Open Business Models and Closed-Loop Value Chains:

Redefining the Firm-Consumer Relationship

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Driven by recent socio-economic developments, manufacturing firms increasingly adapt their business models along two dimensions. Apart from vertically integrating the entire product life cycle, traditionally separated tasks are re-allocated into new forms of horizontal stakeholder collaborations. Incorporating these two dimensions, this article develops a framework of nine business model archetypes that holistically capture the increasing openness of business models towards consumers in the emerging closed-loop value chain. Using illustrative examples, it demonstrates their broad applicability in different industries and derives important managerial implications for firm-consumer relationships, the relevance of consumer communities, new product development activities, and the sustainability of business models. (Keywords: Business Models, Product Life Cycle, Consumers, Vertical Integration, Sustainability)

Conventionally, manufacturing firms independently produce goods and sell them to customers. While this business model governed our thinking and teaching of business and management in the past and still exists in industries like fashion or fast-moving consumer goods, many firms are looking for new pathways out of shrinking markets, declining profits, and increasing commoditization of their products. Two recent socio-economic developments seriously threaten established business models, yet provide ample opportunities for firms to reinvent themselves.

The first development is prompted by growing societal concerns about our environment, corresponding ecological regulations, and the increasing demand for sustainable solutions that force firms "to take responsibility for the entire lives of their products."[1] This holistic perspective is driving the emergence of a *closed-loop value chain* and requires managers to design, control, and operate a system maximizing value creation over the entire life cycle of a product, striving to dynamically recover value from different types of returns over time.[2] Consider the example of consumer electronics: consumers frequently want to replace their current devices with the latest model, but are at the same time interested in returning their old products and to appropriately dispose their electronic waste—not just to save the

environment, but also to partially recover their payments.[3] They initiate return streams of value through re-selling or freely returning their products at the end of the consumption stage and, thus, become an integral part of the resulting closed-loop value chain.[4]

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The closed-loop value chain is conceptualized in this article by means of three consecutive stages in an extended product life cycle, comprising the production stage[5] (located within the sphere of the firm), the consumption stage (in the consumer sphere), and the subsequent circulation stage. The latter is also referred to as the reversed value chain and embraces all firm activities from product returns to the potential recovery of the products' maximum value via recycling and up-cycling activities.[6] Despite its potential for creating additional value, the circulation stage is often regarded as just a substantial cost driver for reacquisition, recycling, and disposal that negatively impacts firm profitability.[7] The management consulting company Accenture, for example, estimated that the costs of product returns in the U.S. consumer electronics industry have increased by 21% between 2007 and 2011, resulting in about $16.7 billion overall. Therefore, firms are challenged to extend their activities into the entire product life cycle and to reconcile economic and ecological objectives.[8] They need to develop competitive and integrated business models that extend the traditional production function, include service offerings in the consumption stage, and emphasize the circulation or recovery of distributed products.[9]

The second development is related to the increasing willingness—and ability—of stakeholders to participate in firm activities, particularly when enabled by emergent information and communication technologies (ICT).[10] Today, integrating external partners into the new product or service development process has become almost a routine activity for many organizations.[11] However, beyond these open innovation activities, a growing number of firms are also adopting a more open approach to their entire business models, including not just value creation, but also value capture. Open business models "help to create value by leveraging many more ideas because of their inclusion of a variety of external concepts [and] also allow greater value capture by utilizing a firm's key asset, resource or position not only in that organization's own operations but also in [the partners'] businesses."[12] Hence, we conceptualize the firm as a system of interdependent and transcending activities that span (internal and external) firm boundaries and enable the creation and capture of value in concert with external partners.[13] Apart from open business models with suppliers or strategic partners, such as IBM's collaboration with the Linux community, we observe an increasing number of businesses models in which consumers become a central element. Thanks to ICT such as social media, online collaboration platforms, toolkits, and mobile devices, firms can likewise open up their business model to a small number of highly specialized lead users as well as to larger consumer communities. With increasing openness of the business models, consumers can be either

engaged in simple co-creation practices of independent firms, the joint creation and capture of value in alliances, or peer-to-peer platforms.

A prominent example of a peer-to-peer platform operator is Amazon's independent publishing services. Here, hobby authors, experts, academic writers, or just about anyone can publish and distribute individually created work as hard-copy, digital, or audio books. Amazon offers access to its publishing ecosystem in return for an (often steep) percentage of any revenues earned. Hence, we argue that opening up business models to horizontal collaborations with external partners is replacing the independent production of goods by manufacturing firms in the traditional forward value chain.

The objective of this article is to demonstrate that taken together, these two developments fundamentally redefine the firm-consumer relationship and associated business models by vertically integrating the entire product-life cycle and by re-allocating traditionally separated tasks into new forms of horizontal collaborations. While the former can be separated into the three successive stages of the closed-loop value chain (production, consumption, and circulation), the latter comprises three types of horizontal collaborations, namely, independent firms (including simple co-creation practices), alliances, and platforms. Building on this categorization, we develop an integrated business model framework in the form of a 3x3 matrix. Including the traditional transaction-oriented manufacturer as a starting point, we define a framework of nine business models archetypes that supports corporate decision makers in structuring and navigating the vast opportunity space of sustainability-oriented business models as well as evaluating different strategic options in this domain.

While specifically contributing to prior literature that emphasizes the role of external partners in closing the value chain loop,[14] we complement the current debate on extended product life cycles by applying a business model perspective to the emergent phenomenon of closed-loop value chains. When the focus of competition shifts from independently operating firms driven by individual profit maximization to sustainability-oriented value chains driven by shared value,[15] new business models are required.[16] Further, we emphasize the impact of increasingly "informed, networked, empowered, and active customers" on the success of firms.[17] Whereas former research has primarily focused on co-creation practices in closed business models, we advance this understanding by delineating how external partners participate in open business models, focusing on the increasing prominence of consumers.

Nine Archetypes of Business Models

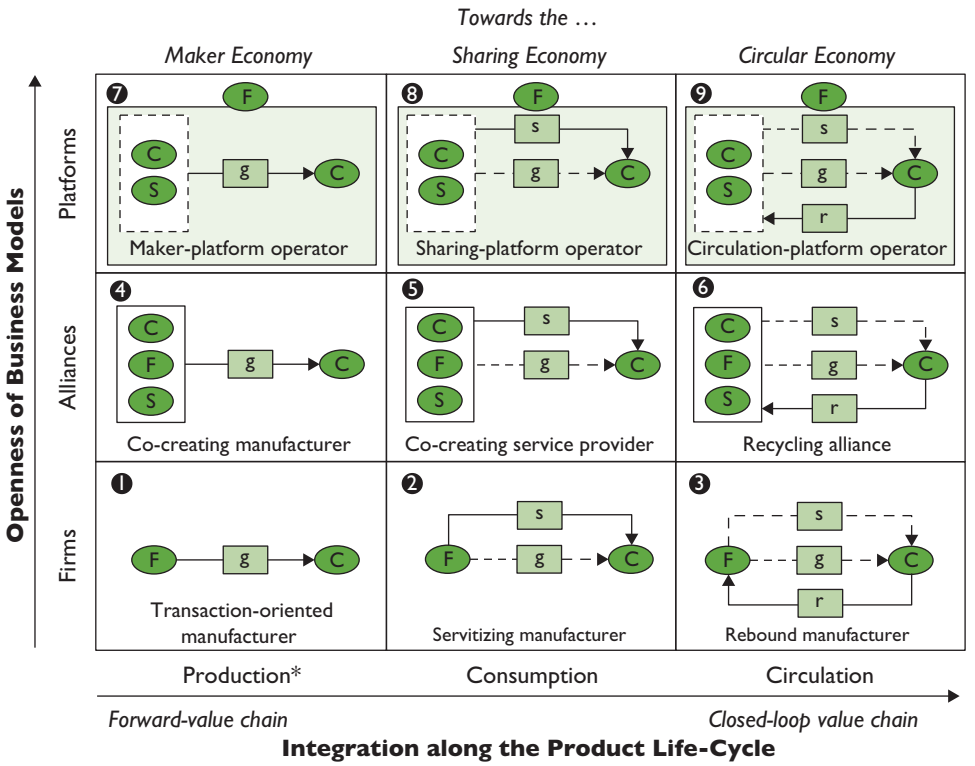
Established business model conceptualizations primarily cover the processes of value creation and capture in the forward value chain ending with the sale of a product to a consumer.[18] Whereas value creation is traditionally defined as the transformation of resources into customer value through innovation, manufacturing, and distribution, value capture is defined as the receipt of customer payments made in expectation of subjective benefits from acquiring the value.[19] Extending this traditional perspective, we derive nine business models

from extending firm activities into the entire product life cycle and considering the reallocation of firm activities to external partners. Figure 1 illustrates this model.

On the horizontal axis, we distinguish between three stages of value creation that offer various options to capture value. *Production* involves the traditional value creation activities of a manufacturing firm: new product development, manufacturing, and distribution. In the *consumption* stage, value-creating activities include all services that are associated with the product and/or the user. Eventually, *circulation* involves all value-creating activities from product returns to the potential recovery of the products' maximum value.

On the vertical axis, we distinguish between three types of collaborations that can be used to reallocate activities to external partners in increasingly open

FIGURE 1. The Integrated Framework: Open Business Models in Extended Product Life Cycles



Notes: **Production* covers all activities of a conventional forward value chain, including product/service development, manufacturing, and distribution.
Indication of Stakeholders: F: focal firm; C: consumers; S: suppliers, contributors.
Output: g: goods, s: value-add services, r: re-acquired products.
Activities: Firms can integrate additional activities down the closed-loop value chain (g, s, r).
Solid lines indicate the core business activity of a cell/business model, *dashed lines* indicate potential activities of other cells/business models that can be integrated.

business models. Independent firms employ *closed business models*, even if they co-create value with consumers and suppliers, but without letting them participate in value capture. This is different from *alliances*, where firms and external partners jointly create and capture value. In the case of *platforms*, firms establish a two-sided or multi-sided "peer-to-peer" market with customers (and/or suppliers) on the supply side and customers on the demand side. The firms make use of platforms to capture value from both sides without actively creating it. Instead, value-creating activities are allocated to consumers (and/or suppliers) that also participate in captured value. These dimensions leave us with nine different business model archetypes.[20]

In the bottom left corner of Figure 1 (Cell 1), we see a firm (F) in the production stage that independently innovates, manufactures, and distributes goods (g) and sells them to consumers (C). This business model is referred to as a "transaction-oriented manufacturer." To the right (Cell 2), we see the "servitizing manufacturer" that is primarily offering value-add services (s). While the production of goods signifies an additional strategic option for the servitizing manufacturer (indicated by a dashed line), value-add services include, for example, renting, leasing, or full maintenance services as well as repairs, inspections, software upgrades, or fleet management solutions. In the bottom right corner (Cell 3) is the "rebound manufacturer" that reacquires (and recycles or upgrades) products from consumers after the consumption stage (r). Likewise, the rebound manufacturer can additionally integrate the activities of producing the good itself and offering associated value-add services into its business model.

Moving from value creation within a firm to value creation in the form of an alliance, the "co-creating manufacturer" (Cell 4) has opened its business model to external partners, such as consumers and/or suppliers for innovation, manufacturing, and/or distribution. Since all alliance partners participate in the creation *and* capture of value, they directly benefit from the subsequent transaction in which the good is sold to an (often third-party) consumer. The "co-creating service provider" engages in alliances with external partners to create value by offering product-related services to consumers (e.g., "renting" products instead of buying them) (Cell 5). Finally, the "recycling alliance" in Cell 6 is an open business model that has specialized in the reacquisition and reuse of products after the consumption stage.

In the upper row, we move to platform-based business models, starting with the "maker-platform operator" (Cell 7) that has established a market-like platform without being involved in the production process itself anymore. This business model is representing the current development towards the so-called "maker economy,"[21] in which individuals take over the traditional production function of firms. To the right, the "sharing-platform operator" is coordinating a peer-to-peer market, where consumers (and/or suppliers) are primarily offering consumption-related services to other consumers. This business model is closely related to the emerging "sharing economy,"[22] in which consumers share the use of products instead of buying them. The business model in the upper right corner (Cell 9) represents the operator of a "circulation-platform," on which consumers (and/or suppliers) are selling their used products to other consumers. While on a "sharing-platform," a product is used by a third-party consumer without a

change of ownership; the "circulation-platform operator" business model is grounded on the (free) transaction of a product. This business model is representing the development towards a circular economy.

Integrating New Activities into the Closed-Loop Value Chain

Firms increasingly extend their activities to the entire product life cycle and seek to enhance their profitability by generating additional revenues through offering product-service bundles and/or converting used products into new sales.[23] This selection of new activities in and after the consumption stage is equivalent to an integration of downstream processes and is associated with the development of new business models towards an closed-loop value chain.[24] The resulting business models are based on a dynamic cycle between forward and reverse value chain activities between firms and consumers.[25] Following are three business models that turn the conventional forward value chain into a closed-loop value chain.

The Transaction-Oriented Manufacturer

Established business model conceptualizations are related to the creation and capture of value in the forward value chain.[26] Manufacturing firms independently develop and produce goods that are subsequently transferred to consumers in exchange for payments. This resembles the conventional business model of a transaction-oriented manufacturer, in which firm activities end with the sale of the product to the consumer. On the first glimpse, many product providers still follow this business model, such as providers of apparel, footwear, typical "supermarket" products, or building materials. For market leaders, this business model still offers high revenues and value capture opportunities. Consider the success of Inditex (Zara) or Uniqlo in the fashion industry, which represent typical forward value chains based on a large degree of vertical integration and continuous optimization of their internal activities.

The Servitizing Manufacturer

When manufacturing firms extend their activities into the consumption stage, they primarily employ business models grounded on value-add services.[27] These servitizing manufacturers offer "combinations of goods, services, support, self-service, and knowledge"[28] "to accompany their existing products throughout the life cycle."[29] The corresponding extension of the business model has been a dominating pattern in many markets for industrial goods such as production machinery or medical technology, where revenues from servicing and operating equipment frequently surpasses the original revenues from selling this equipment.[30] More recently, manufacturers of complex consumer goods are also moving into this domain. Providers of home appliances such Sears, Whirlpool, or Bosch-Siemens consider repair services not as a cost factor for broken products, but as the key to a comprehensive service strategy based on predictive maintenance or upgrades.

While several automotive companies have successfully integrated the "servitizing manufacturer" business model and benefit from substantial profit margins

in the after-sales business, they can face severe competition from firms that solely offer services for goods they have not produced. Consider Carglass, a successful European vehicle glass repair and replacement company that operates independent of any automotive OEM or supplier to this industry. It became the reference point for any automotive or glass manufacturer moving into the repair business. Interestingly, Carglass is also adding the production of goods to its value chain, hence moving upstream, building on its superior process knowledge of a smooth repair process to build replacement products perfectly suited for efficient repairs (while traditional spare parts are often components build for efficient manufacturing of the original equipment). Likewise, automotive companies, such as *Daimler*, decided to more holistically embrace the "servitizing manufacturer" business model by implementing structurally separated subsidiaries and redefining the consumers' value proposition. Instead of selling cars to consumers, Daimler introduced *Car2go* to provide the service of mobility whenever a user needs it, and where she needs it. While partially cannibalizing their traditional "transaction-oriented" business model and their after-sales business, Daimler turned the ownership of a product into an on-demand service that is closer to the actual need of the consumer and requires less investment and maintenance.

The Rebound Manufacturer

At the end of consumption, consumers often sell their products to other individuals (e.g., via platforms like eBay, flea markets, or personal relationships), store them (e.g., to protect private information on laptops and cellphones) or discard them (e.g., due to the absence of potential buyers). If consumers intend to sell their products, they often face a situation of low demand, substantial transaction costs (e.g., finding a buyer or preparing a purchase contract) and high uncertainty (e.g., regarding appropriate prices and guaranty questions). Hence, consumers are often satisfied when they can safely return their product without additional costs. The rebound manufacturer seeks to benefit from these circumstances by acquiring, recovering, and reselling used products.[31] The products are dissembled and useable elements (materials, parts, components, or subassemblies) cleaned, reconditioned, refurbished, and put into inventory. While unusable products or elements are disposed of, recovered elements can be complemented by new ones and reused in the creation of new products.[32] Thanks to this circulation of value, "every product or component that can be reinserted into the forward [value] chain for sale is one less unit that must be procured or manufactured."[33]

A perfect example of a rebound manufacturer is *HYLA Mobile*, a fast-growing company in the mobile phone industry that captures, extends, and optimizes the life and value of used mobile phones. The company realized that the mobile device life cycle was being cut short due to the accelerated pace of new cellphones and wireless devices entering the market place, resulting in a growing global issue of electronic waste. HYLA Mobile wants to reverse this trend by extending the life cycle of mobile devices, realizing that significant residual value remains unclaimed in advanced wireless technology. In turn, the company created an incentive scheme for consumers to trade-in used mobile devices, followed by a full spectrum of device restorations—from minor cosmetic restorations to total renewal—and a

re-sale program. Each time consumers upgrade to a new device, they can apply an instant credit towards their purchase, while the old refurnished device provides someone else the opportunity to take part in the mobile economy.

Recognizing the value captured in the reverse value chain by rebound manufacturers, conventional service providers or manufacturers are starting to integrate their value chain into this stage of the closed-loop value chain. Consider cellphone operator O2, a brand of Spain's Telefónica that has increasingly adopted the business model of a rebound manufacturer, not just to comply with ecological sustainability standards, but also to enhance profitability. While having outsourced the development and production of devices to firms such as HTC or Samsung, their traditional "mobile communication" business was located in the consumer's usage phase and based on the provision of integrated product-service bundles. After realizing that consumers are demanding more flexibility to upgrade the phone at any time, O2 developed an innovative offering called "Refresh" that re-separated the costs for phones and airtime so that consumers can keep the contract, but replace their old phone with a new device. To further facilitate the exchange, O2 combined "Refresh" with a "Recycle" program through which consumers get paid for sending in their used devices. According to O2, all items are carefully reused or recycled to help protect the environment and generate funds for social initiatives such as "Think Big" that supports young people in making positive changes in their community.

Towards the Maker Economy: Opening Business Models to External Partners in Production

A second path of business model development builds on the integration of consumers and other external partners into value creation and capture, including all activities such as product development, manufacturing, and distribution. Especially in innovation, a growing number of transaction-oriented manufacturers have started to integrate consumers and other external partners into their product development activities.[34] They implement ideation contests or use crowdsourcing platforms to solve technical challenges. Consider the example of Beiersdorf, the German company behind the personal care brand Nivea. Nivea's most successful product launch in its existence has been the result of a customer co-creation activity that produced a deodorant with a new feature set that was so successful that it covered up to 50 percent of the market share some countries.[35] Another example is BMW's "Co-Creation Lab," which is integrating consumer expertise into the ideation stage of product development, facilitating communication, and enhancing consumer loyalty.

Notwithstanding, Nivea's and BMW's business models are opened only partially, at best, since consumers do not capture any of the co-created value directly (e.g., through royalties for solutions developed by them or revenue-based payments). Instead, the consumers' main motivations to participate in co-creation practices are the recognition as co-creators, brand attachment, the possibility to suggest their own topics or place their own ideas, and small symbolic rewards.[36] This is the case for most co-creation or open innovation activities today: the transaction-oriented business model of the forward value chain is not being changed

and remains closed. A few pioneering companies, however, are opening their business models for value capture as well.

The Co-Creating Manufacturer

When manufacturing firms open their business model more holistically and let co-creators participate in the captured value, they become co-creating manufacturers who establish alliances with consumers and other external partners. In the business-to-business domain, General Electric (GE) has been hosting an "Ecomagination Challenge" targeting startups, where winners received substantial amounts of investment to realize their concepts in close cooperation with GE.[37]

New York-based Quirky is a particular example of a company entirely focused on this idea. Quirky made the continuous transfer of customer ideas into actual products the core of its business model. These products include electronic gadgets, travel goods, and household items. Quirky engages its community in activities along the entire span of the innovation process, including its financing. A project starts when a user suggests a new product idea. The Quirky community then votes on the ideas that should enter the next stage of development, where ideas are jointly turned into a more-developed product by the community and Quirky's own developers. This development is followed by another evaluation. If it passes, Quirky closely cooperates with manufacturers to produce the items. Sales and distribution follow the conventional model of a branded product manufacturer, using their own sales channels and large retail chains. Different from conventional open innovation, Quirky integrates its users into value capture. About 30% percent of the gross sales revenues of each product are distributed among the participants. According to its founder, the core challenge when launching the company was developing an algorithm that provided a fair distribution of the 30% to the community members who contributed to a particular project. On average, 800-1200 contributors are paid per product. Payments are openly revealed on the website for each product and contributor, hence creating monetary rankings of participants.

Another example for a co-creating manufacturer is the semiconductor manufacturer Qualcomm, operating in the mobile phone industry and co-creating value with downstream business customers. At the end of the last century, Qualcomm sold its phone manufacturing business to Kyocera and its base station business to Ericsson. Today, their goal is to establish strategic partnerships with wireless companies of all sizes to develop and license breakthrough technologies. While the resulting consumer value still relates to the broad category of cellphones, Qualcomm radically adapted its business model. They solely focus on innovation as the key process and jointly co-create technological breakthroughs with their customers (such as Apple, Huawei, Lenovo, Microsoft, or Samsung) who are also responsible for manufacturing and delivery activities.

Dutch-based Fairphone has applied the Qualcomm model to cooperation with consumers. It is the first company offering a cellphone with a minimized negative effect on the environment and society. Other than purely profitability-driven firms, Fairphone's business model is primarily grounded in the creation of social and ecological value through developing and producing "fair" smartphones. While

emphasizing open supply chains and transparent business practices (e.g., full disclosure of suppliers and cost structures), consumers assume various roles in the Fairphone business model. Apart from participating in community-driven design contests and local production enabled by 3D printing technologies, consumers provide financial resources through crowdfunding initiatives and, thus, take over the responsibilities of traditional shareholders.

The Maker-Platform Operator

Eventually, firms can also advance their business model to peer-to-peer markets and become a platform operator. In general, a platform-based business model builds on the provision of a useful function or service and allows third-party access.[38] Platforms can be considered as two-sided or multi-sided markets, which serve two distinct user groups that provide each other with network benefits. The platform operator creates value primarily by enabling direct interactions between two (or more) distinct types of affiliated customers.[39] In this business model, firms provide an integrative platform external partners can use to create and capture value. All business models in the top line of our matrix (Figure 1) follow this understanding.

The maker-platform operator functions as a coordinating entity for the exchange of production-related activities. It establishes a (virtual) marketplace, where users are responsible for bringing together supply and demand. The idiosyncrasy of this business model is that the manufacturing firm is not actively creating product-related value anymore, but captures a portion of it from both sides. A typical example is Etsy, the online market place for craft goods. Etsy is not producing any goods, but connects craftspeople and artisan hobbyist with consumers seeking customized and unconventional objects. A similar model has been followed by Ponoko (today owned by Shapeways), a multi-sided market for digital production that connects designers providing design objects (in form of digital files for 3D printing), consumers interested in purchasing these goods, and owners of 3D printers (and similar production equipment) that would produce the good, often in close proximity to the customer. To facilitate this exchange, Ponoko not only provides a virtual store for the design files, a search function, as well as product reviews and recommendations, but also takes care of modifying files for better print quality and allocating them to suitable machinery. By assuming this coordinative role, Ponoko is responsible for avoiding capacity constraints as well as minimizing delivery times and cost.

Maker platforms can be offline, too. In the manufacturing field, U.S.-based TechShop is the offline equivalent to Ponoko. TechShop is a chain of member-based workshops that let people of all skill levels come in and use industrial tools and equipment to build their own projects. As an orchestrator, TechShop offers safety and basic usage training on the equipment, but basically facilitates the exchange among its members who engage in co-creation of projects. Or consider CraftyMums, a UK-based platform that is engaging talented, quality, handmade craft makers who are looking for a platform to sell their products in stores. CraftyMums offers affordable shelves and space, including wall space for rental inside the shop, advice on setting up business pages and websites, and access to selling craft merchandise on its e-commerce site.

Towards the Sharing Economy: Opening Business Models to External Partners in Consumption

Just like the transaction-oriented manufacturer can employ co-creation practices to enhance its innovation, manufacturing, and distribution capabilities in a closed business model, servitizing manufacturers increasingly co-create value with consumers in the consumption stage. Reflecting Chesbrough's transfer of the open innovation concept into the service context,[40] servitizing manufacturers can actively co-create new service solutions with customers. In doing so, they focus on the utility rather than the product, embed their organization into the one of their customers, and accompany their customers throughout the consumption stage. Recently, Daimler developed its Car2go service more towards such a business model by integrating consumers into value creation. Consumers not only book a car independently and undertake the handovers, but they also manage other consumers under their account in the "co-drivers" program and may even become involved in the car's maintenance (e.g., when they have to recharge the car, their efforts are rewarded with free minutes). Another example in this context is TomTom, a Dutch company that produces navigation (GPS) and mapping products. To support the utility of their devices, TomTom is offering a service package called "LIVE Services," providing the customer with real-time information on local places, traffic, weather, speed cameras, or fuel prices. One major information source for this service is individual users who are feeding the device with real-time data. Consumers become part of an information-sharing community and, thus, actively enhance the utility of TomTom devices for other users.

The Co-Creating Service Provider

Extending the idea of open service innovation, the co-creating service provider is an open business model that allows customers to participate in the obtained profits. They build an alliance with firms (and/or suppliers) to jointly provide other customers with a certain service. A prime example of this model is Giffgaff, a mobile telephone network in the UK running as a Mobile Virtual Network Operator using the O2 network. Owned by Telefónica, Giffgaff claims to be "run by our members," with sales and support almost solely performed by its users. Members who answer questions in the community space or generate sales to new users are rewarded with "Payback" points that can be redeemed as cash, airtime credit, or donated to charity.

Another example for a co-creating service provider business model built by a conventional manufacturer is Moovel, a subsidiary of Daimler AG. Moovel is a platform app that fully integrates various mobility service providers from the public and private sector. It combines the services offered by car-sharing providers such as car2go and mytaxi (a service similar to Uber), railway companies, local public transit authorities, as well as rental bikes and it does so in an integrated way for users who are then able to find and book the "best" possible way (according to personal preferences and budget) to "get from point A to point B." With Moovel, Daimler is primarily selling a mobility service that is created in a close alliance with many network partners, who all are capturing part of the value created for users.

The Sharing Platform Operator

The sharing platform operator is coordinating a peer-to-peer market, where consumers (and/or suppliers) are primarily offering sharing services to consumers. Sharing provides a form of access to an object through redistribution markets, where peer-to-peer matching services (RelayRides, AirBnB) or social networks enable used or owned goods to be redistributed where they are needed (Share Some Sugar, Freecycle, Neighborhood Goods).[41] A well-known example is RelayRides, a peer-to-peer car-sharing model where car owners make their vehicles available to others for rent for short periods of time. The business model is closely aligned with traditional membership-based car-sharing companies such as Streetcar or Zipcar, but replaces the actual fleet with a "virtual" fleet made up of vehicles from participating owners. With peer-to-peer car sharing, participating car owners are able to charge a fee to rent out their vehicles when they are not using them. Participating renters can access nearby and affordable vehicles and pay only for the time they need to use them. Sharing platform operators screen participants (both owners and renters) and offer a technical platform, usually in the form of a website and mobile app, that brings these parties together, manages rental bookings, offers short-time insurance, and collects payments.

Another example of a sharing platform operator is Fon, a company that provides a platform for consumers ("Foneros") who share their home Wi-Fi signal in exchange for free access to hotspots of other members. While consumers that only want to make use of hotspots without providing access to their own can buy access passes or credit, Foneros that grant Wi-Fi access to these consumers participate in the resulting revenues. Apart from providing their own Fonera routers, Fon is collaborating with national telecommunication companies (such as Vodafone, Proximus, or KPN) to increase coverage by integrating the Fon software into their routers. In May 2015, Fon was operating a platform of 15 million hotspots. Different to Giffgaff's approach of using an established network, the Fon community is building its own network by collaborating with various telecommunication companies and providing access directly from user to user.

Towards the Circular Economy: Opening Business Models to External Partners in Circulation

In addition to co-creating value with companies in the production and consumption stage, consumers can also be integrated into several activities associated with the circulation stage. When consumers freely separate their waste into different elements, return and donate used products, or initiate and participate in collections, consumers partially take over the responsibility for the value creation process. They may dissemble their furniture to facilitate transportability, dismantle tires and take them to manufacturers and retailers, remove their data and personal information from used devices, or replace a computer's memory and hard drive. However, just as in case of the transaction-oriented manufacturer and the servitizing manufacturer, consumers do not participate in the captured value. In the following, we therefore introduce two business models that are open to

external stakeholders and let them participate in value capture: the recycling alliance and the circulation platform operator.

Recycling Alliance

The recycling alliance is an open business model specialized in the reacquisition of used products after the consumption stage, often driven by ecological, social, and economic goals. Due to the multiplicity of goals, firms engaging in recycling alliances regularly collaborate with highly diversified stakeholders, such as consumers, non-governmental organizations (NGOs), local communities, municipalities, and other firms. At the same time, recycling alliances usually concentrate on specific industries, product categories, or regions (e.g., the State of Texas Alliance for Recycling (STAR) or The Wireless Alliance). One example of a recycling alliance is the Closed Loop Fund, a coalition of consumer goods companies and retailers that are creating economic value by increasing recycling rates. Even competing companies such as Coca-Cola and PepsiCo, or Procter & Gamble and Unilever, have united under the umbrella of the Closed Loop Fund to provide zero percent interest loans to municipalities and below market interest loans to private companies to develop local recycling infrastructures. By increasing the volume of recyclable packaging and putting more recyclable materials back into the supply chain, participating firms can save substantial revenues and increase the efficiency of their operations and products. Simultaneously, Closed Loop Fund enables municipalities and private companies to tap into the growing revenues of the recycling market, create jobs in the emerging recycling industry, and preserve natural resources.

Another example is Hope Phones, an innovative campaign to fund the global efforts of Medic Mobile. The latter is an open-source platform that allows health workers to register every pregnancy, track disease outbreaks faster, keep stock of essential medicines, and communicate about emergencies. To finance these offerings, Hope Phones is collecting donated cellphones that are subsequently recycled by partner organizations. The partners re-transfer the value of donated phones back to Hope Phones's account to acquire appropriate new technology for the field. In this business model, consumers can not only donate their own phones, but also organize collection drives to reacquire and redistribute phones from other donors in their local community.

The Circulation-Platform Operator

The circulation platform operator provides a marketplace where consumers (and/or suppliers) can sell their *used* products directly to other consumers. The best-known example of this business model is Craigslist, a classified advertisements website. However, this business model is rather related to an extension of the consumption stage by another consumer than the product's recycling and reuse. A more innovative example is The Next Closet, a resale platform for designer fashion located in Amsterdam. Female consumers can buy and sell second-hand designer fashion, while the company provides various distribution, sales, and reconditioning services (e.g., shipping, photography, styling, or advertisement). Garments that are not sold are donated to KICI (an independent clothing collecting charity in the Netherlands) and their project "Dress for Success."

Or consider Recipro, an online exchange for construction surplus and re-usable materials. Recipro can be used to pass on leftover building supplies or to source good-quality, low-cost construction materials. They estimate that 13% of construction products that arrive on a building site end up as waste product without ever being used, corresponding to a market value of approximately $1.5 billion each year. Recipro diverts these materials away from the waste stream and puts them to beneficial use. Another example for an innovative business model in the mobile phone industry is the strategic alliance approach of uSell, which connects customers that intend to resell their products with professional buyers, while primarily focusing on the payment, redistribution, shipping, and tracking processes. Their strategic partners, such as Bikair, ReCellco, or Guzu, then have specialized in the re-creation processes of recycling, reconditioning, refurbishing, and reselling of used devices.

Implications

We have introduced nine different business model archetypes that demonstrate how innovating firms are moving towards closed-loop value chains and simultaneously incorporating external partners into increasingly open business models. These developments have important implications for management, including the nature of firm-consumer relationships, the relevance of consumer communities, the challenges in new product development, and the sustainability of business models.

Implications for the Firm-Consumer Relationship

The business model of the transaction-oriented manufacturer is unidirectional, static, and limited to the exchange of produced goods against consumer payments. However, firms increasingly seek to implement new ways of value creation and capture by building on two recent socioeconomic developments changing the firm-consumer relationship. The first is related to the extension of firm activities into the closed-loop value chain. Here, firms not only offer value-added services in the consumption stage, but also develop business models around product returns for the emerging circular economy. While the unidirectional and static firm-consumer relationship becomes rather dynamic and reciprocal, we distinguish between three stages related to the production, consumption, and circulation of a good. Due to the possibility of returning products and exchanging them against state-of-the-art devices, consumers may become less interested in product ownership and more open to leasing or rental agreements that ensure a carefree use and include complementary services. When consumers buy access to the utility of a product for a definite period of time they might become more willing to commit themselves to the manufacturer and do not perceive long-term contracts as a burden. High switching costs and mutual dependence guarantee a positive surplus on both sides.

The second development is captured by the notion of openness in business models, in which external stakeholders actively participate in the creation *and*

capture of value. Here, consumers assume responsibility for activities traditionally executed by the firm, have a share in the obtained profits, and, thus, become an integral part of their business model. We distinguish between independent firms (with simple co-creation practices), alliances, and platforms, depending on the degree of consumer involvement into a firm's business model. While firms and consumers become equal partners with similar tasks in an alliance, platforms represent multi-sided markets that empower users to independently create value.

In the value creation process, firms face a typical "make-or-buy" decision. To determine the activities that are to be performed by consumers, one has to analyze where consumers can (and are willing to) add more value to the resulting product than the firm, as well as what type of collaboration is technologically feasible and affordable. Integrating the consumers' knowledge, expertise, and skills requires technological solutions that empower consumers to work remotely alongside internal employees on dedicated activities. The extent to which consumers fulfill value-creating activities is also dependent on the complexity of the specific task as well as the complexity of the product itself. While comparatively simple tasks, such as writing a book, can be holistically and autonomously executed by consumers, more complex tasks, such as the manufacturing of a car, still require the coordination of a centralized organization that may engage in co-creation practices or alliances with consumers, suppliers, and other partners.

In value capture, firms need to compare the financial differences between a closed and an open business model. When co-creating consumers or other external stakeholders have a share in the obtained profits, platform providers have to invest in specific technologies. An example is peer-to-peer car-sharing services. Here, vehicle providers often have to provide a technical infrastructure that allows remote access to the car and monitors its usage. The resulting reduction of financial benefits needs to be at least compensated by decreasing operational costs or additional profits from increased sales, a higher willingness to pay by consumers, or increased consumer loyalty.

Implications for the Management of Consumer Communities

Openness of business models is often associated with an increasing importance of consumer communities. These communities can either be initiated by consumers themselves or induced by the focal firm. Thanks to the direct relationships in communities, consumers can directly exchange their experience with the value creation process, share information and ideas, or help each other in the execution of tasks. These activities are in strong contrast to the typical binary firm-consumer relationships. A community functions like an external organization that becomes an alliance partner and partially takes over coordinative and administrative activities in addition to the creation of value. Therefore, consumer communities, especially those online, can yield significant communication and production efficiencies that further enhance the profitability of open business models.

In the case of platforms, the consumers' responsibility and range of functions is even more extensive. Here, consumer communities transform into market-like settings where consumers holistically and independently create the value, capture

a major portion of the profits and, thus, signify the main actors on both the supply and the demand side. Firms, on the other hand, are responsible for creating platforms that consumers can use to produce and sell their own products (maker-platform operator), share their products with other consumers (sharing-platform operator), or sell their used products (circulation-platform operator). It is essential to define and specify market conditions that allow for positive net profits for the value-creating consumer and the platform operator, while ensuring that the willingness-to-pay of the buying consumer is not exhausted. This means that firms need to develop multi-dimensional profit formulas that appropriate economic rents adequately to various stakeholders and, thus, support a balanced market setting. This contributes to a more sustainable economy, in which firms maximize value for all market participants instead of only their own profits.

Implications for the Sustainability of Business Models

The sustainability of business models is to be evaluated in accordance with the triple bottom line, comprising economic, ecological, and social goals. From an ecological point of view, the sustainability of future business models particularly benefits from the emergence of the closed-loop value chain. When firms "take responsibility for the entire lives of their products"[42] and are able to capture some of the circulation value, it becomes increasingly important to develop and manufacture products that can at least be partially reused in new products (e.g., in the form of components, parts, and subassemblies) or sold multiple times to various consumers with comparatively cheap and simple refurbishment and maintenance measures.[43] Business models in the circular economy provide goods for multiple consumption cycles and reduce the amount of resources that go into the production process. They provide consumers with the opportunity to recycle old products, reduce waste, and allow firms to financially benefit from the extended responsibility for the entire product life cycle. From a societal point of view, open business models trigger firms to establish more sustainable businesses that allow external stakeholders to take a share in the obtained profits. Instead of merely maximizing profits for a single firm and its shareholders, the emerging open business models put a strong emphasis on the balanced distribution of profits, so that all stakeholders actively participate in the platform market. Since the firms' profits are dependent on the contributions of consumers, the former need to invest in sophisticated infrastructures allowing the latter to holistically contribute their knowledge, expertise, and skills. This empowerment, combined with participation in the financial profits, strengthens the role of consumers in diverse market settings and makes them the key actor in open business models.

However, potential opportunities for more sustainable business models also bear the risk of opposite effects. From an ecological perspective, the presented business model archetypes can cause significant increases in consumption, inefficient production, and resource demand. More extensive consumption can result from shorter product life cycles (e.g., through an accelerated replacements of products, such as mobile phones) and market expansions. New consumers can be reached in both lower-end market segments with more affordable products

(e.g., due to an enhanced distribution of costs and outsourcing of value-creating activities to consumers) and higher-end market segments with more customized products for which consumers are willing to pay a premium (e.g., by integrating consumers into the design of luxury goods). Inefficiencies in production may be caused by the increased output of substandard and defective goods that are disposed of (e.g., because of the inexperience of consumers with production technologies or extensive experimentation) and the shift from centralized to decentralized operations (e.g., less synergies and scale effects in purchasing, production, distribution, and/or logistics). Eventually, this might lead to an increased demand and accelerated exploitation of resources (e.g., the use of rare earth elements in mobile phones). From a societal perspective, the developed business model archetypes can create market barriers that not only prevent firms from participating in the maker, sharing, and circular economies, but also exacerbate the access for consumers. While in the past, the access to products and markets was primarily determined by individual buying power, in the emerging economies consumers often require additional value creation capabilities and/or access to infrastructures that support customer co-creation. Otherwise, their potential benefits remain limited. Furthermore, the increased responsibility of consumers can cause substantial transactional costs (e.g., related to uncertainty about warranty claims, claims for compensation, or product liability), compliance issues with industry standards as well as regulations that govern and ensure the interests of stakeholders (e.g., application of ISO 9001 quality management standards), and a reduction in the workforce (e.g., through decentralized production systems enabled by innovative 3D printing technologies).

Taken together, this discussion on potential sustainability-related advantages and disadvantages allows corporate decision makers "to structure and manage its business processes to obtain competitive returns on its capital assets without sacrificing the legitimate needs of internal and external stakeholders and with due regard for the impact of its operations on people and the environment."[44]

Implications for Product Innovation

The emergence of new business models in closed-loop value chains also has important implications for a firm's product development activities. First, innovation managers need to be aware of the increasing importance of complementary services. Products are increasingly embedded in product-service bundles that yield additional revenues during the usage stage. Especially in case of "servitizing" manufacturers, the construction and design of products should support efficient maintenance measures, quick repairs, and reliable usage. Complex architectures exacerbate inspection, control, replacement, and repair as well as reassembling processes and cause cost-intensive delays that additionally reduce customer satisfaction. Therefore, after-sales requirements need to be integrated into the innovation process to make sure that planned product features enable professional after-sales services.

While the same product features facilitate the disassembly and removal of products in the reversed value chain, firms can additionally create future revenues

from reselling used products, while keeping recreation costs as low as possible. For this purpose, firms can make use of simpler product architectures (e.g., modular structures with standardized interfaces), employ more robust and durable raw materials (e.g., recyclable instead of non-recyclable plastics or metals), or use the same products, components, and platforms across different product categories (as is typical for the modular product architectures of large automotive companies or the PC industry). The resulting synergies are scale effects that reduce purchasing and production costs, learning effects that support the longevity of products and establish continuously improved processes and routines, as well as substituting effects that allow for multiple sales of products, subassemblies, components, or parts. The challenge is to implement eco-designs into new product development to "close the supply chain loop by addressing product functionality while simultaneously minimizing life-cycle environmental impacts."[45] One example in this context is Dell that is cooperating with asset resale and recycling partners to develop products "with the end in mind." Dell particularly emphasizes the use of recyclable and renewable materials (e.g., mushroom or bamboo for packaging), modularity of standardized components, easy disassembly (e.g., reduction of screws and facilitated access), replacement of glues and adhesives by innovative snap fits, as well as restrictions on paints and coatings. All these activities demand new priorities for product development. As a downside, this can lead to less differentiation. The more technologies get standardized and integrated in a product portfolio, the less balanced is the tension between radically new technologies (ensuring long-term survival) and established technologies (fostering short-term profitability).

Outlook

In this study, we developed a structure of open business model archetypes in the emerging closed-loop value chain. Our illustrative examples showed the broad applicability of these models in different industries. As noted, we see each of the strategies as independent alternatives, applicable to specific contingencies in a market. Still, there are interdependencies between the alternatives. For example, firms that pursue the "servitizing manufacturer" model might additionally benefit from integrating consumers into their innovation and production processes. Through actively contributing to the firm's value creation process, customers can adapt the product to specific requirements, learn how to use it appropriately, and establish communication channels with engineers and other technical experts. Through working closely together before and after sales, firms can significantly increase customer loyalty, customer satisfaction, and willingness-to-pay.

In essence, there are two motives why firms extend their activities into the closed-loop value chain: they have either identified a promising business opportunity or they are forced to do so by legal regulations (e.g., laws to accept returns of used products). In both situations, firms need dedicated capabilities to sense and seize appropriate elements of a fitting business model and reconfigure their existing one. However, the impetus of change may influence the radicalness of change. We

assume that the more proactively (responsively) firms seek to operate in the reversed value chain, the more radical (incremental) the change of their business model.

Furthermore, our framework of the closed-loop value chain underlines the importance of considering the entire product life cycle for business model innovation. In managerial decision making, though, tools prevail that primarily focus on the cost side (e.g., TCO analysis), while neglecting changes in value (e.g., recreated vs. returned vs. created value) and distributed value capture.

Finally, our framework emphasizes the relationship between firms and consumers in open business models. However, designing an eco-system of interdependent and transcending activities requires managers to cope with the complexity, multiplicity and interdependence of various stakeholder relationships.

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