial profitability the more circular the company’s operations become.



**Paulina Edblad
Granholm**
Scania

“The linear system has been perfected for more than 100 years. Getting a circular system to be beneficial requires that you look at the entire system – and that you prioritise circularity before it is perfected. It’s an incredibly exciting change journey for society as a whole – one that has fantastic potential,” says Edblad Granholm.

But moving from selling products to offering services also entails completely new financial challenges. Instead of getting paid when selling a product, customers and manufacturers must find new models for how to share risk and responsibility involved with the manufacturer owning a product.

The financing issue exists for low and high value products, depending on how banks and credit institutions view collateral.

“If you’re going to make a shift like this for an entire vehicle fleet, a large part of the challenge is about being able to enter the value of all vehicles on your balance sheet. We need to find ways to share risk between partners and the banks,” says Edblad Granholm.

Anna Stenströmer at Siemens also believes that financing is crucial to a circular economy.

“The financial sector has a central role in the transition. The sector needs to understand the value of companies investing in new technologies, new services, and business models,” says Stenströmer.

Several Association member companies highlight the fact that the conditions for business models based on not all money being made at a sales opportunity, rather income is spread over a longer period of time are difficult to scale up from pilot initiatives to genuine business opportunities.

“Our research has shown that access to working capital financing is critical to launch and scale up offers based on function sales and retained ownership of products. The financial sector has an important role to play here and a lot to learn, when risk assessments must be based more on business and less on capital in physical assets,” says Ann-Charlotte Mellquist, senior researcher at Research Institutes of Sweden (RISE).

Digitalisation enables circular material flows

The IT sector currently accounts for about 1.4 per cent of global greenhouse gas emissions⁴. At the same time, there are studies that show that the sector can contribute to reducing emissions from other sectors by between 15 and 20 per cent⁵. Digitalisation is therefore crucial for us to be able to fulfil the Paris Agreement, among other things by increasing resource efficiency, but also for contributing to the UN's 17 sustainable development goals (SDGs).

With the help of digitalisation, we can reduce society's dependence on fossil fuels and convert to a more circular and sustainable economy. Digital solutions can create a more efficient society, where the benefits include reduced demand for natural resources due to extended product life cycles and the ability to track materials and components in complex products.

Technologies such as data collection using sensors, big data analysis, machine learning and artificial intelligence will, together with expanded high-speed internet and rapid expansion of 5G, be crucial to the creation of a sustainable and resource-efficient society.

For example, data collection and simulation using so-called digital twins or virtual copies can make development and manufacturing processes more efficient and shed light on where the greatest environmental savings can be made in terms of design and operation. Through a variety of digital services, we can also replace a large number of physical products that are already in use and thereby avoid more manufacturing and in turn reduce the use of resources. Increased use of digital platforms can substantially reduce the need for physical products and sharing economies

reduce the need for individuals to own physical products.

Digital solutions of the future will be highly dependent on the digital infrastructure being reliable and secure and having a high capacity for fast data transfer, for example with the help of 5G. This type of solution will be necessary for the emergence of, among other things, self-driving vehicles, healthcare settings such as remote surgery, smart and distributed electricity networks, digitalised agriculture, and environmental monitoring solutions.

By introducing open standards in digital environments of the future, large numbers of actors – companies and stakeholders – will be able to develop innovations and new solutions that enable new resource-efficient business models. New technologies such as 5G, which are developed to an open standard, will lead to new players innovating and developing digital services that will replace physical products or streamline existing solutions. This can accelerate the transition to a sustainable society with low carbon dependency.

Sweden's new vision for the circular economy is an important driving force, but the crucial tool for it to become practically possible is digitalisation.

⁴ <https://www.mdpi.com/2071-1050/10/9/3027/pdf>

⁵ <https://www.ericsson.com/en/reports-and-papers/research-papers/estimating-the-enabling-potential-of-ict--a-challenging-research-task>

DIGITALISATION ENABLES CIRCULAR MATERIAL FLOWS

TEKNIKFÖRETAGEN CALLS FOR:

1. **Work with information security to be prioritised and strengthened.** Circularity leads to greater need for increased data sharing and the establishment of databases. Content in public databases must be protected against abuse. Therefore, the work with information security needs to be prioritised and strengthened.
2. **The strengthening of cybersecurity legislation so that collaboration between companies can take place without the risk of trade secrets being spread outside the collaboration environment.** Connected products, new business models, and increased information exchange between economic actors are services that are often cloud-based. Therefore, a high level of cybersecurity is important in a circular economy.
3. **Sweden to prioritise digital technology test and demonstration environments.** One reason for this are the opportunities to use digitalisation to reduce society's impact on the environment. A rapid expansion of 5G would enable increased digital innovation, which in many cases leads to increased resource efficiency and reduced material use. Large-scale testing with circular business models, such as trials with connected products, can be conducted more effectively when 5G is in place.



“Digitalisation is necessary to achieve circularity”

In a relatively short period of time, digitalisation has revolutionised large parts of our consumption patterns. For many technology companies, work with new business models and increased resource efficiency, digitalisation means the way forward. But the change places great demands on companies to dare to take the lead in development.



Peter Isberg
ABB

“In the 1950s and 1960s, ‘Swedish Quality’ was a concept recognised all over the world. Let’s coin the expression ‘Swedish Sustainability’ as the concept that Sweden as a country and industrial power stands for. Sweden is a small country, but can serve as a role model for how to change society and industry to achieve both carbon neutrality and sustainable industry,” says Peter Isberg, Digital Lead and Business Development at ABB.



Jonas Willaredt
Husqvarna

The fact that Sweden is at the forefront of digitalisation opens up fantastic opportunities for Swedish companies to identify the direction of travel early on. It also provides an opportunity to take a leading position in terms of developing products, services, and offerings. This provides excellent business opportunities globally.

“Digitalisation is a prerequisite for circular economy because it makes it possible to transform products into services. Circular and service-based concepts also give us an opportunity to increase our customer base, even if we produce fewer machines,” says Jonas Willaredt, Sustainability Director at Husqvarna.





**Emanuel Badehi
Kullander**
Omocom

Swedish insurance company Omocom offers digital insurance. Among other things, Omocom's insurance is included when private individuals rent a tent or cultivator via the Hygglo service instead of buying such items. Omocom also provides insurance linked to the bicycle repair service Mioo. Mioo users pay a monthly fee which includes puncture repairs, irrespective of where it happens. All you have to do is lock your bike and Mioo dispatches someone to repair the bike. With regular servicing, the utilization rate and service life of the bicycle increases. Furthermore, Omocom's service provides customers with extra protection against theft.

"The whole idea of the company is to promote a circular economy and to keep products in use," says Emanuel Badehi Kullander, who co-founded Omocom 2017.

Omocom's business concept pre-supposes far-reaching digitalisation, but for a shift from a linear to a circular economy to take place, more is needed.

"Customer service and convenience are key. Circular must always be more convenient than linear. Then you may need to weave in services that make the offer more attractive, which creates conditions for a completely new type of business and consumption that are more sustainable. For example, that you just lock the bike where you are, receive an insurance notification, and then a message when the repair is complete – it couldn't be easier," says Badehi Kullander.

Husqvarna conducts intensive innovation activities primarily focused on identifying new business models through digitalisation. For several years, Husqvarna has been running the Tools For You sharing project, which allows customers to rent garden machinery instead of buying their own. The company's innovation work is also about finding new ways to streamline the use of the company's products and reduce their environmental footprint. For example, the Husqvarna Fleet Services cloud platform includes a carbon dioxide calculator that helps companies and municipalities in park and green space management to calculate how much carbon dioxide their machinery emits.

"This gives users a sound basis for making better decisions," says Jonas Willaredt at Husqvarna.

"Scania currently has about half a million connected vehicles around the world. An advantage of all this connectivity is that we have access to data that potentially allows us to respond to specific vehicle maintenance needs. In this way, we can offer our customers the highest possible productivity and maintain the value of their vehicles for as long as possible. It also provides feedback on how customers can reduce their fuel consumption. This increases customers' profitability and creates a more efficient and climate-smart transport system," says Paulina Edblad Granholm.

Since the spring of 2020, Scania has adopted scientifically based climate goals that address how we can reduce emissions from our production facilities and when our products are used by customers. The fact that we also include in our goals what our customers will achieve in emission reductions in collaboration with us is new to our sector and a step forward on the journey to where we want to do everything we can to achieve a sustainable transport system, concludes Edblad Granholm.

Similar progress is described by ABB, where sensors on engines and drive systems make it possible to monitor the status of companies' equipment, nascent faults, and energy consumption. This makes it possible to reduce risk for customers. By replacing older, less energy-efficient products at appropriate times, environmental impact is also reduced, and old products are removed from the market and sent for material recycling.

"It is almost impossible for the user today to know how our electric motors are used, what energy consumption it has and when it is time to replace it to reduce the environmental impact."

Digitalisation solves this. Monitoring through connected sensors means that we can avoid unplanned downtime, says Peter Isberg at ABB. When you avoid downtime, fewer site visits are required to supply spare parts or new engines, which saves both time and resources.

Ericsson delivers digitalisation infrastructure and works to create the foundations needed to develop solutions necessary for the sustainable society of tomorrow. The company believes that 5G and increased digitalisation are crucial in the transformation to climate neutrality to be able to develop the new solutions and business models required for increased resource efficiency.



Daniel Paska
Ericsson

"Our entire product portfolio has been created to enable circular solutions, where products are connected, have an extended service life, are digitally upgradable, and can be reused on a number of different markets. We only need to develop the business models and to some extent how the products are designed and manufactured for the model to be effective," says Daniel Paska, who is Technology for Good Program Director at Ericsson.

"We need to find solutions and models for how we – who are legally responsible for putting products on the market – do not lose control of products' life cycles. The big gain, however, is how we as an infrastructure provider can help other industries to become more efficient and sustainable through telecom in general and 5G in particular," says Paska.

FACT BOX: DIGITALISATION

Digitalisation is the ongoing, system-wide transition from analogue to digital information flows and the pervasive consequences of changed working methods, organisational processes, and societal structures that this leads to.

The technical side of the digitalisation can be described as falling into four components. Combinations of these provide conditions for such things as big data, the Internet of Things, smart networks, and visualisations.

- 1. Measure.** Measurement and data collection via sensors are key aspects of the connection between the digital and the physical worlds. In many applications, it is important to be able to determine location. For this, GPS sensors are used, for example.
- 2. Connect.** Simply to transfer data between different devices, our possessions need to be connected via a common digital infrastructure. A high degree of connection supports digitalisation.
- 3. Store.** Data storage capacity has drastically improved in recent years and is increasingly taking place in what is known as the "cloud", which usually refers to data centres with extensive storage capacity.
- 4. Process.** Data itself is not particularly useful. It needs to be processed and interpreted to make sense of it. A processor processes and computes digital data to a vastly greater extent than a human can.

Source: Digitaliseringsguiden by Mattias Höjer and Tina Ringenson, CESC, KTH licenced CC BY 4.0: creativecommons.org/licenses/by/4.0/deed.sv



“Digitalisation and circular economy are important tools for climate neutrality, so a combination of the two has considerable potential. Digitalisation is a condition for circular economy because it makes it possible to transform products into services.”

JENNY SANDAHL, DIRECTOR SUSTAINABILITY POLICY, TEKNIKFÖRETAGEN



“High-speed internet and the rapid rollout of 5G will be critical to our efforts to create a sustainable and resource-efficient society.”

PATRIK SANDGREN, DIGITALISATION EXPERT, TEKNIKFÖRETAGEN

Co-operation results in increased recycling of complex products

To achieve a circular economy, it is necessary to establish functioning flows of recycled material. Through innovation and technological development, scrapped products must once again be able to be used for new products. Through collaboration and new technologies, companies can increase the degree of recycling and reduce the need for primary resources.

To create functional circular material flows, companies must design their future products from the outset so that they are easier to recycle. Large innovative technological steps are also required to enable increased circularity in the technology sector's material flows.

The use of digitalisation and automation to create unified waste flows is hampered by a lack of information about input materials and insufficient measurement methods. Knowledge of digitalisation is available in the engineering sector and among manufacturers. This may, for example, include automated identification of material fractions through pioneering techniques such as artificial intelligence and pattern recognition, so-called deep learning. These techniques will mean that even complex products in the future will be recycled efficiently and thus contribute to several separated and clean material flows.

When recycling processes are digitalised, recycling rates increase, while transparency and the exchange of information in the value chain also improves. Product manufacturers then benefit directly from sharing information with recyclers about how products can best be recycled. Only then can the recycling sector use this information to create cleaner flows of recycled materials.

Today, it is often cheaper to buy new raw materials than recycled raw materials. Developing products with materials that can be easily and cost-effectively circulated requires substantial investment. For companies, collaboration and new alliances are vital to success. For circular systems to be economically sustainable, incentives are also required that make recycled materials cheaper and easier to use than virgin materials – and support for products that can be circulated.



“It is vital that projects are created in which participants from several actors are involved and collaborate to increase opportunities to recycle complex products. To a large extent this includes technological development and co-operation based on learning. When this results in new business that in and of itself drives improved reuse and recycling, that’s a great outcome.”

ELINOR KRUSE, DIRECTOR ENVIRONMENTAL POLICY, TEKNIKFÖRETAGEN

BETTER RECYCLING IS A RESPONSIBILITY FOR MANY

TEKNIKFÖRETAGEN CALLS FOR:

1. Efforts to achieve the same quality of recycled materials as in primary resources.

Waste often contains large amounts of chemicals because mixed waste has often built up over a longer period. Increased use of recycled materials must not create a diffuse spread of unwanted chemicals. Incentives are needed so that the demand for larger volumes of recycled material increases, but recycled material needs to maintain the right quality and be in the volumes required. When undesirable substances in secondary raw materials are a problem, they should be addressed early on through innovation, collaborations, and new technologies. Goal conflicts between circular flows and sustainable or secure resource flows need to be addressed politically through pragmatic solutions and clear rules. In terms of product design, risk assessment of materials, e.g. recovery of recycled materials, is a key important measure.

2. The harmonisation of information system instruments such as product passports for the internal market.

Rules regarding what information should be shared in these systems need to be demand-driven so that relevant information is shared. When necessary, technical systems for digital information sharing between those who put products on the market and those who recycle these can be developed and tested over time. It is important that these requirements and systems do not push up costs in the recycling phase, which counteracts the competitiveness of circular business concepts based on recycled materials.

3. The harmonisation of waste legislation within the EU and promote efforts to ensure that materials maintain a higher value over time.

When waste becomes a resource, legislation that regulates different types of waste needs to be reviewed. One example is that responsibilities within the EU's different producer responsibility rules are not always clear, which can make it more difficult to give end-of-life products new life, such as electric car batteries. Producer responsibility needs to be with first producers, but with legal opportunities to transfer that right to subsequent professional customers under agreement. For example, it should be possible to reuse batteries in new applications without compromising safety.

“Circularity must be managed jointly”

Closing the product cycle requires entirely new collaborations: with suppliers, customers, and sometimes even competitors. To make the transition possible, better flows and higher quality of recycled materials are also required. Support to enable these adjustments to a circular economy may also be necessary, as these changes are set to involve major investments that only pay in the longer term.



James Lundström
Volvo Cars

“An engineering company that does not conduct long-term sustainability work is not considered credible, either by customers or investors. To contribute to the transformation of society, we need to change our company. Because this challenges the entire basis of our sector’s business thinking, a company cannot do everything itself – customers and suppliers also have a role to play. So, change must be made through collaboration,” says James Lundström, responsible for circularity at Volvo Cars.

An issue that several Association member companies highlight is the need for better flows of recycled materials. To use these materials also requires quality standards and better information about recycled materials. Currently, it is difficult to source recycled materials in sufficiently large volumes of sufficiently good quality and at the same time provide cost-efficient solutions. It is still the case that recycled materials tend to be more expensive than newly manufactured ones.



Karl Edsjö
Electrolux

“Recycled plastic materials available on the market are only suitable for a small number of applications, and typically for materials that do not have to maintain the same quality of, for example, colour. The development work needed to produce functional material qualities for products is usually extensive and involves many different stages in the supply chain from discarded products to new materials,” says Karl Edsjö, responsible for recycling issues and resource policy at Electrolux.

A key driver of new recycling collaborations is to share the costs of developing new technologies and new systems. Collaborations based on improved recycling can also be a way of identifying new circular business models.

“Today’s business models and product development are optimised for linear flows. Change incurs initial costs that result in profits later. Collaboration will be necessary to identify new business models and create interest in bridging the costs of the transition phase,” says Lundström.

A key issue, therefore, is to obtain financing that enables companies to participate in collaborative projects. This then makes it possible to adopt new technologies in practice. To facilitate this, Edsjö is calling for some form of incentive.

“Switching from fossil-primary resources to secondary raw materials typically requires substantial investment, not least in knowledge and experience building. It that would be interesting to look at whether some form of financial incentive to increase the use of secondary raw materials compared to primary resources would work; a tax on primary resources, for example, or tax relief for conversion, or some kind of bonus malus system,” says Edsjö.

Despite there being a widespread climate and environmental commitment among many Association members, a prerequisite for increased circularity is that it is profitable. This often goes hand in hand, but there are challenges. A view backed by Henrik Nilsson, chairman of Inrego, whose business concept is to reuse computers and other IT equipment.



Henrik Nilsson
Inrego

“The problem is that society is structured and has been made more efficient as a linear economy. Today, it takes four minutes to make a new computer and an hour to recycle an old one. Circularity is labour-intensive in its initial stages, and as long as tax on labour is high and low on primary resources, the circular economy will struggle to compete,” says Nilsson.





Magnus Björk
Combitech

“To create demand, recycled materials must have a market advantage over virgin materials. One enabler is that circular, material-separating processes are rewarded,” says Magnus Björk, digitalisation consultant at Combitech.

Combitech is part of an alliance with Stena Recycling and ABB to increase the proportion of recycled materials through automation, artificial intelligence, and machine learning. The alliance is currently conducting qualified feasibility studies that will lead to the development of completely new recycling systems that incorporate the development of advanced sensors and AI in combination with the very latest robotics technologies to scan and sort incoming materials to improve the quality of recycled materials.

“I’m convinced that other industries will be able to use these system solutions that will encourage competitiveness and enable a faster transition to circular flows,” says Björk.

We see the really major benefit for the environment when the whole chain – from manufacturing to collection and recycling – is connected. Major development efforts are needed to achieve efficient information and data sharing, as industry players in the future will need to share data in more standardised and secure ways.

“Collaboration and experience exchange are key to success. The more companies participate and contribute with their knowledge, the better the results. This requires long-term work and commitment,” says Björk.

For example, starting to remanufacture components requires investment that mean that it takes time to recoup returns and in addition, customer willingness to pay may fade.

“We need collaborations that extend across national borders because our products are manufactured from components from different countries. We have and need more projects in Sweden and elsewhere,” says Lundström.

For collaborations to work, a common shared goal is needed as well as consensus on what is required for society to become more circular and resource efficient. Openness and willingness to share information and expertise are also necessary.

“As manufacturers, we need to change criteria for how we design our products. But we can’t do this without knowing what our suppliers can offer now and in the future. The work of transitioning to a circular business model must be pushed forward through collaboration and through changing customer behaviour; in future, profitability will drive competitiveness and separate companies from each other,” says Lundström.



Research and innovation that supports the climate transition

Research and innovation play a key role in the transition to a circular economy, not only in a practical sense, but also in terms of developing new business models and involving customers and suppliers. Therefore, governments should increase investment that focuses on sustainability in education and research systems. Such investment is especially important for education in trade and finance – it is business that will lead change with the support of technology.

Circularity research has grown and shifted from focusing on what should or could be done to becoming increasingly proactive by instead focusing on what works in practice and what constitutes obstacles. Technological development is the enabler but not the driving force.

Above all, it is crucial that companies and those who formulate regulations understand the nature of the opportunities that exist in designing circular business models. It is crucial that companies have long-term strategies for how to involve customers and suppliers in the transition to a more sustainable and resource-efficient economy. Strategic investment creates and tests knowledge in trials and demonstration facilities. Similarly, regulations should create conditions for investment by being clear, long-term, and supportive of innovation.

Conclusions from current research into circularity clearly show that to facilitate transition, research based on practical modelling must be strengthened further. This can take the form of trials with existing paying customers and with products that are currently available to identify models that can be scaled.

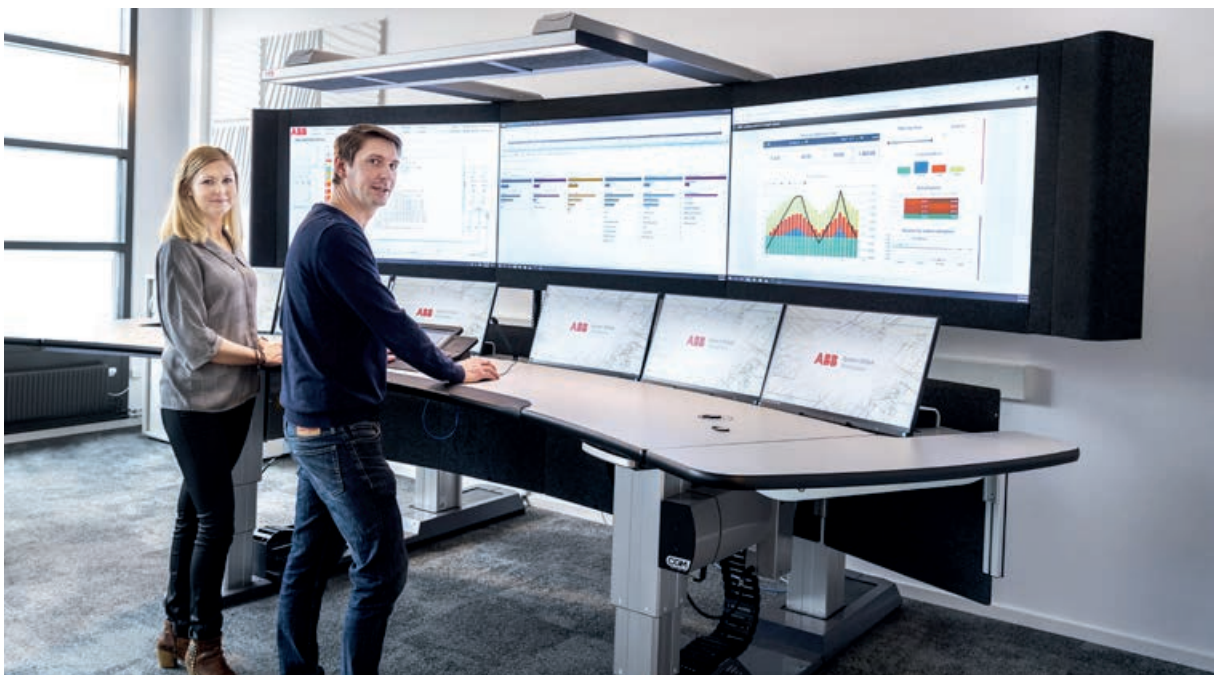
To ensure circular business models become better established substantial numbers of strategic collaborations need to be developed – between different types of actors, alliances between different industries and within supply chains, between engineering companies and recycling companies, universities, and colleges. Unexpected collaborations can often hold the key to new innovations.

From a purely technical point of view, research and innovation are needed in the areas of materials technology, artificial intelligence, machine learning and visualisation, with digitalisation as the common denominator. These technologies can drive business development and the recycling of complex products. A key ingredient is collaboration involving test and demonstration sites with the participation of genuine customers and suppliers.

RESEARCH AND INNOVATION DRIVES TRANSFORMATION

TEKNIKFÖRETAGEN CALLS FOR:

- 1. Circular business models should be prioritised in the allocation of financial support, from the EU and nationally, for example research and development grants, support for innovation etc.** One area of research, for example, is how the financial sector can better support circular business models. Choosing to continue to own the products they manufacture and distribute through leasing, sharing, and hiring represents a fundamental financial change for companies. These business models often present financial challenges in terms of scaling that need to be reviewed. An important part of this process are the behaviours of users.
- 2. Increase knowledge about where environmental impact arises in circular business offerings.** Logistics and transport are a crucial part of a circular economy. Supply chains are global and are of vital importance to a circular economy as a measurable component of the national economy. Reduced environmental impact when material flows become circular must be measured against the environmental effects of increased transport. Better knowledge is needed regarding the optimisation of environmental impacts.
- 3. Research and innovative collaborations for cleaner material flows that enable recycling of complex materials need to be stimulated.** Electrification and digitalisation result in large proportions of waste streams consisting of batteries and electronics, at the same time as the need for certain critical raw materials increases. Advanced technologies are needed to recycle different types of complex materials. Strategic innovation programmes and state-funded initiatives are needed. Partnerships between companies in different sectors should be a priority.



“People’s behaviours are key to circularity”

Creating successful circular solutions will require large amounts of new knowledge, including how to develop and recycle different types of materials. Equally important is research into business models and how individuals can change long-established behaviours. The more resources that are allocated to this type of research, the faster we can achieve circularity.



Mikael Dahlgren
ABB

“The climate crisis and the declining supply of natural resources are major concerns. We believe it is our responsibility to contribute to creating a better world. Therefore, we’re actively evaluating how we can move from a linear to a circular business model. We want to be able to contribute to a sustainable society,” says Mikael Dahlgren, Head of ABB Corporate Research Sweden.

Producing a product and selling it to a customer, who then owns it and is responsible for its continued life cycle, is relatively straightforward. But complexity increases significantly as we switch from a linear to a circular economy in terms of handling relationships and information. For manufacturers to know where raw materials come from, how they need to be processed so that they can be reused or recycled and what happens to products during their entire life cycles necessitates substantial flows of information from several different actors. Research plays a key role here.

“Designing a product to be circular approach requires a holistic approach throughout its life cycle. We need to optimise how we use different materials. We need to design products so they can be managed, repaired, remanufactured, and its various materials can be easily recycled. To achieve this, we need to conduct sustainable research over time. A key to success is to understand how products will be used,” says Dahlgren.

Husqvarna’s robotic lawnmowers are a good example of how long-term work on research and innovation yields results and drives profitability. Twenty-five years ago, the company launched an initiative to develop robotic lawnmowers, which are now one of Husqvarna’s top-selling products.

“It’s inspiring to think how long-term management’s approach was on this and now we can see that they were right,” says Jonas Willaredt, sustainability director at Husqvarna.

“We’ve set a goal to increase the number of circular innovations by 2025 and to date we’ve identified more than 100 innovation ideas. We want to turn good ideas into actual innovations that in the future can become part of our product portfolio. And through the Sustainovate Open initiative, we also want to involve external actors to co-operate with and help us,” says Willaredt.

The robotic lawnmower illustrates how difficult it is to know which products customers will want in the future. No one needed a smartphone before Apple and Steve Jobs launched the iPhone, for example.

“We’re now conducting a number of pilot projects, which is a good way to involve customers and to learn what we need to change so that products and services can be genuinely attractive to our customers,” says Willaredt.

What needs to happen in product development in a few years’ time needs to be decided now. Swedish company Epiroc is a case in point. Epiroc develops equipment for the mining and infrastructure sectors. As early as 2010, the company began to develop battery-powered machines for operations deep underground. Their vision was to enable mining that created zero CO₂ emissions.

“When you’re the first to do something, it can be difficult to decide to make this sort of an investment. You can’t look to others for reference, so you can’t show that it can be done. But we had great customers who were willing to help make a commitment. We could see that electrification was the future – the only question was when. I think it’s important to have strong leadership at a high level, with a management team that dares to choose a path and lead the company hands-on,” says Erik Svedlund, marketing manager at Epiroc Electrification.

It is also important to be bold and commit at the right moment to avoid being left behind.

“Just look at Nokia. In 2009, they were world leaders in mobile phones but in the space of a couple of years everything had changed. Things can go wrong so quickly if you fail to spot where the market is headed,” says Svedlund.

User behaviour is extremely hard to predict. This is why companies need to develop products in conjunction with users and customers, explains Willaredt.

“We test products and services before everything’s ready and before the market is fully mature to learn – and to prepare customers. It’s also about receptivity of users, which can relate to the shopping experience as much as pricing,” says Willaredt.

This is why behavioural research and research into the effects on societal systems is crucial, says Stefan Christiernin, Director External Research at Volvo Cars. Economic research on how to manage models with multiple actors and a large number of small transactions will also be needed.

“More investment is needed in cross-border and cross-disciplinary research to address domino effects, where behavioural research and research into societal systems are important pieces of the puzzle,” says Christiernin.

“At the same time, we need to develop methods for recycling different types of materials from products, and mixtures of materials,” says Mikael Dahlgren at ABB.



Stefan Christiernin
Volvo Cars

To obtain reliable statistics and a good basis for evaluation, large-scale testbeds are required, i.e. an environment where prototypes can be tested at scale. Today, many companies can run tests on 10 different test units. Testing needs to be scaled up to perhaps 10,000 units.

The need for large-scale testbeds is also identified by Christiernin at Volvo Cars.

“System complexity and customer behaviour cannot be evaluated without large testbeds,” he says.

“Testbeds make it possible to get involved and collaborate with all stakeholders, so that everyone can participate and evaluate advantages and potential disadvantages. This is why testbeds are so important for developing circular business models,” says Mikael Dahlgren.

A view shared by Jonas Willaredt at Husqvarna.

“It’s about taking strategic decisions today,” says Willaredt.

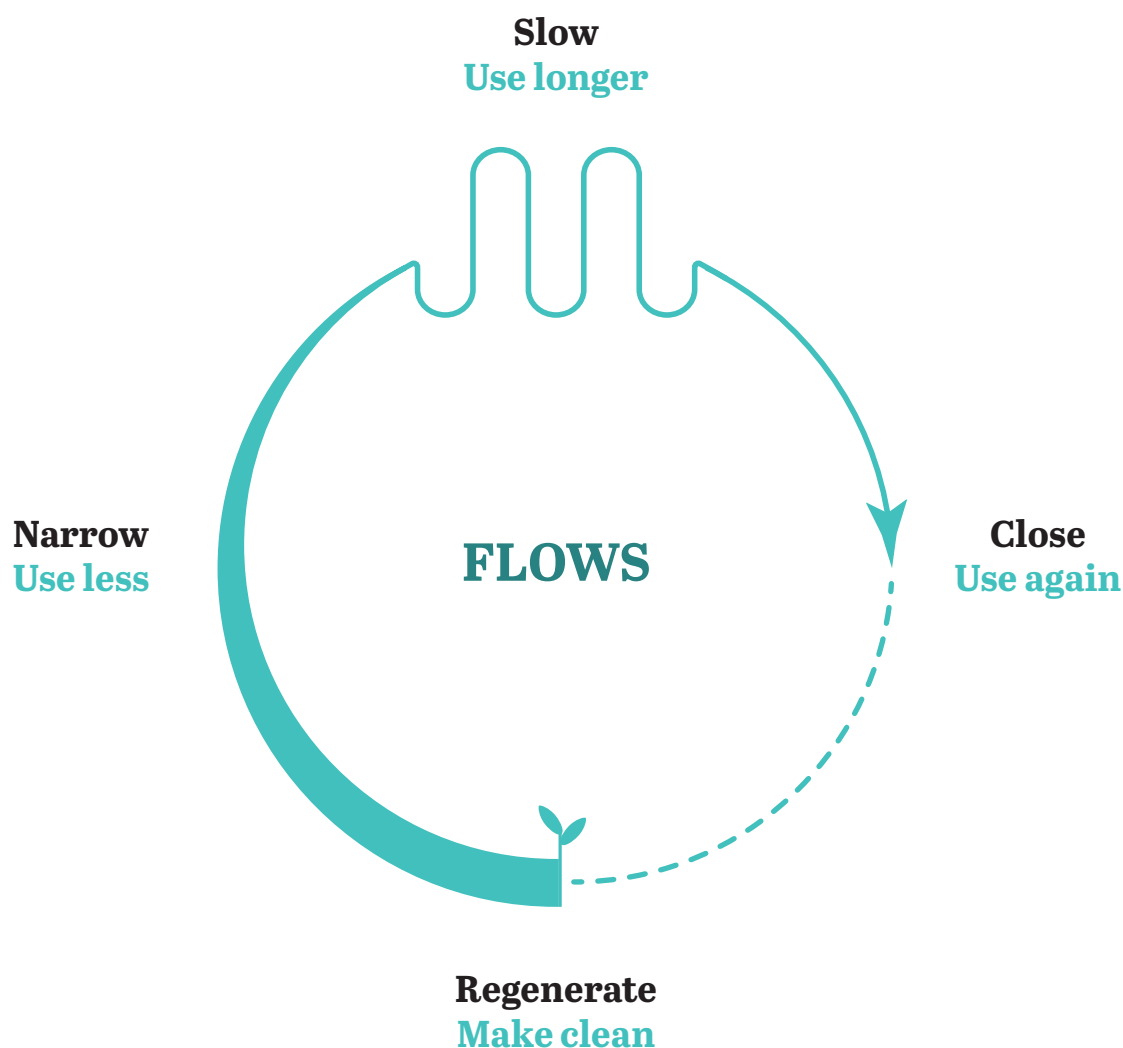
A crucial ingredient for success is the ability to collaborate across traditional organisational boundaries – between companies and different sectors. Electrification and digitalisation mean that companies that could previously deliver a specific product to a buyer, can now do so earlier in the supply chain. The supplier must now be able to take overall responsibility for a product’s entire life cycle and use. And this is where Sweden can have a significant advantage internationally, due to high levels of trust between individuals and widespread co-operation.

“I think we can create a lot of collaborations and work smarter to be successful in this way. It’s not the biggest who will emerge victorious from this. Rather, it’ll be the smartest and fastest, and those who are willing to co-operate,” says Erik Svedlund at Epiroc.



“Strategic initiatives create a learning process that can also be trialled in test and demonstration environments. This is not just about finding out how you do things on a purely practical level, but also about developing new business models and getting customers and suppliers on board.”

PETER JOHANSSON, DEPUTY HEAD OF INDUSTRIAL POLICY, TEKNIKFÖRETAGEN



FOUR DESIGN PRINCIPLES FOR CIRCULARITY

The figure shows four design principles for circularity and clarifies the concept as a tool for increased resource efficiency. One important way to reduce the use of natural resources is, for example, by reducing energy use. This can be achieved by designing lighter products and using renewable energy. Another important way is to use products for a longer period of time and maximise their use, for example by giving products several functions and offering products as a service. By applying modular design, products can be used in more ways and components can be reused more effectively. Making it possible to use product components for different purposes is also a circular principle. The last step is to recreate and detoxify waste that is generated.

Source: Circular Ecosystem Innovation: An Initial Set Of Principles, April 2020, Journal of Cleaner Production 253: 119942 J. Konietzko, N. Bocken, E. J. Hultink

Summary

For industry, circularity means achieving greater resource efficiency and extending the financial relationship with the customer. Industry is vital to Swedish exports, which means that the circular economy needs to be seen in a global perspective. All Swedish investment in the circular economy should therefore be based on the thesis – Sweden in a circular world – with the goal of maximising the value and profitability of products over time.

In this report, Teknikföretagen presents four thematic areas that are strategically important for the transition to a circular economy and 15 concrete measures that drive that change.

- 1. The radical transformation created by new technologies and new business models**
- 2. Digitalisation enables circular material flows**
- 3. Co-operation results in increased recycling of complex products**
- 4. Research and innovation that supports the climate transition**





TEKNIKFÖRETAGEN'S LIST OF 15 IMPORTANT POLICY MEASURES THAT TOGETHER DRIVE THE TRANSITION TOWARDS A CIRCULAR ECONOMY

The radical transformation created by new technologies and new business models

1. The public sector needs to be better at procuring resource-efficient products and services.
2. Continue to promote the conditions for sustainable transport because this is a precondition for circular material flows.
3. Scrap environmental taxes that prevent a circular economy, such as the Swedish chemicals tax.
4. Harmonised rules in the internal market improve industry competitiveness. A well-functioning internal market is the basis for circular business models to function internationally.
5. Requirements for products should be drafted so that they are technology-neutral, measurable, and unambiguous. Overlapping product regulations should be avoided.
6. Responsibility for product safety throughout a product's lifespan needs to be defined as the use of second-hand products increases.

Digitalisation enables new business models

7. Work on data security must be prioritised and strengthened because circular economy results in increased data sharing and the creation of databases.
8. Cybersecurity legislation needs to be developed so that collaboration between companies can take place without the risk of trade secrets being leaked outside the collaborative environment.
9. Sweden should prioritise digital technology test and demonstration environments.

Collaboration results in increased recycling of complex products

10. Conflicts of objectives between circular, sustainable, and secure resource flows need to be managed politically with pragmatic solutions and clear rules.
11. Instruments for information systems, for example product passports must be needs-based and harmonised on the internal market.
12. Waste legislation needs to be harmonised across the EU and result in materials retaining a greater value over time.

Research and innovation that supports the climate transition

13. Circular business models should be given priority in the allocation of financial support both from the EU and nationally, for example R&D grants, innovation support etc.
14. Increase knowledge about where environmental impact arises in circular business models.
15. Increased funding for research and innovative collaborations is needed to enable the recycling of complex materials.

Digitalised Business Models

FOR CIRCULAR MATERIAL FLOWS



Teknikföretagen

Technology makes the world a better place

The Swedish engineering sector's companies supply the solutions with which to tackle the greatest challenges of our times. These companies are members of Teknikföretagen.