

Circular Business Model Transformation: A ROADMAP FOR INCUMBENT FIRMS

California Management Review

2019, Vol. 61(2) 5–29

© The Regents of the

University of California 2018

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/0008125618811926

journals.sagepub.com/home/cm**Johan Frishammar^{1,2} and Vinit Parida^{1,3}**

SUMMARY

To achieve positive economic, environmental, and social benefits, many incumbent manufacturing firms attempt to apply circular economy principles to their business practices. However, these firms often struggle to change their existing linear business models to circular models because the steps required for successful transformation are still poorly understood. Based on a multiple case study of eight business model transformation journeys, this article proposes a roadmap for circular business model transformation. It provides a step-by-step process to enable circular transition, allowing companies to meet environmental, social, and financial objectives and proactively address sustainability.

KEYWORDS: business models, case study, circular economy, manufacturing, sustainability, servitization

For the past century, business success has depended on providing financial returns to shareholders.¹ This predominant focus on economic performance has contributed to a multitude of environmental problems such as pollution, global warming, and ozone layer depletion. Many would argue that business activities are a root cause of such environmental problems.² However, a growing number of incumbent firms are putting sustainability issues at the top of the corporate agenda.³ For example, German manufacturing firm Siemens is now the most energy-efficient firm in its industry. Other examples include U.S. companies such as Cisco and Johnson & Johnson, which have recently appeared in lists of the world's most sustainable companies.⁴

¹Entrepreneurship & Innovation, Luleå University of Technology, Luleå, Sweden

²House of Innovation, Stockholm School of Economics, Stockholm, Sweden

³University of Vaasa, Vaasa, Finland

Indeed, many incumbent firms are moving away from a pure product orientation toward an orientation that combines products and services in an attempt to contribute to sustainability goals.⁵ In recent years, such initiatives have often been subsumed under the term *circular economy*. The circular economy was brought to the attention of a wider audience by the Ellen MacArthur Foundation, which defines it as an industrial system that is restorative or regenerative by intention and design.⁶ Many incumbent firms attempt to implement circular economy principles by adopting a cradle-to-cradle logic, whereby the company assumes life-cycle responsibilities, abandons nonrenewable energy, embraces the idea of reusing, refurbishing, and recycling its products, and improves its maintenance commitments.

However, adhering to the principles of the circular economy requires the transformation of the incumbent firm's business model. This transformation is highly challenging because implementing circular activities requires the firm to transform the way it creates, delivers, and captures value.⁷ An incumbent firm's core value proposition must often change when new types of performance-based services are launched.⁸ For example, there is often a profound difference in customers' perceptions of a value proposition when buying a product versus buying a function or result. Similarly, there may be significant changes to the firm's value capture mechanisms such as when revenues from material-intensive up-front product sales are replaced with monthly earnings from providing product availability.⁹ This requires fundamental changes in business logic¹⁰ and often entails collaboration with both new and old actors in the firm's ecosystem.

The literature on business models for sustainability and the circular economy is growing.¹¹ Based on prior literature,¹² we define a circular business model as *one in which a focal company, together with partners, uses innovation to create, capture, and deliver value to improve resource efficiency by extending the lifespan of products and parts, thereby realizing environmental, social, and economic benefits*. The circular business model transformation process is particularly important in incumbent firms. In such firms, even moderate sustainability upgrading can have enormous environmental effects because of these companies' large market shares.

However, business model transformation research has tended to focus on sustainable niche-market pioneers rather than mass-market incumbents.¹³ Furthermore, this research has been conceptual or has offered a static view of what is actually a complex, dynamic reality.¹⁴ For example, researchers have classified business model characteristics according to structure¹⁵ and have proposed sustainability-based versions of the well-known business model canvas.¹⁶ In other words, most of the scarce research on circular business models has focused on the business model per se rather than on the process whereby incumbent firms transform their business models.¹⁷ How incumbent firms actually do so is, thus, poorly understood,¹⁸ and new insights are needed to help firms transition to a circular model.¹⁹ Finally, a major shortcoming of the literature is the prevailing focus on a single firm's business model. Because business models transcend organizational boundaries,²⁰ contributions by partners in the ecosystem

must be better understood.²¹ Consequently, when outcomes are systemic and require a full ecosystem of partners to be mobilized, it is misleading to think of products as made and sold by individual firms alone.

This lack of theoretical insight into incumbent firms' circular business model transformation means that, in practice, firms often face difficulties when changing their existing business models. The purpose of this study is, therefore, to investigate how circular business model transformation actually occurs in incumbent firms. We pursued this purpose using a multiple case study of ongoing business model transformations in eight large manufacturing companies and their ecosystem partners. Through case study analysis, we developed a roadmap for circular business model transformation. This roadmap provides a step-by-step process for transitioning to a circular business model.

Theoretical Background: Circular Economy and the Role of Incumbent Firms

Sustainability entrepreneurship provides a theoretical logic for understanding the rationale behind circular business model transformation because it addresses sustainability problems by using innovative business models.²² Incumbent firms engage in sustainability entrepreneurship and business model transformation for a variety of reasons. These include volatility in commodity prices, threats from new entrants or niche-market pioneers, new policies and legislation, social pressure, managers' intrinsic motivation, or a combination of these factors.

When pursuing sustainability entrepreneurship, incumbent firms are often pictured as moving slowly and giving sustainability a low priority. This is referred to as a "weak" sustainability proposition, "sustainability upgrading," or "green-washing" of existing products.²³ To some extent, this criticism is fair. However, mass-market incumbents can have a considerable impact even with a "weak" sustainability proposition because they operate in global markets with large market shares.²⁴

In practice, the execution of sustainability entrepreneurship using innovative business models is often built on the core premises of the product-service system (PSS) literature. The PSS literature shows that incorporating circular economy principles into business models can yield the highest possible resource efficiency.²⁵ The PSS literature also highlights the impact of life-cycle stages on resource efficiency (i.e., material extraction, processing, production, product use, and end-of-life treatment).²⁶ Therefore, the implementation of circular economy principles often emerges in practice in the form of PSS-based business models such as pay-per-use instead of product ownership, although PSS is not the only strategy for an incumbent firm to pursue circularity.²⁷ Nevertheless, the sustainability entrepreneurship, circular economy, and PSS literatures still lack insight into systematic processes for transforming existing business models.

Circular Business Models

Circular transformation is best conceptualized through a well-defined and commercially viable circular business model.²⁸ However, we still lack “a clear definition of circular business models, and no common understanding of the concept has been established.”²⁹

According to recent strategy and innovation studies, a business model represents a cognitive schema that explains how a company creates, delivers, and captures value by exploiting business opportunities.³⁰ Hence, the assumption is that managers theorize about ideas and images of current (and future) business models when making strategic decisions.³¹ Specifically, a business model answers four key questions that span four dimensions:³²

- *What* is offered to the customer? For example, what type of product or service is offered? This is the *value creation* dimension.
- *How* are activities and processes employed to deliver the promised value? For example, what specific logistical resources and capabilities are needed? This is the *value delivery* dimension.
- *Why* is the revenue model financially viable? That is, what are the possible revenue sources and are these sufficiently large? This is the *value capture* dimension.
- *Who* is the target customer? That is, what are the customer’s characteristics? This dimension refers to both existing and potential *customers*.

A circular business model answers these questions while maintaining or regenerating environmental, social, and economic capital beyond the firm’s boundaries.³³ However, few authors have attempted to define circular business models. Certain scholars have depicted circular business models as activities that include recycling, remanufacturing, reuse, or related activities such as refurbishment, renovation, and repair.³⁴ In contrast, others have highlighted collaboration, communication, and coordination within complex ecosystems of interdependent yet separate actors to achieve the benefits of the circular economy.³⁵ Building on these and other prior studies,³⁶ we propose the following definition: *a circular business model is one in which a focal company, together with partners, uses innovation to create, capture, and deliver value to improve resource efficiency by extending the lifespan of products and parts, thereby realizing environmental, social, and economic benefits.* A circular business model, thus, allows companies to question or redesign value-related processes and reduce negative impacts.

However, few if any incumbent firms manage to fully meet all the requirements of a circular business model. When incumbent firms optimize their processes, close material loops, select better energy sources, and retain product ownership, they apply the principles of the circular economy and move along a continuum. Therefore, it is more accurate to speak of *circularness*, rather than perfect circularity. As Lewandowski points out, every business model is both linear and circular to some extent.³⁷

Transformation toward Circular Business Models

Business model transformation represents a change in the logic according to which value is created, delivered, and captured.³⁸ Circular business model transformation may be highly challenging and may require significant changes to the way that incumbent firms operate.³⁹ Consequently, few incumbent firms completely transform from a product-focused business to a solution-focused business, and many end up operating under multiple business models.⁴⁰ For example, a manufacturer of heavy machinery for the construction industry, such as Volvo Construction Equipment, may continue to sell the machinery or may retain ownership and offer performance-based contracts to individual customers.

But when incumbent firms shift toward circular business models, what do they transform their existing business model into? The PSS literature reveals that leading manufacturing firms increasingly focus on resource efficiency throughout the product life cycle.⁴¹ More specifically, the PSS literature sheds light on two types of circular business models.⁴²

In a *use-oriented business model*, an incumbent firm makes a product available under rental or lease agreements but retains ownership. The product is not sold to the customer, but its availability is guaranteed for a predefined period, during which the provider receives periodic payments. In the *results-oriented business model*, the incumbent firm provides a customer with a predefined result or outcome. The supplier receives payment for a given result and assumes full responsibility for its delivery.

A successful business model transformation can, and often does, involve change in several dimensions. Examples include when the provider retains product ownership and offers incentives to prolong product life cycles through reuse, repair, refurbishment, upgrading, and proactive maintenance. Sustainability can also be improved through more intensive product use, which results from sharing and pooling as the provider's incentives to improve resource use increase. However, studies have predominantly focused on circular business models per se rather than the transformation process, of which knowledge is scarce.

Moreover, the business model is a boundary-spanning concept that centers on a focal firm and its partners in the ecosystem.⁴³ An ecosystem is a collaborative arrangement through which firms combine resources to deliver a solution.⁴⁴ Because of increased specialization and division of labor, few of today's incumbent firms provide a full circular business model themselves. The business model has a varying degree of openness and requires active contribution of partners in the ecosystem.⁴⁵

An incumbent firm typically supplies product hardware that is at the core of the circular business model. In results- or use-oriented business models, customers are typically co-creators of the offer.⁴⁶ In addition, a large number of third-party service providers may be needed to complete the offer.⁴⁷ These may be specialists in software, data analytics, installation, repair, recycling, or any other type of essential service. These external specialists can contribute diverse information,

provide access to resources, make the solution more innovative, and enhance the total value of the offer.⁴⁸ They may also contribute to the transformation process that is necessary for the implementation of a circular business model.⁴⁹ However, their interests and driving forces do not always align, and stakeholder tensions must be mapped out and managed proactively.⁵⁰ Although the literature cites ecosystem actors as critical to successful circular business model transformation, it currently provides little insight into what these actors do and how potential tensions can be managed.

Against this backdrop, we seek to close several research gaps by operationalizing the ideas expounded in the circular economy literature, depicting a detailed circular business model transformation process, which is missing from the PSS literature, and overcoming the prevailing focus on a single firm's business model by highlighting the influence of ecosystem actors.

Method and Research Setting

Research on how incumbent firms transform their business models to incorporate circularity is at a nascent stage. Our goal was to study *how* this circular transformation process takes place in practice. We, therefore, conducted a multiple case study of ongoing business model transformations. By comparing multiple cases, we were able to identify common patterns and gather detailed insights into the activities undertaken, steps followed, and real-world challenges faced by managers and firms.⁵¹

Our research project lasted three years (from May 2014 to June 2017). The unit of analysis was the focal firm's transformation toward a circular business model. However, to gain deeper insights into business model transformation, we also collected data from ecosystem actors for each circular business model case. This approach was rooted in the view that a business model transcends organizational boundaries⁵² and, thus, needs the involvement of multiple stakeholders such as customers, suppliers, and service partners. In each case, however, one dominant incumbent manufacturing firm took charge of coordinating development and transformation efforts with regard to the evolving circular business model. All cases represented business model extensions in that they complemented rather than replaced existing dominant business models. For example, many cases centered on circular business models such as advanced service solutions or performance-based offers, although most companies continued to use product-based business models as well.

Data Collection

We used purposive sampling and selected eight incumbent manufacturing firms for data collection. Three sampling criteria were used. First, each firm indicated that sustainability was a vital part of its future strategy. For example, all firms had circular business models that were in progress or that had recently been launched. Second, to increase variation within the sample and yield more

general insights, firms from numerous industries and global markets were selected. The industries included construction equipment, medical technology, appliances, aviation, automotive, and mining. Finally, we selected firms for which we had access to ecosystem actors (e.g., suppliers, customers, and service partners). Table 1 provides details on the eight case firms and the interviews that underpinned the study. Table 2 provides descriptions of the cases, business model challenges, and outcomes associated with each case.

The vast majority of the interviews were conducted in Sweden. Complementary interviews were conducted in the United States, Denmark, Norway, the Netherlands, and Finland. We conducted 60 interviews with different respondents over three phases.

First, before the formal interviews, circular business model transformation cases within the eight incumbent firms were identified through dialogue with key company contacts. Three criteria were used to identify suitable cases: the business model was new and focused on substantially improving sustainability, business model changes occurred across two or more of the four dimensions of each business model, and the new business model had clear implications for the roles and responsibilities of ecosystem actors. During this step, we mainly interacted with senior management executives (e.g., CEOs, research and development [R&D] managers, and service directors), who were able to provide a detailed overview of ongoing or recently launched business model transformation initiatives within their firms.

Second, we conducted 25 semistructured interviews with multiple respondents at the eight incumbent manufacturing firms. Respondents held a range of positions. These interviews gathered data on the development and launch of circular business models and lasted between 50 and 120 minutes. Example questions were: Can you describe the nature of your circular business model? How does the new business model create, capture, and deliver value to customer segments? What are the critical challenges and activities performed during circular business model development?

Third, we performed another 35 interviews with ecosystem actors such as customers, suppliers, and service partner companies. These actors were directly or indirectly linked to each evolving circular business model.

Finally, after the interviews, we conducted 12 workshops. Our emerging circular business model framework was presented to key contacts at the eight incumbent firms to discuss and validate our findings. The workshops lasted two to three hours. Participants provided feedback on the proposed roadmap and suggested improvements.

To enhance quality, multiple researchers conducted key interviews together for each business model case. This encouraged discussion and ensured an overlap between data collection and data analysis. We also studied secondary data sources such as company websites, internal documents, and published materials. These secondary sources complemented the interviews during data analysis. Data from

TABLE 1. Descriptive Overview of Case Firms.

Focal Case Company	Company Size (Sales Turnover/ Employees)	Circular Business Model Description	Respondents at Focal Company	Ecosystem Actors	Respondents at Ecosystem Actors
Case 1: Metso <i>A world leading industrial company serving the mining, aggregates, recycling, oil, gas, pulp, paper, and other process industries.</i>	2,586 MEUR/12,619 Employees	Performance-based pressure filter systems in processing industries	Product Specialist, Project Service Manager, Senior Manager Spare Parts	Boliden, LKAB, ABB, Rimard industri, Pöyrö, Bosch Rexroth	Procurement Manager, Head of Operation Department, Procurement Manager, Control System Specialist, Service Manager, Electrical Engineer, Plant Manager
Case 2: Scania <i>A world leading manufacturer of commercial vehicles—specifically heavy trucks and buses.</i>	11,260 MEUR/42,000 Employees	Digital fleet management system	Senior Manager Accessories, Senior Business Development Manager	Ziegler Group, Vendelbo Spedition A/S, Militzer & Munch, Asta Logistik Grupo	Operation Officer, Senior Manager Operation, Service and Maintenance Manager, Operations Development Manager
Case 3: Volvo Cars <i>A well-known global car brand, which is heralding an all-electric future.</i>	13,226 MEUR/38,000 Employees	Luxury car sharing services	New Technology and Service Director, Product Development Director, General Director Services	Sunfleet, Tobin properties	Head of Business Development, Customer Relationships, and After- Market Services
Case 4: Saab <i>A provider of world-leading products, services, and solutions for military defence to civil security.</i>	29,529 MEUR/16,427 Employees	Performance-based aircraft solutions	Design Engineer, Key Account Manager, Director Business Development, Head of Commercial Management	Williams, BAM, FMV	Senior Design Engineer, Base Manager, Purchasing Manager

(continued)

TABLE 1. (continued)

Focal Case Company	Company Size (Sales Turnover/ Employees)	Circular Business Model Description	Respondents at Focal Company	Ecosystem Actors	Respondents at Ecosystem Actors
Case 5: Smith & Nephew <i>A global medical technology business dedicated to helping improve people's lives.</i>	39,995 MEUR/5,000 Employees	Medical arthroscopy fluid management services for hospitals	Sales manager	Medical Vision, nondisclosed service delivery company	CEO, Sales and Marketing Manager; Service Manager; Service Delivery Manager
Case 6: Volvo Construction Equipment <i>A major international company that develops, manufactures, and markets equipment for construction and related industries.</i>	6,254 MEUR/4,000 Employees	Performance-based customer support agreements for the construction industry	After-Sales Manager; Regional Manager; Global Product Manager; Soft Product Planning Director Technology Funding and Acquisition	FAMCO, SMT, Kuiken, Swecon	Operations Manager; Product and Service Business Developer; Head of Operation, After-Sales Manager
Case 7: Asko (Gorenje Group) <i>A Swedish appliance manufacturer that is inspired by all the typical Scandinavian values, such as functional, minimalist design, high quality, and environmental responsibility.</i>	12,580 MEUR/1,000 Employees	Sustainable kitchen solutions	Production Manager; Service Manager; Key Account Manager; Operations Manager	Collia, Porkka, Wexiödisk	Key Account Manager; Senior Manager Technology, Procurement Manager
Case 8: Nexans <i>A global leader in advanced cabling and connectivity solutions.</i>	6,370 BEUR/26,000 Employees	Sustainable cable packaging	Product Manager; Head of Purchasing, Plant Manager	Ahlsell, Borealis, Elektrokoppur; Spitze, Stora Enso	Head of Production, Sustainability Manager; Senior Manager; Environment Expert, Sales and Marketing Manager; CEO, CEO No. 2, Sustainability Manager

Note: MEUR = million Euro; BAM = Bromma Air Maintenance; FMV= Swedish Defence Materiel Administration; SMT= service machinery trucks; BEUR = billion Euro.

TABLE 2. Description of Circular Business Model Cases.**Case 1: Performance-based pressure filter systems in processing industries**

Pressure filters perform dewatering of minerals or ore concentrates and are critical to the production of the final product, such as metals, fines, or iron pellets used in processing industries. The upgraded filters resolve bottlenecks during production through improved uptime. The business model transformation involved revised value-capturing mechanisms and a reconfiguring of the offer as an integrated solution. The circular economy outcomes include improved total system utilization, significant cuts in electricity use/energy costs, improved raw material flows, decreased need for maintenance, prolonged filter lifespan (about 50%). In addition, production costs decreased and annual processing capacity increased.

Participating companies: Metso, Boliden, LKAB, ABB, Rimard industri, Pöyrö, and Bosch Rexroth.

Case 2: Digital fleet management system

A service package comprising trucks, sensors, connectivity, and software for use by truck fleet operators. It monitors usage and also offers driver training, route planning, and advice regarding truck loading and use of gears and brakes. The business model challenges relate to a need for new service development with limited prior experience, considering additional risks and revenue sharing with service partners, and managing increased customer interaction. The circular economy outcomes include reduced maintenance needs and improved spare part management due to better planning and less breakage, reduced fuel consumption (5%-6%), and prolonged life of tires. In addition, customers' operating margin improved (about 2%), as did overall fleet utilization.

Participating companies: Scania, Ziegler Group, Vendelbo Spedition A/S, Militzer & Munch, and Asta Logistik Grupo.

Case 3: Luxury car sharing services

Service offering access to an array of premium Volvo cars to residents of high-end apartments in Stockholm, Sweden (access without ownership). It is promoted as an economical and sustainable alternative to ownership of a second car (the fee is included in the monthly rent for the apartment). The business model challenges relate to designing of new revenue model, establishing superior after-sale services, delivering on promised function and accessibility to end user, and ensuring quality grantees (i.e., standard of cars, clean interiors). The circular economy outcomes include improved utilization of products, more effective maintenance, and reduction in total number of cars needed (when second car is replaced).

Participating companies: Volvo Cars, Sunfleet, and Tobin Properties.

Case 4: Performance-based aircraft solutions

Service offering access to military aircrafts on performance-based terms. The customer receives a set of capabilities or "systems" for an annual fee instead of purchasing the product up-front. This "augmented" solution includes flight training, logistics, upgrading, storage, and life-cycle management. The business model challenges relate to development of new types of services, contracts portfolio, and proposing a new revenue model where 75% of cost is invoiced as fixed amount. The circular economy outcomes include reducing maintenance costs, prolonged product life cycles, and increased availability. In addition, there could be cost savings for the customer (of up to 25% of total costs) and improved system-wide performance of technology.

Participating companies: Saab, Williams, BAM, and FMV.

Case 5: Medical arthroscopy fluid management services for hospitals

Package consisting of a pump and disposables that together increase visibility during endoscopic surgery—surgeons' view is less obstructed by blood and other fluids. Typically, the pump is too expensive for hospitals to purchase, so customers are charged for the disposables (razor-and-blade business model logic). The business model challenges relate to business model change centered on a new service for hospitals, and revised revenue model—that is, pay-per-use logic, for disposables. The circular economy outcomes include decreased use of saline water, which reduces operating costs, including after-sale service with a focus on maintenance and calibration of equipment. These service components have increased the life of the pump by about three years.

Participating companies: Smith & Nephew, Medical Vision, and a nondisclosed service partner.

(continued)

TABLE 2. (continued)**Case 6: Performance-based customer support agreements for the construction industry**

A three-level service package of tools and services tailored to the customer's unique needs and value. The highest value-adding package (gold) includes a number of benefits, such as a strong partnership between provider and customer, a focus on the customer's core business, maximum uptime potential, and effective cost control. The business model challenges relate to aligning incentives between OEM and service delivery partners, improving revenue model for lowering risk, and ensuring delivery of promised functions. The circular economy outcomes include enhanced life of the equipment through improved maintenance and service contracts. Opportunity for availability-based guarantee for predetermined number of working hours and maximize uptime. Flexible payment options for customers.

Participating companies: Volvo Construction Equipment, FAMCO, SMT, Kuiken, and Swecon.

Case 7: Sustainable kitchen solutions

Solutions include after-sales and after-life services that are packaged and structured based on unique customer-centric sales contracts. The services generate benefits by customizing according to the customer's need/contract and by taking care of the product at the end of its active life (recycling and reuse). The business model challenges relate to reluctance to change internal revenue model, higher risk guarantees, and managing customers' unique needs, and safeguarding financial costs associated with end-of-life activities. The circular economy outcomes include customized solutions combined with service contracts to ensure longer life for the appliances and reduced energy consumption in kitchens due to enhanced construction and installation. After-life services ensure systematic recycling and resource recovery for the next generation of appliances.

Participating companies: Asko, Colia, Porkka, and Wexiödisk.

Case 8: Sustainable cable packing

This packaging solution is an alternative to PVC and other types of plastic traditionally used for cable packaging. The cable is surrounded by sturdy corrugated cardboard made to withstand humid conditions and rough handling. Additional features include the use of recycled biodegradable materials. The business model challenges relate to closing circular loops by involving customers and lead users, ensuring that the average customer sees the value in developing new, recyclable packaging based on paper instead of plastic, and increased responsibility and involvement of third parties. The circular economy outcomes include the cable packaging is stable during transport and is easy to stack, saving space and minimizing transport costs. In addition, the packaging ensures that the cable will not be damaged, increasing the product's economic and environmental potential.

Participating companies: Nexans, Ahlsell, Borealis, Elektrokoppar, Spitze, and Stora Enso.

Note: OEM = original equipment manufacturer; PVC = vinyl or polyvinyl chloride.

these sources were then analyzed to build case-specific knowledge, validate findings, and triangulate the empirical data.

Data Analysis

The study followed a hybrid data analysis approach. This approach combined content analysis (i.e., coding text to identify prominent themes) and process analysis (i.e., data collection and analysis of data over time). The interviews were recorded and transcribed verbatim. We first analyzed each case separately. We then performed cross-case analysis where the eight cases were compared and similarities and differences were identified. Because our focus was on *how* circular business model transformation takes place, we coded these data thematically into four themes. *Circular economy principles* consisted of guidelines for transforming the existing business model. *Key activities* referred to specific steps taken by incumbent firms to realize circular business model transformation. *Sequence of activities* referred to the chronological order in which key activities took place.

Finally, *phase outcomes* related to milestones in the business model transformation process.

The identification of themes across the cases enabled us to develop a step-by-step roadmap for circular business model transformation. We compared our first draft with the processes described in the literature. We then validated the framework using multiple workshops with companies, discussed it extensively within our research team, and revised it multiple times.

A Roadmap for Circular Business Model Transformation

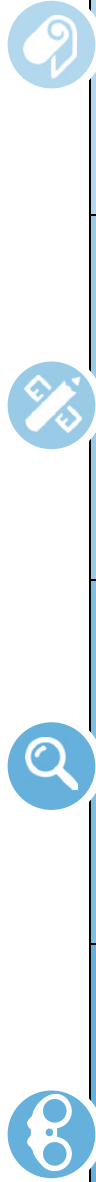
The activities of the circular business model transformation roadmap were surprisingly similar across the cases. They further converged when our interim findings were discussed across the firms and were validated through workshops with senior managers and engineers from the firms. The underlying development paths followed by the different case firms were similar.

Overall, the business model transformation process was iterative rather than sequential and emergent rather than planned. It was also characterized by small-scale trial and error rather than immediate large-scale rollout. Managers did not always know exactly what would materialize and what the circular contributions would be. This observation is consistent with sustainable development as a “wicked problem” whose solutions must develop through a socially complex process.⁵³ Table 3 provides some order to a process that, in practice, was far from orderly. The table explains the key steps taken by incumbent firms as they managed internal organizational as well external transformation of ecosystem actors toward the implementation of circular business models.

Initiate Circular Business Model Transformation

The purpose of the first phase was to analyze the circular business model transformation opportunities for incumbent firms. Not all business model transformation opportunities have similar potential for increasing circular properties within existing business models. Moreover, many incumbent firms had inadequate information about the underlying requirements for transformation toward a circular economy. Thus, firms often needed awareness of circular economy guidelines geared toward exploiting business model opportunities related to, for example, reduction and reuse, recycling, energy recovery, and waste management approaches. Many case companies had also revised their visions of becoming more environmentally and socially conscious. For example, according to the CEO of Volvo Cars (Case 3): “Our purpose is to provide safe, sustainable and convenient mobility, making a positive contribution to society.”⁵⁴ Asko (Case 7) constantly strived to provide environmentally friendly products while contributing to society by educating consumers about how to make sustainable choices. These and similar statements from the other cases reflected awareness of developing more sustainable solutions with potential for economic, environmental, and social benefits.

TABLE 3. A Framework for Circular Business Model Transformation.



Phase objective:	PHASE 1: Initiate circular business model transformation opportunities	PHASE 2: Audit the current business model	PHASE 3: Design and develop a circular business model	PHASE 4: Scale-up the circular business model
Circular economy principles (What to think about)	<p>Awareness of circular economy guidelines:</p> <ul style="list-style-type: none"> - Reduction and reuse - Recycling and composting - Energy recovery - Treatment and disposal <p>Evaluate circular economy principles to see if and how they may be building blocks for a revised business model</p>	<p>Targeting circular economy business model goals:</p> <ul style="list-style-type: none"> - Financial benefits - Environmental benefits - Social benefits <p>Evaluating circular business model opportunities for achieving triple bottom line</p>	<p>Circular business model (design elements):</p> <ul style="list-style-type: none"> - Regenerate - Share - Loop - Optimize - Virtualize - Exchange 	<p>Realize circular economy business model goals:</p> <ul style="list-style-type: none"> - Financial benefits - Environmental benefits - Social benefits <p>Ensure circular business model fulfills triple bottom line</p>
Key activities (What to do)	<p>Broad scanning of environmental trends (political, economic, social, technological, legal, and environmental factors) for circular business opportunities</p> <p>Understand the ecosystem in which a focal firm is embedded (partners, stakeholders, their interests and needs, tensions, etc.) for exploitation of circular business opportunities</p> <p>Customer analysis using circular economy guidelines: Who are at the heart of the customer base? For whom are we creating value? What are the customer dynamics?</p>	<p>Map the current business model by explicating Value creation, Value delivery, Value capture, and Customers or customer segments</p> <p>Map shortcomings and opportunities with the current business model toward the triple bottom line effect:</p> <ul style="list-style-type: none"> - Key shortcomings in Value creation, Value delivery, Value capture, and Customers or customer segments - Key opportunities in Value creation, Value delivery, Value capture, and Customers or customer segments <p>Analyze scope for circular business model transformation:</p> <ul style="list-style-type: none"> - Number of business model dimensions subject to change - Magnitude of change within each dimension - Analysis of the ecosystem in which a focal firm is embedded (partners, stakeholders, their interests and needs, tensions, etc.) 	<p>Mimicry/imitation: Study or benchmark innovative business models from other firms and industries</p> <p>Achieve sufficient internal alignment for circular business model</p> <ul style="list-style-type: none"> - Alignment of culture, logic, and incentives among internal departments <p>Configure the ecosystem partners for circular business model realization</p> <ul style="list-style-type: none"> - Alignment of processes, activities, contributions, roles, incentives, and perception of business model dimensions <p>Reach conceptual agreement on circular business model:</p> <ul style="list-style-type: none"> - Revise Value creation, Value delivery, Value capture, and Customers or customer segments - Ensure the different business model dimensions fit together as a coherent whole 	<p>Small-scale pilot testing</p> <ul style="list-style-type: none"> - Evaluate positive and negative effects of the circular business model elements on the triple bottom line business model element - Evaluate revenue and costs associated with each business model element - Reconfigure ecosystem collaboration <p>Large scale rollout and continuous business model adjustment</p> <ul style="list-style-type: none"> - Ongoing learning and adjustments - Additional changes within and across key business model dimensions
Phase outcomes:	Mapping and understanding the circular economy transformation requirements	The current business model made explicit, including shortcomings, opportunities, and scope for circular transformation	A revised business model with circular properties	A circular business model implemented to serve a mass market

In most cases, the dialogue surrounding circular transformation and the additional changes to elements of the business model started with a scan of relevant environmental trends. Many firms seemed to be guided by the standard political, economic, social, technological, legal, and environmental factors discussed in strategic management textbooks. The analysis was sometimes systematic and sometimes not. Key factors that seemed particularly relevant included current and future legislation (e.g., waste-disposal laws and certifications), social factors such as social acceptance or “social license to operate,” and changes in underlying technologies. New digital technologies were of particular interest because they were often viewed as potential enablers of a circular business model by providing opportunities to combine product and service properties. The case of Scania trucks (Case 2) highlights the enabling role of added sensors, improved connectivity, and data analytics as key components of launching service-based offerings, such as the fleet management system, which extends the life of trucks and reduces fuel consumption for customers. Another point of interest was technological development in response to social change. According to the New Technology and Service Director for Volvo Cars (Case 3),

Many people living in the city center don't want to own a second car but want to have access to one. So, together with luxury property developers and a car leasing company, we now offer a luxury car sharing experience to residents of certain newly constructed apartment buildings. They pay an hourly rate for the car, along with a monthly fee [that is] included in the rent for the apartment, then book a car through a mobile application. This provides an incentive to share rather than own a car, which makes social, environmental and economic sense.

Both examples highlight how business model transformation is triggered by a better understanding of circular economy guidelines.

The second activity was to analyze the ecosystem in which the companies were embedded. Respondents used terms such as “network actors,” “partners,” and “value chain” when discussing their industrial ecosystems. This view is based on the realization that developing a circular business model strongly depends on the contributions of others and that focusing solely on one's own firm and customers is insufficient. It was acknowledged that circular business model opportunity exploitation frequently requires active management of interconnected stakeholders whose interests must eventually converge. As a senior manager at Volvo Construction Equipment (Case 6) explained,

The company's ability to offer availability or performance-based customer support agreements is largely dependent on the competence and skills of global dealers. Dealers need to work jointly, work with us, to achieve the common goal of not only selling machines, but also ensuring availability of equipment. This is not always easy.

A common reason for such resistance was misalignment of incentives between the focal firm and its ecosystem actors. Thus, the mapping of complex and nested stakeholder needs and tensions was seen as critical.

Finally, during phase 1, additional analysis of the customer base was highly relevant. In Case 7, for example, Asko worked proactively to understand and define attractive new customer segments for its emerging circular business model (i.e., sustainable kitchen solutions). The following questions were seen as critical: who is at the heart of the customer base? For whom are we creating value? What are the characteristics of the particular customer segment? And how do we ensure that we are delivering value to customers? Questions such as these must always be kept in mind because the impact of the business model transformation will eventually depend on customer acceptance. The aforementioned activities for phase 1 lead to mapping and advanced understanding of the circular economy transformation requirements, which serve as an important prerequisite for business model change.

Audit the Current Business Model

In phase 2, the analysis shifted from external to internal business model issues. The focus was largely on the current business model of the incumbent manufacturing firms. In this phase, the guiding principle of the circular economy was to ensure alignment during transformation to achieve a triple-bottom-line effect consisting of financial, environmental, and social benefits. The common interpretation of the triple-bottom-line effect was the recognition that the new business model would need to create some benefits along all three dimensions (rather than solely focusing on economic benefits).

It is worth noting two points regarding phase 2. First, in every case, the dominant focal firm thought of the business model as “theirs,” despite wide recognition of the need for contributions from other actors. Second, the current business model was often implicit rather than explicit. Some respondents had a superficial or vague understanding of their business model, claiming that they were familiar with it despite having problems articulating its details. The following quotation from a project service manager in Case 1 illustrates both of these points:

Our division offers various types of products, and then there is this international unit of ours that focuses more strongly on solutions . . . So our firm has two dominant modes for doing business. Two business models as you call it.

To mitigate the latter problem, the current business model was explained as best as possible by employees. Many respondents were guided by prior theoretical frameworks. For example, several firms were aware of the business model canvas framework, or other frameworks from the literature. While each firm had an idiosyncratic approach to this exercise, the analysis centered on explaining how value is created, delivered, and captured, and, finally, who the current customer is or what the current customer segments are.

According to a technology development manager at Volvo Construction Equipment (Case 6), “The business model is probably the most misunderstood management concept. If you asked different people to describe our business

model, you will get very different answers.” In subsequent dialogues, the need to establish a common understanding of the business model was underscored by this informant and others. Similar insights were shared by informants from Case 4, where the focal firm intended to provide aircraft solutions. These informants explained that the greater focus on service business development first required that the traditional business model and all its elements were made explicit.

The analysis then shifted to mapping the shortcomings of the current business model and opportunities associated with potential (future) circular versions. This process put emphasis on achieving triple-bottom-line effects, but most often revealed that these goals were difficult to achieve without significant business model transformations. In Case 1, for example, value was created when the customer was guaranteed a certain processing capacity, but the main supplier was still unable to fully capitalize on productivity improvements because the results were sold like a product (i.e., a one-time transaction). This observation underscores a potential shortcoming of the value capture mechanisms of the supplying firm. In Case 5, in contrast, the customers (hospitals) were reluctant to make up-front product purchases of pumps for endoscopic surgery. This resistance allowed for a value proposition in which the costs of the pump were distributed on disposables that worked with the pump. This represented an opportunity.

Companies then proceeded to analyze the scope of business model transformation, which had two dimensions. The first was quantitative: how many components of the business model can and should be transformed? The second referred to the magnitude of transformation *within* each component of the business model. For example, in Case 3 (luxury car sharing services), Volvo Cars and its partners made changes to all components of the business model. The performance-based aircraft solutions reported in Case 4 were less drastic as customer segments and value creation mechanisms remained largely intact. Finally, the scope of transformation was evaluated in relation to ecosystem actor roles and responsibilities as the focal firm pursued a circular business model opportunity. These phase activities enabled incumbent firms to explain their business models, including shortcomings, opportunities, and scope for circular transformation.

Design and Develop a Circular Business Model

After a thorough examination of external and internal preconditions, a circular business model (i.e., a business model with circular properties under the design logics of regenerate, share, optimize, loop, virtualize, and exchange) was developed.

The first core activity was to stimulate business model transformation through mimicry, which enabled benchmarking against other innovative business models. It might appear paradoxical that a key driver of business model transformation, which presupposes innovation, is actually *business model imitation*. Many companies benchmarked or studied examples of circular, sustainable, or other innovative business models in firms from their own or other industries.

Well-known examples such as the power-by-the-hour model pioneered by Rolls-Royce and the razor-and-blade business model pioneered by Gillette were mentioned multiple times. Other examples included Michelin's approach of charging its customers for kilometers driven based on chips placed inside tires and Hilti's fleet management solution, which allows customers to pay a fixed monthly fee that covers use, service, and repair costs for tools. A common lesson learned from studying other innovative business model examples was the need to enhance the focus on building the service components of the offering to achieve circular economy goals.

These and similar use- or results-oriented business models highlight potential sustainable benefits. Our analysis did not reveal any common way in which the case firms searched for or found such innovative business model benchmarks. It was nonetheless clear that the examples that were given often originated outside the focal company's industry. For example, Nexans (Case 8) actively looked for pioneering examples from the packaging industry, where sustainability is a priority and where companies such as BillerudKorsnäs not only promote renewable packaging materials but also work systematically with packaging design to enhance functionality (i.e., smart packaging solutions). By studying such examples, companies drove their own development efforts and became aware of potential difficulties, contingencies, or problems lying ahead.

The second core activity was for the focal firm (i.e., the primary owner or coordinator of the business model) to achieve sufficient internal alignment to ensure successful circular business model transformation. This activity proved a major challenge across all cases. When transitioning from selling products to selling solutions, firms often remained stuck in a product-oriented culture where key performance indicators lagged behind and largely measured product sales. Thus, companies had to work extensively with process and capability development throughout value creation, delivery, and capture activities, and ensure internal alignment for circular business models.

One particular problem was the R&D and service units' divergent views on value creation. Service units tended to press for customization and for every offer to be unique, whereas back-end R&D promoted standardization and a one-size-fits-all approach. For example, in Case 7, the focus was on offering sustainable kitchen solutions. Doing so required empowering front-end personnel to work on customized solutions while revising the role of R&D to support this strategy. These problems were further exacerbated when companies operated globally, which entailed managing internal units across cultural and country boundaries. In response, the firm in Case 7 launched a development program to train both progressive and laggard service and sales units so that they could become more skilled in delivering their offerings. In contrast, a key lesson from Case 6 (Volvo Construction Equipment), which centered on performance-based contracts in the construction industry, was the need for alignment activities across all dimensions of the circular business model (i.e., value creation, value capture, value delivery, and customers).

However, external alignment and configuration of the ecosystem or partner network were found to be equally important. A circular business model calls for the involvement of multiple actors in an ecosystem, who become increasingly interdependent in terms of processes and activities. In many cases (e.g., Case 5 and Case 2), new partners were also sought to develop and deliver the new solution.

For example, Volvo Cars (Case 3) established new relationships with diverse property developers (e.g., Tobin Properties) that benefited from offering sustainable mobility solutions to their residents. Volvo Cars and Sunfleet, a leasing and service organization, also benefited from being branded as a mobility solutions provider, in addition to gaining new sources of revenue from increased car sales and a subscription-based payment model.

However, alignment of incentives within a group of ecosystem actors often proved problematic. For example, service partners may act opportunistically by selling service contracts without taking full accountability for service maintenance costs, which must then be borne by the original equipment manufacturer, as observed in Case 6. Customers can also start to misuse the service guarantee and change their behavior, as occurred during the early years of power-by-the-hour contracts. Other examples are simpler. For instance, in Case 5, ecosystem partners did not have the financial means to invest in new business models. Incumbent manufacturing firms, therefore, need to actively collaborate through “ecosystem orchestration” to make the emerging circular business model work. Examples include activities such as nurturing (i.e., providing additional incentives), negotiating (i.e., resolving conflicts and tensions), and standardizing (i.e., seeking formal certification) to ensure alignment and reduce the likelihood of opportunistic behavior. In particular, it is important to determine which partners are needed, what they contribute, and how the different actors perceive their roles, as well as creating a win-win setup that guarantees a feasible value proposition for all participants.

Once internal and external alignment has been achieved, conceptual agreement about a new circular business model has to be reached. The revised model of value creation, value delivery, and value capture can be formalized along with new approaches for targeting new customer segments. In all eight cases, the incumbent manufacturing company changed at least two of the business model dimensions (see Table 2). However, changes to individual business model dimensions did not occur in isolation. In particular, value creation must be aligned with the expectations of new customer segments. For example, customers may be reluctant to buy functions rather than products because they do not want suppliers to become further integrated into their operations. Second, alignment between cost structure and revenue streams is necessary. Any imbalance may represent a major challenge. One example is when revenues from up-front sales are lost in favor of monthly licensing fees. If this is not properly accounted for, a serious liquidity problem may arise. To conclude, phase 3 activities lead to design and development of a revised business model with circular properties.

Scale-Up the Circular Business Model

The final phase focused on validating and implementing a circular business model that met the broad goals with respect to financial, environmental, and social benefits. However, precise measurement was often difficult. The focus on revised business models was not always to quantitatively achieve equal effects on the triple bottom line but rather to ensure that focal firms intentionally worked toward enhancing value in all dimensions by launching new circular business models.

A common challenge here relates to capturing and communicating value across all three dimensions because they are often interlinked with one another. For example, economic and environmental benefits were easier to define than social benefits. Case 3 improved product use, provided more effective maintenance, reduced the total number of cars needed, enhanced brand value, and boosted sales of new cars through new service offers. However, hidden social value consisted of changing customer behavior to move away from owning and toward sharing cars. Similarly, Case 7 focused on combining customized solutions with service contracts, which prolonged appliances' lifespans. Thus, these effects were often difficult to measure quantitatively and accurately.

One similarity in all cases was a preference for small-scale (rather than mass-market) rollout. Across all cases, the new business model was implemented through pilot testing. The idea was to launch a "prototype business model," typically for one key customer, to obtain feedback on business model design and appropriate working conditions. This was seen as an opportunity for rapid learning through trial and error, valuable feedback cycles, and a revised business model for the next customer. During interaction with Volvo Construction Equipment (Case 6), we were introduced to the self-invented concept of "micro services." These emerging service concepts were tested on a regular basis with selected customers before being standardized and bundled for global rollout.

These pilot tests enabled evaluation of positive and negative effects of the elements of the business model on the triple bottom line. Realizing these positive effects was sometimes easier in theory than in practice. For example, with the greater focus on ownership and service contracts, a provider might develop inferior equipment, which costs less up front and leads to higher profits but may have a shorter lifespan, actually resulting in a negative environmental impact. In other words, there was sometimes a trade-off between financial, environmental, and social benefits. Such negative effects must be understood so that countermeasures can be taken. Such countermeasures include adjusting the business model to further emphasize circular properties.

In addition, countermeasures needed to be aligned with ecosystem actors for successful rollout. In some small-scale trials, it became evident that the supplier had taken on more responsibilities than could be delivered or sustained by in-house competence. This opened up discussions on including other partner companies in the ecosystem. This situation was particularly evident when incumbent firms wanted to recycle or take back the product at the end of the product's life (Case 7) or needed to introduce new digital functionalities (Case 2).

Finally, we found evidence of the need to match large-scale rollout with continuous learning and adjustment, especially after the new circular business model has been scaled up to reach an intermediate level or serve a mass market, which is often the ultimate goal. Continuous alignment of the four key dimensions of the business model may be necessary, as well as additional changes within each dimension. Thus, based on phase 4 activities, incumbent firms are able to implement a circular business model that serves a mass market.

Discussion

Together, environmental problems such as pollution, global warming, and ozone layer depletion arguably constitute the most important challenge of our time. Because business activities are one cause of such environmental problems, improved sustainability is now a priority for many large manufacturing firms. Incumbent firms respond to this challenge by implementing circular business models. In doing so, however, they frequently encounter a host of transformational challenges. Moreover, transformation from linear to circular business models takes time. Typically, in the cases we studied, a period of one to three years was required to undergo this transformation. Therefore, we investigated how circular business model transformation actually takes place in incumbent firms. By doing so, we addressed three shortcomings of the literature.

First, while the circular economy has become the primary framework for examining sustainability in practice, it currently represents a philosophy, phenomenon, or view rather than offering specific guidelines for application. This article provides a way of operationalizing the ideas expounded in the circular economy literature. Second, the PSS literature, which is more mature than the circular economy literature, presents conceptualizations of various types, characteristics, and outcomes of circular business models.⁵⁵ However, it fails to depict a detailed transformation process.⁵⁶ Third, the prevailing focus is on a single firm's business model, even though circular business models are, in fact, developed within ecosystems (i.e., through interactions among organizations that are bound together by collective investments rather than hierarchical management).⁵⁷ We seek to overcome this prevailing focus. Finally, prior studies of sustainability transitions in business models have studied niche-market pioneers rather than mass-market incumbents. Furthermore, these studies have largely been conceptual or have offered a static view of what is in fact a complex, dynamic reality. For example, sustainability-based versions of the business model canvas have been proposed, but insights into how incumbent firms transform their business models by embracing circular elements are lacking. This focus on incumbents, thus, constitutes an empirical contribution.

To overcome these shortcomings, we provide a framework for circular business model transformation in the form of a step-by-step roadmap for a firm-level transition and ecosystem-level changes. By defining key activities, sequences, and outcomes, our framework provides guidance on turning existing linear business models into circular models.

Managerial Implications

At its core, the transition to a circular business model is a fundamentally discovery-driven approach, which is characterized by iteration, experimentation, trial and error, learn-as-you-go, and rapid feedback loops. The transition process may be risky. It is fundamentally uncertain because managers may have less accurate information and perceptions of the firm's future business model than they have of the current one.⁵⁸ In addition, and somewhat paradoxically, circular business model transition seems to happen by imitation rather than by innovation. Through a process of mimicry, managers seek inspiration from other firms and industries and transfer best practices and insights to their own business model development. As firms pursue transition, it becomes apparent that it is a question of circularness, with firms gradually adopting and adding circular properties. Therefore, even a so-called "weak sustainability proposition" can lead to major positive environmental effects because incumbents operate in mass markets.

Our step-by-step roadmap is a tool for managing risk and uncertainty because it allows managers and firms to better understand what circular transformation can look like. It enables mimicry and allows companies to gradually adopt circular business models. By learning from our case study, managers can gain insights into activities, process steps, and outcomes. Fundamentally, therefore, the roadmap is a sensemaking device.⁵⁹ It allows managers to make sense of a firm's current business model and the ideas that underpin the circular economy literature. The roadmap explains the implications for the focal firm and the ecosystem actors and provides a starting point for firms to revise their existing business models.

In particular, circular business model transformation often requires changes to two or more of the key business model dimensions (e.g., value creation, value delivery, value capture, and customer segments). In pursuing these changes, managers must seek changes not only *within each dimension*, but also *across dimensions*. For example, changes in value creation must align with the preferences of customer segments, and new types of revenue streams have immediate cost-side implications. There may also be a front-end/back-end coordination problem because R&D and product development promote standardization, whereas service units adopt the customer's perspective and require a much greater degree of heterogeneity and customization. The implication is that both internal and external alignment is critical for successful circular business model implementation, which further underscores the importance of a firm's internal sensemaking.

At a deeper level, the transition toward a circular business model may entail cultural change. A materials-intensive, product-oriented firm that repositions itself as a provider of solutions under a use- or results-oriented business model redefines itself as a provider rather than a producer.⁶⁰ This redefinition may require new collaborative capabilities and a change in self-identity and operating logic. The implication is that new capabilities may be needed. These new capabilities take time to develop as they are acquired through path-dependent learning processes. To some extent, new types of partnerships can offset internal capability development and may help incumbent firms launch circular business models.

However, internal sensemaking and new capabilities are not enough. New forms of value creation and delivery must be aligned with customers' willingness to buy functions or results rather than products. Moreover, a new circular business model requires input from a network or ecosystem of firms rather than a single firm. While an incumbent firm may play a central role and coordinate efforts, incentives need to be aligned across firms in a win-win strategy that encourages all firms to contribute. This places immediate pressure on managers to resolve tensions, mitigate resource dependencies, and create a win-win scenario.⁶¹ It also urges managers to develop an in-depth understanding of how value is created, not only for their own firm but also for their partners. Doing so enables coordination of multilateral dependence through roles and rules and ensures alignment across actors.⁶² The need for alignment is also underscored by the fact that many firms end up operating multiple business models (PSS and conventional product sales in parallel), which require them to manage a portfolio of business models rather than just a single model.⁶³

Conclusion

Environmental problems require much more than research. They require action. Our article provides a roadmap for how to change linear business models into circular business models. By delineating key activities and outcomes, it provides a starting point for circular transition in firms. The roadmap, thus, underscores the need for action and provides a method to do so. We call upon incumbent firms to act.

Acknowledgments

The authors would like to thank the editors of CMR and six anonymous referees for constructive comments.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was funded by The Swedish Governmental Agency for Innovation Systems (Vinnova), Formas, and Energimyndigheten under the research program "Production 2030."

Author Biographies

Johan Frishammar is a professor at Entrepreneurship & Innovation at Luleå University of Technology and an associate research fellow at the House of Innovation at Stockholm School of Economics, Sweden (email: Johan.Frishammar@ltu.se).

Vinit Parida is a professor at Entrepreneurship & Innovation at Luleå University of Technology, Sweden, and a visiting professor at the University of Vaasa, Finland (email: Vinit.Parida@ltu.se).

Notes

1. Antony Upward and Peter Jones, "An Ontology for Strongly Sustainable Business Models: Defining an Enterprise Framework Compatible with Natural and Social Science," *Organization and Environment*, 29/1 (March 2016): 97-123.
2. Stefan Schaltegger, Florian Lüdeke-Freund, and Erik G. Hansen, "Business Models for Sustainability: A Co-evolutionary Analysis of Sustainable Entrepreneurship, Innovation, and Transformation," *Organization and Environment*, 29/3 (September 2016): 264-289.
3. By sustainability, we mean, "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This definition was adopted from *Our Common Future: Report of the World Commission on Environment and Development* (New York: United Nations, 1987).
4. Jeff Kauflin, "The World's Most Sustainable Companies 2017," *Forbes*, January 17, 2017, accessed October 26, 2018, <https://www.forbes.com/sites/jeffkauflin/2017/01/17/the-worlds-most-sustainable-companies-2017/#67321ca64e9d>.
5. Upward and Jones, 2016, op. cit.
6. Ellen MacArthur Foundation, "Towards the Circular Economy: Economic and Business Rationale for an Accelerated Transition," accessed October 20, 2017, <https://www.ellenmacarthurfoundation.org/circular-economy/concept>.
7. Mateusz Lewandowski, "Designing the Business Models for Circular Economy—Towards the Conceptual Framework," *Sustainability*, 8/1 (January 18, 2016): 43-71; Nigel Roome and Céline Louche, "Journeying toward Business Models for Sustainability: A Conceptual Model Found Inside the Black Box of Organizational Transformation," *Organization and Environment*, 29/1 (March 2016): 11-35.
8. Wiebke Reim, Vinit Parida, and Daniel Örtqvist, "Product-Service Systems (PSS) Business Models and Tactics—A Systematic Literature Review," *Journal of Cleaner Production*, 97 (June 15, 2015): 61-75.
9. Arnold Tukker, "Eight Types of Product-Service System: Eight Ways to Sustainability? Experiences from SusProNet," *Business Strategy and the Environment*, 13/4 (July/August 2004): 246-260.
10. Kaj Storbacka, Charlotta Windahl, Suvi Nenonen, and Anna Salonen, "Solution Business Models: Transformation along Four Continua," *Industrial Marketing Management*, 42/5 (July 2013): 705-716.
11. See, for example, N. M. P. Bocken, S. W. Short, P. Rana, and S. Evans, "A Literature and Practice Review to Develop Sustainable Business Model Archetypes," *Journal of Cleaner Production*, 65 (February 15, 2014): 42-56; Frank Boons and Florian Lüdeke-Freund, "Business Models for Sustainable Innovation: State-of-the-Art and Steps towards a Research Agenda," *Journal of Cleaner Production*, 45 (April 2013): 9-19; Lewandowski, 2016, op. cit.; Reim et al., 2015, op. cit.; Schaltegger et al., 2016, op. cit.
12. Marcus Linder and Mats Williander, "Circular Business Model Innovation: Inherent Uncertainties," *Business Strategy and the Environment*, 26/2 (February 2017): 182-196; N. M. P. Bocken, C. S. C. Schuit, and C. Kraaijenhagen, "Experimenting with a Circular Business Model: Lessons from Eight Cases," *Environmental Innovation and Societal Transitions*, 28 (September 2018): 79-95; Pejvak Oghazi and Rana Mostaghel, "Circular Business Model Challenges and Lessons Learned—An Industrial Perspective," *Sustainability*, 10/3 (2018): 739-758.
13. Schaltegger et al., 2016, op. cit.
14. Lewandowski, 2016, op. cit.; Roome and Louche, 2016, op. cit.
15. Ana Paula Bezerra Barquet, Maicon Gouvea de Oliveira, Carolina Román Amigo, Vitor Pinheiro Cunha, and Henrique Rozenfeld, "Employing the Business Model Concept to Support the Adoption of Product-Service Systems (PSS)," *Industrial Marketing Management*, 42/5 (July 2013): 693-704.
16. Lewandowski, 2016, op. cit.
17. Karolin Frankenberger, Tobias Weiblen, Michaela Csik, and Oliver Gassmann, "The 4I-Framework of Business Model Innovation: A Structured View on Process Phases and Challenges," *International Journal of Product Development*, 18/3-4 (2013): 249-273; Roome and Louche, 2016, op. cit.
18. Leona Achtenhagen, Leif Melin, and Lucia Naldi, "Dynamics of Business Models—Strategizing, Critical Capabilities and Activities for Sustained Value Creation," *Long Range Planning*, 46/6 (December 2013): 427-442.

19. Lewandowski, 2016, op. cit.
20. Christoph Zott, Raphael Amit, and Lorenzo Massa, "The Business Model: Recent Developments and Future Research," *Journal of Management*, 37/4 (July 2011): 1019-1042.
21. Karolin Frankenberger, Tobias Weiblen, and Oliver Gassmann, "Network Configuration, Customer Centricity, and Performance of Open Business Models: A Solution Provider Perspective," *Industrial Marketing Management*, 42/5 (July 2013): 671-682; Charlotta Windahl and Nicolette Lakemond, "Developing Integrated Solutions: The Importance of Relationships within the Network," *Industrial Marketing Management*, 35/7 (October 2006): 806-818.
22. Schaltegger et al., 2016, op. cit.; Thomas J. Dean and Jeffery S. McMullen, "Toward a Theory of Sustainable Entrepreneurship: Reducing Environmental Degradation through Entrepreneurial Action," *Journal of Business Venturing*, 22/1 (January 2007): 50-76; Bradley D. Parrish, "Sustainability-Driven Entrepreneurship: Principles of Organization Design," *Journal of Business Venturing*, 25/5 (September 2010): 510-523.
23. Schaltegger et al., 2016, op. cit.
24. Stefan Schaltegger, Florian Lüdeke-Freund, and Erik G. Hansen, "Business Cases for Sustainability: The Role of Business Model Innovation for Corporate Sustainability," *International Journal of Innovation and Sustainable Development*, 6/2 (2012): 95-119.
25. Arnold Tukker, "Product Services for a Resource-Efficient and Circular Economy—A Review," *Journal of Cleaner Production*, 97 (June 15, 2015): 76-91.
26. Bocken et al., 2018, op. cit.
27. Uwe G. Schulte, "New Business Models for a Radical Change in Resource Efficiency," *Environmental Innovation and Societal Transitions*, 9 (December 2013): 43-47; Julia L. K. Nußholz, "Circular Business Models: Defining a Concept and Framing an Emerging Research Field," *Sustainability*, 9/10 (October 10, 2017): 1810-1825; Vesela Veleva and Gavin Bodkin, "Corporate-Entrepreneur Collaborations to Advance a Circular Economy," *Journal of Cleaner Production*, 188 (July 2018): 20-37.
28. Oghazi and Mostaghel, 2018, op. cit.
29. Nußholz, 2017, op. cit., p. 1.
30. Lorenzo Massa, Christopher Tucci, and Allan Afuah, "A Critical Assessment of Business Model Research," *Academy of Management Annals*, 11/1, 2017: 73-104; Zott et al., 2011, op. cit.
31. Luis L. Martins, Violina P. Rindova, and Bruce E. Greenbaum, "Unlocking the Hidden Value of Concepts: A Cognitive Approach to Business Model Innovation," *Strategic Entrepreneurship Journal*, 9/1 (March 2015): 99-117.
32. David J. Teece, "Business Models, Business Strategy and Innovation," *Long Range Planning*, 43/2-3 (April-June 2010): 172-194; Frankenberger et al., 2013, op. cit.
33. Schaltegger et al., 2016, op. cit.
34. Linder and Williander, 2017, op. cit.
35. Bocken et al., 2018, op. cit.
36. Lewandowski, 2016, op. cit.; Nußholz, 2017, op. cit.; Oghazi and Mostaghel, 2018, op. cit.
37. Lewandowski, 2016, op. cit.
38. Jaakko Aspara, Juha-Antti Lamberg, Arjo Laukia, and Henriikki Tikkanen, "Corporate Business Model Transformation and Inter-organizational Cognition: The Case of Nokia," *Long Range Planning*, 46/6 (December 2013): 459-474; cf. H. Chesbrough, *Open Business Models* (Boston, MA: Harvard Business School Press, 2006); Teece, 2010, op. cit.
39. T. S. Baines, H. W. Lightfoot, O. Benedettini, and J. M. Kay, "The Servitization of Manufacturing: A Literature Review," *Journal of Manufacturing Technology Management*, 20/5 (2009): 547-567.
40. Storbacka et al., 2013, op. cit.
41. Tukker, 2015, op. cit.; Nußholz, 2017, op. cit.; Bocken et al., 2018, op. cit.
42. Tukker, 2004, op. cit.; Reim et al., 2015, op. cit.
43. Teece, 2010, op. cit.; Zott et al., 2011, op. cit.
44. Ron Adner, "Match Your Innovation Strategy to Your Innovation Ecosystem," *Harvard Business Review*, 84/4 (April 2006): 98-107; M. Jacobides, C. Cennamo, and Annabelle Gawer, "Towards a Theory of Ecosystems," *Strategic Management Journal*, 39/8 (August 2018): 2255-2276.
45. Charles Baden-Fuller and Vincent Mangematin, "Business Models: A Challenging Agenda," *Strategic Organization*, 11/4 (November 2013): 418-427.

46. Reim et al., 2015, op. cit.; Mark Esposito, Terence Tse, and Khaled Soufani, "Introducing a Circular Economy: New Thinking with New Managerial and Policy Implications," *California Management Review*, 60/3 (Spring 2018): 5-19.
47. Ivanka Visnjic, Andy Neely, Carmelo Cennamo, and Nikola Visnjic, "Governing the City: Unleashing Value from the Business Ecosystem," *California Management Review*, 59/1 (Fall 2016): 109-140.
48. Frankenberger et al., 2013, op. cit.
49. Roome and Louche, 2016, op. cit.
50. Martin Ihrig and Ian MacMillan, "How to Get Ecosystem Buy-In," *Harvard Business Review*, 95/2 (March/April 2017): 102-107.
51. Cf. Frankenberger et al., 2013, op. cit.; Roome and Louche, 2016, op. cit.
52. Zott et al., 2011, op. cit.
53. Roome and Louche, 2016, op. cit.
54. "Our Company at a Glance," accessed December 2017, <https://group.volvocars.com/company>.
55. Reim et al., 2015, op. cit.; Bocken et al., 2018, op. cit.
56. Nußholz, 2017, op. cit.; Mario Fagnoli, Francesco Costantino, Giulio Di Gravio, and Massimo Tronci, "Product Service-Systems Implementation: A Customized Framework to Enhance Sustainability and Customer Satisfaction," *Journal of Cleaner Production*, 188 (July 2018): 387-401.
57. Jacobides et al., 2018, op. cit.
58. Lamberg et al., 2013, op. cit.
59. Lionel Garreau, Philippe Mouricou, and Amaury Grimand, "Drawing on the Map: An Exploration of Strategic Sensemaking/Giving Practices Using Visual Representations," *British Journal of Management*, 26/4 (October 2015): 689-712.
60. Storbacka et al., 2013, op. cit.
61. Ihrig and MacMillan, 2017, op. cit.
62. Jacobides et al., 2018, op. cit.
63. Valérie Sabatier, Vincent Mangematin, and Tristan Rousselle, "From Recipe to Dinner: Business Model Portfolios in The European Biopharmaceutical Industry," *Long Range Planning*, 43/2-3 (April-June 2010): 431-447.