



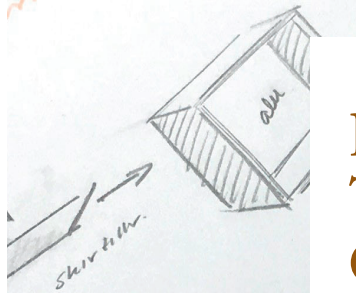
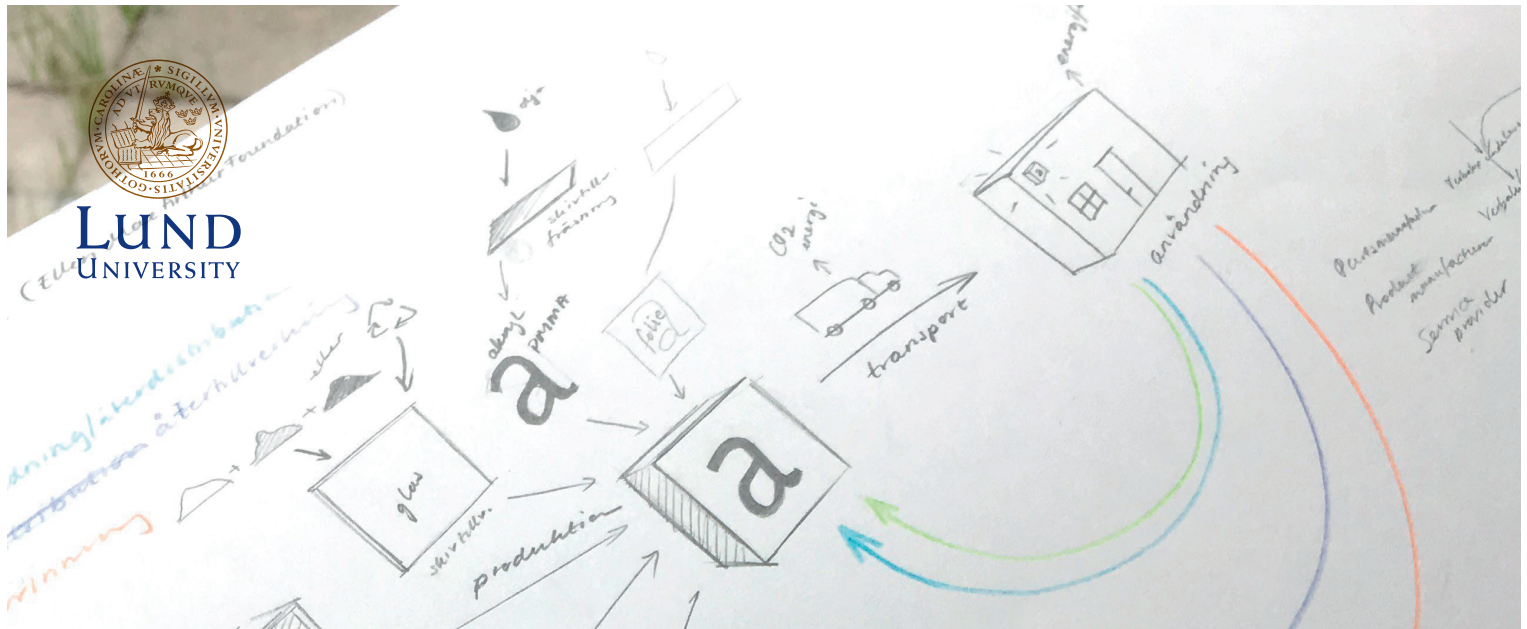
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# Putting Circular Ambitions into Action: The Case of Accus, a Small Swedish Sign Company

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## Foreword

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In June 2017, the sign company Accus in Malmö applies for funding from Vinnova to carry out the second phase of development project "Future signs show the way II" within the framework of the research programme "Circular flow - An investment in the circular bio-based economy" (Reference number: 2016-03496\_6). Lund University is one of the co-applicants.

Accus's application sets as a goal for the development project to create a system for recirculation of signs that: promotes re-use and remanufacturing; creates a sustainable business model; develop an attractive portfolio of signs that can be re-circulated; and, more generally, promote a transition to a circular economy.

The application is granted to allow the development project to take place from November 2017 to December 2019. According to the application, Professor Hervé Corvellec from the Department of Service Studies at Lund University is part of the management group for the pilot study with a responsibility to document and analyze the process. This is what this report does, authored in collaboration with Maira Babri, School of Business, Örebro University and Herman I. Stål, Umeå School of Business, Economics and Statistics (USBE), Umeå University.

Special thanks to Accus personnel.

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**Hervé Corvellec**  
**Malmö, October 4, 2019**

# Abstract

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This report presents a case study of how Accus, a small Swedish company, worked on developing a circular business model for light sign production and installation to become more sustainable. Drawing on Actor Network Theory (ANT), the Accus case shows that circular business model development is a cooperative endeavor that rests on bringing together a large and changing array of human, as well as non-human, actors in a development process that is hesitant, imprecise, provisory, contingent, and reversible. The case exemplifies the difficulties for a small company to enroll other actors in a transition to circular business, and initiate a shift toward a parsimonious material order that challenges, transforms, and replaces worked-in linear supplier-customer relationships. Good intentions only reach up to a certain point. If more than exceptional firms are to successfully find partners to translate their circular ambitions into circular business practices, the competitive strength of linear solutions needs to be drastically reduced and delegitimized.

# Keywords

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Circular business model, Actor-Network Theory (ANT), Light signs, Sweden



# Introduction

Circular Business Models (CBMs) are to translate the macro-ambitions of the circular economy (e.g., European Commission, 2018), into business practices. Based upon the business model literature (e.g., Osterwalder, Pigneur, & Clark, 2010), much research on CBMs addresses the question of how companies can create value while adhering to the principles of the circular economy (Lüdeke-Freund, Gold, & Bocken, 2019). Creating circular value is a challenge. Whereas De Angelis (2018) stresses that circular value creation is characterized by idiosyncratic mechanisms of value proposition, creation, delivery, and capture, most others instead suggest generic CBMs. The ReSOLVE-framework developed by the Ellen MacArthur Foundation (2015) proposes six core strategies to not let the value of goods and materials fall to zero: Regenerate, Share, Optimize, Loop, Virtualize and Exchange; Lacy and Rutqvist (2015) suggest five generic ways to develop a circular advantage: circular supply-chain, recovery and recycling, product life-extension, sharing platform, product as a service; and Lüdeke-Freund et al. (2019) identify six generic circular business models: repair and maintenance, reuse and redistribution, refurbishment and remanufacturing, recycling, cascading and repurposing, and organic feedstock.

More concisely, Bocken, de Pauw, Bakker, and van der Grinten (2016) put forward three ways to move from a linear to a circular economy: slowing, closing, and narrowing resource loops; a triad to which Geissdoerfer, Morioka, de Carvalho, and Evans (2018) add intensifying and dematerializing. Further, Urbinati, Chiaroni, and Chiesa (2017) argue that only firms that combine an internal approach upon production processes with an external approach to one's customers, where both incorporate principles of circular economy, can be fully circular. Moreover, research on CBMs has identified several impediments to circular value creation; from organizational and market-based barriers as well as cultural barriers (Kirchherr et al., 2018) to CBM implementation (Vermunt, Negro, Verweij, Kuppens, & Hekkert, 2019), to unclear waste and environmental effects (Corvellec & Stål, 2017) inadequate regulation (Kirchherr, Reike, & Hekkert, 2017), increased business risk (Linder & Williander, 2017), and corporations paying lip service to the notion (Stål & Corvellec, 2018). In particular, many CBMs come with a claim to deliver superior environmental value – whatever the difficulties to assess such a value (Manninen et al., 2018). On this account, CBMs are a sub-category of business models for sustainability (Wells, 2013) and many CBMs borrow traits from these models, for example, a com-



Figure 1: Sign program (Image: Accus)

mitment to either weak or strong sustainability (Stål, 2018; Stål & Bonnedahl, 2016).

Taking account of this sustainability dimension of CBMs, and thereby an interest in material concerns (Whiteman, Walker, & Perego, 2013), this chapter focuses on the case of Accus, a smaller Swedish light sign company (see Figure 1) which began with CBM development for environmental motives. Drawing on Actor Network Theory (ANT) (Callon, 1986; Latour, 1986, 2005; Law & Mol, 2008) and Action Net Theory (Corvellec & Czarniawska, 2015; Czarniawska, 2004) the chapter analyses the dynamics of material and social actors' interactions in the development of circular products. This analysis demonstrates the key role of materiality for circular products and business model development, expressed by questions such as: which materials are in use, and with which environmental consequence? How can the company control materials from sourcing to post-use phases? And, how can the company convince its customers of the value of circular-able products?

The Accus case makes clear that circular business models are material models before being business models, and this primacy of materiality has, in turn, at least two major consequences. First, a practical consequence in that addressing the difficulties of CBM development and implementation (Vermunt et al., 2019), requires an in-depth understanding of the relationships of the social and the material in and around the organization. Second, a political consequence in that a generalization of CBMs is contingent on a shift from a focus on customer value and monetary flows (Osterwalder et al., 2010) to a transformative focus on sustainable material flows (cf., Daly & Farley, 2004). Such a shift would be in line with the growing awareness of our time, the Anthropocene (Crutzen, 2002) which involves having started to reach the material boundaries of the planet (Steffen et al., 2015; Wijkman & Rockström, 2012). However, we also suggest, such a shift would require overruling the current profitability of linear solutions to help CBMs overcome current implementation difficulties.

# Theory: Actor Network Theory (ANT) and action nets theory

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Originally created by French scholars Bruno Latour and Michel Callon to explain how science (e.g., Latour, 1986) and technology (e.g., Callon, 1986) come into being or not, actor-network theory (ANT) has evolved into a multifaceted theoretical and empirical stance to analyze social and physical reality in terms of networks. As Law (2009: 141) puts it, in a rare effort to provide a theoretical definition of ANT:

Actor network theory is a disparate family of material-semiotic tools, sensibilities, and methods of analysis that treat everything in the social and natural worlds as a continuously generated effect of the webs of relations within which they are located. It assumes that nothing has reality or form outside the enactment of those relations. Its studies explore and characterize the webs and the practices that carry them. Like other material-semiotic approaches, the actor network approach thus describes the enactment of materially and discursively heterogeneous relations that produce and reshuffle all kinds of actors including objects, subjects, human beings, machines, animals, "nature," ideas, organizations, inequalities, scale and sizes, and geographical arrangements.

Therefore, ANT can be depicted as a set of analytical tools, and rests on three methodological principles (Crawford, 2005): not holding a priori assumptions about the nature of the web of relations (networks) that one wishes to study, for example how it is held together; granting symmetric agency to human and non-human actors, be it artefacts, abstract constructions such as laws and algorithms, or living organisms and natural elements; and abandoning any ontological distinction between natural and social phenomenon.

Applying ANT rests on the study of actions: what actors are actually doing. With a symmetric distribution of agency, all humans and non-humans are seen as having the potential to act; how, when and if they do, is however an empirical concern. Expressed simply, agency can be defined as power exerted onto ones surrounding. For Law and Mol (2008), agency is often a matter of interconnection between actors, who or what exerts agency is contextual and relational, and therefore not easily attributable to any sole actor.

This means, in order to make a difference, an actor sometimes just needs to exist or be, not necessarily be acting upon a specific strategy or intent. A speed bump makes car drivers slower, and an electronic key makes hotel guests adapt their way of opening a door. Observable traces of agency might also point at a resistance (Law & Mol, 2008) to others' agency.

The general concept used within ANT to trace the result of agency is translation (Latour, 2005; Law, 2009). Just like a linguistic translation makes it possible to pass from one language to another, translations in ANT make it possible to move from one actor to the other, associating thereby these actors, even if precariously. An example of translation is when an offer of recycled material, by a supplier keen on developing its line of products, becomes a means to develop a sustainable offering of products for a manufacturer: managerial agency can get recycled material to cross the boundary (Star, 2010) between organizations only because it can be translated from one type of innovation into another so as to fit in each organizational context.

Translation can thus be described as the process through which new associations between actors are made possible, developed, and strengthened (Callon, 1986). Callon further uses the notion of enrollment to describe the work to develop chains and webs of translations that are able to hold together actors in networks. Enrollment is the conditional creation of associations. Never definitive, though, enrollment may fail if people or materials stop accepting translations, for example, if customers do not see any environmental value in purchasing recycled material. Enrollment processes may entail conflicts and be unsuccessful for a particular actor but successful for another. For example, recycled materials can be successfully enrolled as sustainable supplies in replacement of virgin materials.

To further stress the central role of action in building networks of actors, Czarniawska (2004, 2010) has coined the notion of action nets. An action net is the web of actions that links actors, and makes associations, translations and enrollments possible, and perhaps durable. Associations do not occur by themselves but

result from actions, for example calling on a supplier, testing a new material, or presenting prototypes to potential customers. Note that even non-humans can act. For example, a waste shredder translates discards into renewables, and a contract translates a business idea into an economic flow.

Building on Latour and Callon's work, Czarniawska brings to the fore that the heterogeneous assemblages of humans and non-humans which constitute the social exist and become visible only because of actions. Actions are the conditions of associations between actors, both humans and non-humans. These actions result in translations, which may bring actors together and make networks possible, but may also separate actors and create divides. If repeated many times enough, along with successful enrollments however, actions can eventually somewhat stabilize networks and make them durable. Corvellec and Czarniawska (2015: 90) describe this as, "[a]ctions in action nets are like threads woven or knotted together. If successfully stabilized, they hold in ways that resist tractions and pressure to forces of deformation and displacement."

# Method

This study is based on a longitudinal qualitative single case study (Flyvbjerg, 2011) of the efforts of Accus, a small company to develop an offering of circular light sign products and programs.

## ACCUS, A SMALL COMPANY WITH CIRCULAR AMBITIONS

Accus is a Malmö-based company that designs, sells and installs light signs. A small amount of the production is handled internally, while most production is carried out by Verbalux, a commercial partner with its head office near Malmö and its manufacturing in Poland. Accus targets both the private and public sector, mainly in southern Sweden, and sells both single signs and sign programs for office and commercial buildings. In 2018 Accus had 15 employees, working as designers, project leaders, managers and manufacturers, and had a turnover of 2,6 million Euros.

Accus' CEO, who is a member of the family that owns the company, expresses a strong commitment to reduce the environmental impacts of the company. To do so, he applied for financial support from Vinnova, Sweden's innovation agency, to explore how Accus could become more circular. A first grant financed a pre-study project, and another a development project with a focus on products, business models and circular systems. This chapter is based on the activities conducted during these two projects of CBM development which has resulted, among other things, in the launching of a brand for circular signs.

## COLLECTION AND ANALYSIS OF EMPIRICAL MATERIAL

*Qualitative Data Collection:* Starting September 15, 2016, the fieldwork for this single case study has been conducted by the first author acting as an embedded but independent researcher in Accus' two successive projects to become more circular. This role has granted him nearly unlimited access to the project participants. Overall, the first author has spent around 100 active contact hours with people working with the projects over a period of 3 years. A summary of the collected data is presented in table1 below.

Forced to ask questions to understand some of the discussions, solicited by the participants to share his views as a member of the steering group, and being asked about his views by the personnel, the first author's role in the process has entailed more than simply being an observer. For example, he has made suggestions, presented his preliminary findings to the steering group and the personnel, participated fully during workshops, and discussed alternative solutions to specific problems with the CEO and the personnel. He also invited Accus' CEO to hold a combined lecture and workshop on circular transition for his students in a sustainability management course. As an example of outcomes of the interaction through the project, the first author coined the expression single-use signs that the CEO now uses regularly in his presentation. He has also pointed out that different parts of the signs have different speed of circulation, also something that the CEO regularly mentions, and publicly credits him for. (See Table 1)

Data Collection Method	Number	Empirical material
Formal interviews	15	Transcribed verbatim
Participation in steering group meetings	10	Meeting notes Company documents
Participant observation at meetings and workshops (reference groups, employees, external stakeholders, external consultants, Accus' management, salesforce and designers)	18	Meeting notes on lap top Power-point presentations Informal chats

Table 1: Specification of Empirical Material



*Qualitative Data Analysis:* The interview transcriptions, meeting notes, corporate documents, and secondary material were ordered in a chronological order and fed into an NVivo database to code the material for what was being done by different actors. We focused on actions and interactions and searched for expressions of agency, translations and enrollments to see how Accus worked at building up circular action nets. We found both successful and failed examples of these. An example of successful association is when Accus introduces an industrial designer with sustainability competence into the project, whereas an unsuccessful one is when Accus is unable to find a waste management company interested in recycling electronic components. Likewise, an example of successful translation is when Accus draws on generic business models (e.g., Lacy & Rutqvist, 2015) to imagine ways to rent or lease light signs; whereas an example of unsuccessful translation is when the process of developing a retro-style modular sign without lighting is abandoned for not being original enough. Likewise again, recurrent references to Sustainable Development Goals 9, 11 and 12 were coded as tentative enrollments of the United Nation's blueprint for sustainability; whereas the inability of finding a recycling solution for light diodes was coded as an unsuccessful enrollment of these diodes in the circularizing process.

Eventually, four themes analytically emerged from this coding that explain Accus' developmental efforts: 1) associations have made it possible to learn about circularity and assess the circular-ability of signs, 2) why enrollments are conditional and how they create dependence among actors, 3) it is more appropriate to speak of circularizing signs than of an offer of circular signs, and 4) there are internal and external traces of resistance to the translations needed to build circular actions nets. The conceptual framework of ANT is not only offering a distinct parlance, it also allows explaining why Accus' circularization efforts went as they did.

# Analysis: Toward circularity

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## FORMING ASSOCIATIONS TO LEARN ABOUT CIRCULARITY AND ASSESS THE CIRCULAR-ABILITY OF SIGNS

Over the three years that the projects runs, Accus' personnel developed associations with actors that are outside their immediate value chain. Via a consultant, the Accus CEO comes in contact with other companies interested in circular developments, for example a producer of sound proofing; he makes a study visit to the Netherlands where he meets with representatives from a company selling lighting services; and he initiates a discussion with the Swedish Sign Association regarding the compatibility of circular signs with the general delivery regulations for light signs. He also hires an industrial designer with expertise in sustainability to the project.

Information is essential, and to get that information, Accus engages with unfamiliar actors. For example, a recycling company is invited to share information about the recyclability of the different materials in Accus' most common product: a stand-alone letter consisting of an aluminum frame, LED lighting and an acrylic front which is attached to the frame using glue heels on clear polycarbonate.

The recycling company explains that screws and aluminum which are taken out mechanically during disassembly can be recovered to produce, for example, casted aluminum products; the metals in the cables can also be recovered; but the rest is to be incinerated for energy recovery. Theoretically, the acrylic front and the polycarbonate fastener could be recovered, but the mechanical process cannot handle these materials and manual dismantling entails too high labor costs. The LED-lamps (see Figure 2) also fail the test of economic viability. They do contain valuable metals, but in too low quantities, for example: one billion LED chips amount to 17-25 kg of Gallium, but only 18 g of Indium; LED-lamps can therefore only be partly recovered through disintegration.



Figure 2: Standalone letter sign without a front (Image: Accus)

Some materials turn out to actively refuse being translated into recyclables, expressing an active material agency based on how their characteristics relate to available technique. For example, the type of glass used for fronts turns out not to be recyclable, resisting Accus' plans to qualify (Callon, Méadel, & Rabeharisoa, 2002; Corvellec & Stål, 2019) glass as the circular-able material par excellence. Subsequently, Accus' personnel understands that making products that are easy to dismantle is not enough, because a waste management company might still not take circular care of the material. For example, circular care is ruled out as unprofitable if it entails manual disassembly, if Accus delivers too small volumes, or if there is no secondary market for a specific recyclable. By quoting minimum quantities and the types of materials that it would be interested in getting, the recycling company expresses concretely how material agency conditions the translations of linear materials into circular-able ones.

Accus CEO does not further associate the recycling company to the project. However, the information gained through this temporary association with the recycling company proves to have important consequences for subsequent views on materials and products. First, Accus learns how products have to be disassembled

into materials and components in order for these to be recyclable, for instance in terms of mixing materials or using glues that do not contaminate materials. Second, Accus' personnel realize that they can only enroll the recycling company if the circular solutions that they envision matches the technical equipment and economic interests of the latter. Economic calculations, available recycling technology, and secondary material markets give Accus more distinct associations with the materials it uses and a clearer understanding of its possibilities, but also own responsibilities, for these materials.

Yet other actors brings their own conditions into Accus' plans; for example, the real estate companies and the architect firm in the project's reference group make clear that they only see a transition to a circular economy possible if circular signs can translate into something which fits with their communication strategy and bring solutions to their and their customers' needs. As in any process of value co-creation (Grönroos, 2012), the circular value propositions made by Accus are predicated on their being translatable into an understanding that aligns with customers own interests. A key teaching of ANT is that without successful translations, there will be no enrollment.

### **ENROLLMENTS ARE CONDITIONAL AND CREATE DEPENDENCE AMONG ACTORS**

Partnering and cooperating with Verbalux, the producer of the light signs that Accus designs and sells, is exemplary of the critical role of enrollment-building for CBM development. Accus's association with Verbalux is already established, frequent and regular when the process of circularization starts. For example, Accus' CEO routinely turns to his counterpart at Verbalux for technical product-related questions such as the optimal thickness of certain sign parts, the consequences of varnishing the sign boxes, the yearly consumption of aluminum, or existing possibilities to reuse spill from production.

An important issue for Accus' circularity is the possibility to use recycled materials, primarily acrylic and aluminum. Recycled acrylic supply is uncertain and Verbalux's CEO passes the question onto his suppliers. The acrylic suppliers first respond that the demand for recycled acrylic is small today, and that recycled acrylic could reduce the product quality since the material may contain spots of a different color and display a lowered transparency. Further, when the Verbalux CEO asks about returning used acrylic, since Accus also needs to get rid of the acrylic that it retrieves from the

old signs that it collects while installing new ones, the acrylic suppliers respond that their condition for taking back acrylic would be that there is no foil left on the acrylic – another condition for enrollment. This means that either Accus or Verbalux needs to arrange for this separation and also bear the costs for the work that this involves: disposal of recovered acrylic must be guaranteed through own product recovery, and any quality related risks are borne by those who will manage the recycling process, turning limited technical feasibility into financial risks. After some additional efforts, Accus eventually finds a small supplier of recycled acrylic in Northern Italy able to cater to all its needs.

The translations between Accus and Verbalux and between Verbalux and its suppliers illustrate the dependence that circular transitions can create among actors in the value chain. Accus is clearly dependent on Verbalux developing an interest for using recycled acrylic in its production processes. Accus is also dependent on actors that can help set up a system for collecting the used acrylic. Relationships of power are created that introduce a structural risk in CBM development. Enrollments are changing, contingent on how actors translate the requests and offers of other actors in terms of their own needs and interests. Encountered actors express clear conditions of enrollment that insert their interests and contingencies into the action net that Accus seeks to establish. As the shift to a new supplier illustrates, enrolling a newcomer can mean dismissing other actors. New translations can undo enrollments at any time.

Incidentally, Verbalux CEO informs Accus' personnel that he has started to sell signs made of recycled acrylic and aluminum even to Accus' competitors, diffusing Accus' innovation to other actors. This enrollment of Accus' competitors by Verbalux threatens Accus' ability to enroll customers in its own circular program and develop a competitive advantage. Enrollments are as versatile as beyond control.

### **CIRCULARIZING SIGNS RATHER THAN OFFERING CIRCULAR SIGNS**

It is more relevant to speak of circularizing Accus than of a circular Accus. The ing-form depicts more accurately that becoming circular is a process, and thus something that requires being approached through a processual stance (Bakken & Hernes, 2006). In contrast to the CBM literature that pitches linear and circular solutions as antagonistic alternatives (Ellen MacArthur Foundation, 2015; Lacy & Rutqvist, 2015;

Lüdeke-Freund et al., 2019), and even speaks at times of full CBM (Urbinati et al., 2017), the Accus case suggests that there might not necessarily be a clear-cut distinction between linearity and circularity. Accus' CEO expresses this in his presentations to customers with the expression "as circular as possible".

First, not all light signs circulate at the same speed. Some signs stay in place for decades, whereas it has happened that an unexpected change in logo has made a sign obsolete before it was even put in place. Likewise, not all parts of a sign have the same circular speed. Whereas a foil for a specific commercial promotion can stay up a few days only, a transformer for LED lights has an expected lifetime of 7 years, and the metal frame of a sign can stay up for decades.

Second, not all parts of a sign can circulate as many laps. Whereas foils are single use parts, the glass support on which they are put can be re-used as many times as they are cleansed appropriately. And whereas the kind of glass used for light signs can hardly be recycled, metal parts in aluminum or steel can easily be. So, in some context, one can look at the circularity of a light sign as a whole (e.g., a solution to a need for communication), but one needs in other contexts to separate the different elements and materials that a sign is made of (e.g., to assess to which extent a sign can be circular). Assessing the degree of circularity of a products and its parts is thus a matter of which

translations are made. In systemic parlance, one would speak of different levels of analysis. (See Figure 3)

Third, it remains that a circular sign will only actually be circular if processed in a circular way when taken down. Circularity is a bet on the future, a potential waiting to be realized which is why one should rather speak of circular-able signs, just like one should rather speak of circular-able fashion (Corvellec & Stål, 2017). The efficacy of today's circular efforts is contingent on a future circular discipline that remains to be developed and enforced. One of the key challenges of the circular transition process is to find ways to ensure the stabilization and longevity of the action nets that are necessary to realize the circular potential of circular-able signs. In particular, to minimize the risk that circular-able signs will not be processed in a circular way the day that they are taken down, Accus explores different idiosyncratic alternatives (De Angelis, 2018) to exert a continued control over the signs that it sells, for example including maintenance in the sale of sign, renting signs, or selling signs to property owners rather than tenants (c.f., Ellen MacArthur Foundation, 2015; Lacy & Rutqvist, 2015; Lüdeke-Freund et al., 2019)

### RESISTANCES TO CIRCULAR ACTION NETS

To enroll customers into action nets (Corvellec & Czarniawska, 2015; Czarniawska, 2004), Accus launches Re:Sign in early 2019, a brand of circular signs that is to work as an in-house circularity label that com-

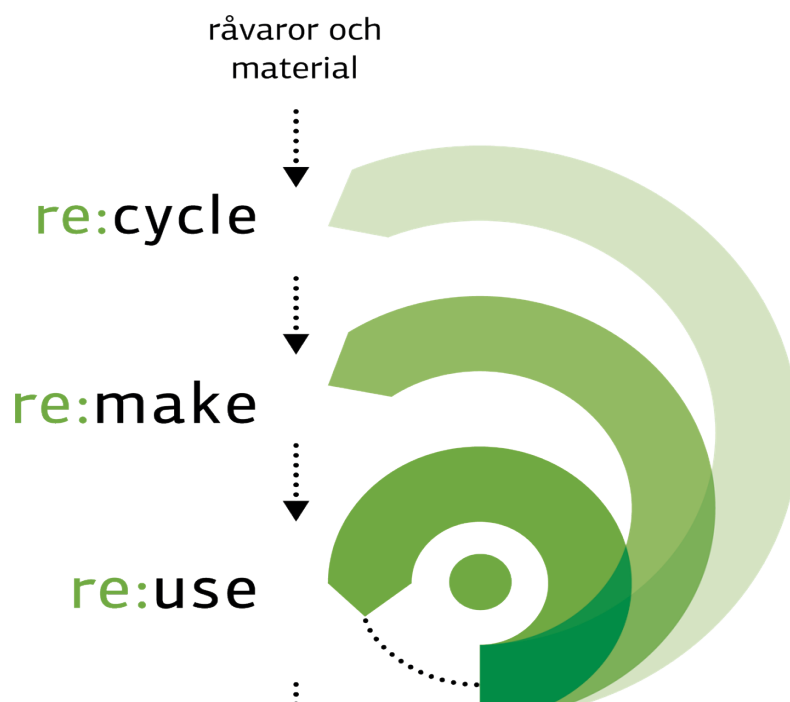


Figure 3: Principles of circularity for a light sign (Image: Accus)



municates the company's practical efforts to become circular (see Figure 4).

Re:Sign points at three directions. First, Accus does its best to design signs that are easier to disassemble, material efficient products that use as much recycled material as possible, and develop its reuse and recycling activities. The circular focus is here on improving the recycling and possibly reuse of signs. Second, Accus offers real-estate companies to turn signs into a part of their properties and rent them to their tenants, Accus also provides design- and maintenance services. For Accus' CEO, this is a circular offering because the same sign, minus single-use foils, is used across several end-customer circles. Third, Accus develops an offer of sign rentals for its end-users, with a diminishing rate over time to avoid discouraging long-terms contracts. At the end of the rental period, Accus gets the sign back to feed its re-use and recycling program (see Figure 5).

Although Re:Sign has received positive attention in the trade press, its more ambitious circular variants struggle to enroll customers into circular patterns of actions and interactions. Accus CEO confides that real estate companies are reluctant to let themselves be enrolled for longer periods of time. They are also reluctant to have to enroll their tenants into Accus' circular program. Only few single-sign customers have opted for a sign-as-service contract in place of buying

a sign-artefact. And some disinclination has been expressed internally for renting or leasing rather than selling signs. Accus' efforts at constructing circular action nets meets a resistance, which is consistent with other research on CBM implementation. For example, CBM implementation is likely to meet internal barriers to, for example, the development of lease models (Vermunt et al., 2019), as well as market barriers due to, for example, a lack of interest of customers for CBMs (Kirchherr et al., 2018).

As we write these lines, Re:Sign seems more successful at making Accus' regular products more sustainable, than at supporting the development of new CBMs for the production and installation of signs. The initial objective to reduce the environmental impact of the company's products is in a way attained, but through some circularization of many products rather than much circularization of some products. Personnel at Accus have worked hard at imagining non-linear solutions. Somewhat paradoxically, though, their efforts end up being translated into gradual improvements that comfort the use of linear signs. This paradoxical outcome points at a potentially critical issue with CBM development, yet to be confirmed by other cases: circular ambitions may namely lead to product and service developments, but in a way that serve the linear more than the circular economy – this can be seen as a kind of rebound effect where circular advances result in small, incremental changes that fail



Figure 4: Re:Sign logo (Image: Accus)

to establish circularity and result in stead in maintaining, and perhaps even strengthening linearity.

The contingencies of translation, enrollment, and action net building explain Re:Signs' difficulties at enrolling customers in the more ambitious circular solutions. To address these difficulties Accus' CEO contemplates making it more explicit that Re:Sign can serve different levels of circular ambitions. Investigating ways of enrolling a metric that quantifies products' circularity (e.g., Linder, Sarasini, & van Loon, 2017; Tecchio, McAlister, Mathieux, & Ardente, 2017), he would like to develop a way to signal that the different circular options offered by Accus stand for different degrees of circularity.



Figure 5: Exploded view of a modular sign (Image: Accus)

## Concluding discussion: Turning to a material order

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Illustrative of the slowing, closing and narrowing of resource loops that Bocken et al. (2016) consider as typical of a transition from a linear to a circular economy, the Accus case points at a cardinal dimension of CBMs: organizing circular material pathways. Renting, leasing, sharing, exchanging, redistributing or turning a product into a service (cf., Ellen MacArthur Foundation, 2015; Lacy & Rutqvist, 2015; Lüdeke-Freund et al., 2019) are not automatically circular and should be carefully tested for the question: in which sense are they enacting circularity? But organizing material flows around circularity principles makes a clearer justice to the epithet circular in the CBM appellation.

The above ANT analysis of the Accus case shows how organizing materiality for circularity, in turn, rests on dynamic combinations of the material and the social. The difficulties to enroll material and recycling constraints into the design of circular products, and the difficulties to enroll customers in ambitious circular offerings are but two examples of the intricacies of human and non-human interactions in Accus' efforts at circularizing its products. It appears that the process of becoming circular has an endless capacity to emit hard-to-answer calls for associations to legislations, technologies, materials, organizations, individuals, design philosophies, modes of calculation, political ambitions, and other key actors in order to make it possible for materials to circulate in closed loops.

This critical role of material in the Accus case suggests a need for a radical change in how to approach business model development if circularity is the purpose: moving away from the marketing-inspired focus on customer value (Osterwalder et al., 2010) toward an ecological economics inspired focus on material and energy throughputs (Daly & Farley, 2004). Not that CBMs do not need to come with attractive value propositions to enroll customers, but that they primarily ground their core value proposition in circular material flows. As Accus' CEO puts it one should "design for circular flows". If connected to a strict ecological awareness (Korhonen, Nuur, Feldmann, & Birkie, 2018), such a focus on material would address the growing issue with material limits imposed on economic activities by our planet's boundaries (Steffen et al., 2015; Wijkman & Rockström, 2012).

Shifting from business models aimed at delivering superior customer value to business models aimed at delivering superior material-environmental value is not an easy shift, though, as illustrated by the difficulties that Accus encounters in enrolling suppliers, partners, customers, and waste management companies in its journey toward circularity. CBM developments take place in an economy flooded by linear mindsets, norms, and traditions.

In particular, the profitability of the linear economy forms the baseline against which all circular efforts are compared, and a combination of low prices for raw materials and high prices for sorting put circular solutions in a weaker competitive position (see also: Linder & Williander, 2017). Breaking up with wastefulness to advocate a respectful and parsimonious approach to materials tends to come with a cost as it tends to require additional efforts and entails taking into account costs that linear business models can externalize.

A way to promote CBMs would therefore be to make existing linear offerings more expensive and thus less profitable, for example, thanks to clear legislation demarcating producer responsibilities, taxes, or environmental protection and material conservation laws. Circular and linear solutions are in competition. For a firm to have a fair chance at building circular action nets, a precedence of care, parsimony and responsibility for materials must be imposed on all competitors, even linear business models. In the name of environmental justice, linear business models with devastating Anthropocenic damages should even be made illegal. In particular, an externalization of the social and environmental costs of single-uses of materials and products, give linear business models an enormous competitive price advantage. As long as industry policies still favor linear models (Tura et al., 2019) efforts at circularizing activities will remain particularly vulnerable due to the combined effect of financial, material and technological limitations. If more than exceptional firms are to translate their circular ambitions into circular business practices, the competitive strength of linear solutions needs to be drastically reduced and delegitimized.

# References

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- Bakken, T., and T. Hernes (2006), Organizing is both a verb and a noun: Weick meets Whitehead. *Organization Studies*, 27(11): 1599-1616.
- Bocken, N.M.P., I. de Pauw, C. Bakker, and B. van der Grinten (2016), Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering*, 33(5): 308-320.
- Callon, M. (1986), Some elements of a sociology of translation: Domestication of the scallops and the fishermen of St Brieuc Bay. *Sociological Review Monograph*, 32: 196-233.
- Callon, M., C. Méadel, and V. Rabeharisoa (2002), The economy of qualities. *Economy and Society*, 31(2): 194-217.
- Corvellec, H., and B. Czarniawska (2015), 'Action nets for waste prevention'. In K. M. Ekström (ed.), *Waste management and sustainable consumption: Reflection on consumer waste*. Oxford: Earthscan-Routledge, pp. 88-101.
- Corvellec, H., and H.I. Stål (2017), Evidencing the waste effect of Product-Service Systems (PSSs). *Journal of Cleaner Production*, 145(145): 14-24.
- Corvellec, H., and H.I. Stål (2019), Qualification as corporate activism: How Swedish apparel retailers attach circular fashion qualities to take-back systems. *Scandinavian Journal of Management*, 35(3): 101046.
- Crawford, C.S. (2005), 'Actor Network Theory'. In G. Ritzer (ed.), *Encyclopedia of Social Theory*: Sage Publications.
- Crutzen, P.J. (2002), Geology of mankind. *Science*, 415: 23.
- Czarniawska, B. (2004), On time, space, and action nets. *Organization*, 11(6): 773-791.
- Czarniawska, B. (2010), 'Going back to go forward: On studying organizing in action nets'. In T. Hernes, & S. Maitlis (eds.), *Process, sensemaking, and organizing*: Oxford: Oxford University Press, pp. 140-160.
- Daly, H.E., and J.C. Farley (2004), *Ecological economics: Principles and applications*. Washington (DC): Island Press.
- De Angelis, R. (2018), *Business models in the circular economy: Concepts, examples and theory*: Cham : Springer International Publishing.
- Ellen MacArthur Foundation (2015), *Towards the circular economy: Economic and business rationale for an accelerated transition*. Isle of Wight: Ellen MacArthur Foundation.
- European Commission (2018), 'Circular economy: Implementation of the circular economy action plan'. *European Commission, Environment*, accessed December 2018 at [http://ec.europa.eu/environment/circular-economy/index\\_en.htm](http://ec.europa.eu/environment/circular-economy/index_en.htm)
- Flyvbjerg, B. (2011), 'Case study'. In N. K. Denzin, & Y. S. Lincoln (eds.), *The SAGE handbook of qualitative research*, 4th ed.: Thousand Oaks (CA): Sage, pp. 301-316.
- Geissdoerfer, M., S.N. Morioka, M.M. de Carvalho, and S. Evans (2018), Business models and supply chains for the circular economy. *Journal of Cleaner Production*, 190: 712-721.
- Grönroos, C. (2012), Conceptualising value co-creation: A journey to the 1970s and back to the future. *Journal of Marketing Management*, 28(13/14): 1520-1534.
- Kirchherr, J., L. Piscicelli, R. Bour, E. Kostense-Smit, J. Muller, A. Huibrechtse-Truijens, and M. Hekkert (2018), Barriers to the Circular Economy: Evidence From the European Union (EU). *Ecological Economics*, 150: 264-272.
- Kirchherr, J., D. Reike, and M. Hekkert (2017), Conceptualizing the circular economy: An analysis of 114 definitions. *Resources, Conservation and Recycling*, 127(Supplement C): 221-232.
- Korhonen, J., C. Nuur, A. Feldmann, and S.E. Birkie (2018), Circular economy as an essentially contested concept. *Journal of Cleaner Production*, 175: 544-552.
- Lacy, P., and J. Rutqvist (2015), *Waste to wealth: The circular economy advantage*. Basingstoke: Palgrave Macmillan.
- Latour, B. (1986), 'The Power of association'. In J. Law (ed.), *Power, action and belief: A new sociology of knowledge?*: London: Routledge, pp. 264-280.
- Latour, B. (2005), *Reassembling the social: An introduction to actor-network-theory*. Oxford: University Press.



- Law, J. (2009), 'Actor Network Theory and material semiotics'. In B. S. Turner (ed.), *The new Blackwell companion to social theory*: Chichester: John Wiley & Sons, pp. 141-158.
- Law, J., and A. Mol (2008), 'The actor-enacted: Cumbrian sheep in 2001'. In C. Knappett, & L. Malafouris (eds.), *Material agency: Towards a non-anthropocentric approach*: New York: Springer, pp. 57-77.
- Linder, M., S. Sarasini, and P. van Loon (2017), A metric for quantifying product-level circularity. *Journal of Industrial Ecology*, 21(3): 545-558.
- Linder, M., and M. Williander (2017), Circular business model innovation: Inherent uncertainties. *Business Strategy and the Environment*, 26: 182-196.
- Lüdeke-Freund, F., S. Gold, and N.M.P. Bocken (2019), A review and typology of circular economy business model patterns. *Journal of Industrial Ecology*, 23(1): 36-61.
- Manninen, K., S. Koskela, R. Antikainen, N. Bocken, H. Dahlbo, and A. Aminoff (2018), Do circular economy business models capture intended environmental value propositions? *Journal of Cleaner Production*, 171: 413-422.
- Osterwalder, A., Y. Pigneur, and T. Clark (2010), *Business model generation: A handbook for visionaries, game changers, and challengers*. Amsterdam: Alexander Osterwalder & Yves Pigneur.
- Star, S.L. (2010), This is not a boundary object: Reflections on the origin of a concept. *Science, Technology & Human Values*, 35(5): 601-617.
- Steffen, W., K. Richardson, J. Rockström, S.E. Cornell, I. Fetzer, E.M. Bennett, R. Biggs, S.R. Carpenter, W. de Vries, C.A. de Wit, C. Folke, D. Gerten, J. Heinke, G.M. Mace, L.M. Persson, V. Ramanathan, B. Reyers, and S. Sörlin (2015), Planetary boundaries: Guiding human development on a changing planet. *Science*, 347 (6223):736-746.
- Stål, H.I. (2018), 'Business models based on strong sustainable entrepreneurship'. In K. Bonnedahl, & P. Heikkuri (eds.), *Strongly sustainable societies*: Earthscan-Routledge, pp. 153-171.
- Stål, H.I., and K. Bonnedahl (2016), Conceptualizing strong sustainable entrepreneurship. *Small Enterprise Research*, 23(1): 73-84.
- Stål, H.I., and H. Corvellec (2018), A decoupling perspective on circular business model implementation: Illustrations from Swedish apparel. *Journal of Cleaner Production*, 171(Supplement C): 630-643.
- Tecchio, P., C. McAlister, F. Mathieux, and F. Ardente (2017), In search of standards to support circularity in product policies: A systematic approach. *Journal of Cleaner Production*, 168: 1533-1546.
- Tura, N., J. Hanski, T. Ahola, M. Stähle, S. Piiparinen, and P. Valkokari (2019), Unlocking circular business: A framework of barriers and drivers. *Journal of Cleaner Production*, 212: 90-98.
- Urbinati, A., D. Chiaroni, and V. Chiesa (2017), Towards a new taxonomy of circular economy business models. *Journal of Cleaner Production*, 168: 487-498.
- Wells, P.E. (2013), *Business models for sustainability*. Cheltenham: Edward Elgar.
- Vermunt, D.A., S.O. Negro, P.A. Verweij, D.V. Kuppens, and M.P. Hekkert (2019), Exploring barriers to implementing different circular business models. *Journal of Cleaner Production*, 222: 891-902.
- Whiteman, G., B. Walker, and P. Perego (2013), Planetary boundaries: Ecological foundations for corporate sustainability. *Journal of Management Studies*, 50(2): 307-336.
- Wijkman, A., and J. Rockström (2012), *Bankrupting nature: Denying our planetary boundaries*. London: Routledge.

